MNYORORO WA THAMANI WA MAZAO YA MISITU

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ANALYSIS OF CHARCOAL MARKET SYSTEM IN HANDENI, KINONDONI AND MAGHARIBI "A" DISTRICTS, TANZANIA - MASTER THESIS FOR SOKOINE UNIVERSITY OF AGRICULTURE

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ANALYSIS OF CHARCOAL MARKET SYSTEM IN HANDENI, KINONDONI AND MAGHARIBI "A" DISTRICTS, TANZANIA

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A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN ENVIRONMENTAL AND NATURAL RESOURCE ECONOMICS OF SOKOINE UNIVERSITY OF AGRICULTURE.

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ABSTRACT

This study aims to analyse the charcoal market system in Handeni, Kinondoni and Magharibi A districts. Despite of the profits gained by charcoal actors in the value chain, the actors are not paying charcoal government fees and unregistered, thus making a significant loss of government revenues through royalties evasion. This study analysed the roles of each actor in value chain, examined the profits gained by each actor, analysed supporting functions and assessed enabling environments for charcoal business in study areas. A cross-sectional study was conducted to analyse the charcoal market system in study areas. Data were collected through questionnaire surveys, Indepth interviews and focus group discussion. Results from descriptive statistics show that among the interviewed respondents charcoal actors play a role of paying the charcoal government fees; Charcoal wholesalers were nearly three thirds (74.2%) while producers were less than half (47.1%) and one third (35.7%) were retailers. Charcoal transporters were more than half (52.8%) played a role of transporting charcoal with government payment documents while very few consumers (9.2%) had received charcoal receipts from sellers. There was a high statistical significant difference of profit gained between charcoal actors who were registered and those who are not registered by using Man- Whitney test ($P < 0.01$). On supporting functions, descriptive analysis shows that about 23.5% of charcoal producers from Handeni district trained on charcoal business. Charcoal wholesalers (46.0%) from Magharibi A district accessed the bank loans. About 44.1% of charcoal producers from Handeni district urged roads were in good to support the business. All charcoal wholesalers from Magharibi A district used charcoal selling centres. All

wholesalers found in Magharibi A district joined the charcoal groups. Most of charcoal wholesalers (92.3%) from Magharibi A district urged market information support charcoal business. All charcoal producers used earth mound kilns for charcoal productions. Thematic and descriptive analysis used to assess business enabling environments. Five themes emerged: Charcoal business registration, movement documents, revenue collection and records, agreement between TFS and DFNR- Zanzibar and unstainable charcoal production. Further, supporting functions are unavoidable to make charcoal actors to pay government fees and register their business. This study recommends that policy makers should develop charcoal trade guideline between Government of Tanzania mainland and Zanzibar.

DECLARATION

I, William D. Marandu do hereby declare to the Senate of Sokoine University of Agriculture that, this dissertation is my own original work except where acknowledged and that it has not been submitted for a degree award to any other institution other than the Sokoine University of Agriculture. Morogoro, Tanzania.

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DEDICATIONS

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LIST OF ABBREVIATIONS AND ACRONYMS

Ci	Cost
DFC	District Forest Officer
DFO	District Forest Officer
EFD	Electronic Fiscal Device Machine
FGD	Focus Group Discussion
FORVAC	Forestry and value chain development project
Kg	Kilogram
NGO	Non-Government Organisation
Pi	Profit
Ri	Revenue
SPSS	Statistical Package for Social Science
SUA	Sokoine University of Agriculture
TFS	Tanzania Forest Services
TRA	Tanzania Revenue Authority
TZS	Tanzanian Shilling
URT	United Republic of Tanzania
US$	United State Dollar
VEO	Village Executive Officer
WEO	Ward Executive Officer
ZRB	Zanzibar Revenue Board

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background information

Charcoal markets contribute significantly to the economy and in reducing poverty in developing countries through creation of employment, trade, and household income generation (Brobbey, 2019). Worldwide, millions of people from rural and urban areas derive part of their livelihood from charcoal business (Zulu and Richardson, 2013; Baumert *et al.,* 2016). In sub-Saharan countries, charcoal market is estimated to contribute to the income of approximately seven million people and is projected to increase to 12 million people by 2030 (Mwampamba *et al.,* 2013). Despite the importance of charcoal markets to most African countries, governments have weak systems for implementing appropriate policies to successfully manage and monitor the charcoal sector (Nyamoga and Solberg, 2019). Existing policies in most countries are often unclear, conflicting, unrealistic and ineffective resulting into informal sector (Schure *et al.*, 2013; Liyama *et al.*, 2015; Owen *et al.,* 2013).

In Tanzania, charcoal business was generating more than US$ 650 million annually (WB, 2009) but the most current estimation it accounted for 867 billion (TZS) which is approximately US$ 370 million in 2017 (Mabele, 2020a). The survey conducted in 2014 on forest governance at district level showed that the 23 districts in the country collected about US$ 838,000 from charcoal royalties and fees (Mabele, 2020a). Despite of the charcoal market benefits, the government of Tanzania experiences loss of about US$ 100 million per year from charcoal revenue due to minimal or no

control of the charcoal business as results of weak, uncontrolled and unregistered charcoal trading systems (Sander *et al.,* 2013; Nyamoga and Solberg, 2019).

Empirical evidences indicate that in Tanzania, charcoal is largely traded under informal environments, characterized by dispersed, poorly developed, and weakly regulated systems (Zulu and Richardson 2013). This results into inefficient and poor coordination of the key actors in the charcoal value chain such as producers, wholesalers, retailers, and transporters (Nyamoga and Solberg, 2019). Charcoal producers and traders are in most cases linked and interacting directly with village government only leaving other important stakeholders out of the chain (Sander *et al.,* 2013; Nyamoga and Solberg, 2019).

In Handeni district, charcoal production is among the important activities for generating income where Dar es salaam and Zanzibar are the main markets (Ishengoma and Abdallah, 2016; URT, 2018). In Handeni district about 1% of charcoal bags are issued under formal charcoal procedures that means about 99% of charcoal bags are traded under informal basis where charcoal actors are not known by the government and not paying the charcoal royalties (Koppers, 2001). Therefore, there is a need for government to ensure revenues are collected properly and efficiently through registration of the charcoal actors and paying the government charcoal royalties (Schure *et al.,* 2013).

1.2 Problem statement

Charcoal market employs about two million people in the entire value chain in Tanzania and there are almost no barriers to entry along the value chain (Camco, 2014; Nyamoga and Solberg, 2019). However, the charcoal market tends to benefit few key actors in the value chain (Doggart and Meshack, 2017; Nyamoga and Solberg, 2019). Almost all actors are employed on an informal basis that means they are not paying the government royalties and majority are unregistered (Schure *et al.,* 2013; Camco, 2014). This causes a significant loss of government revenues through royalties evasion and there are few proper records on quantifying the amount of charcoal produced per year (Sander *et al.,* 2013; Nyamoga and Solberg, 2019). Previous studies have been done about charcoal production and consumption in Tanzania. However, there are few studies have focused the formalisation of the charcoal actors in Tanzania.

In Handeni district about 11 charcoal bags are only issued by permits out of 1000 charcoal bags produced per day indicating that most of the charcoal actors are not registered, not paying the required charcoal royalties and performing informal charcoal business (Koppers, 2001; URT, 2018). Therefore, this study analysed the roles played by charcoal actors, market profitability, supporting functions and enabling environments that could formalise the charcoal actors in Handeni district because it is among the districts that serves Dar es salaam and Zanzibar which are the largest charcoal markets in the country.

1.3 Justification of the study

The findings information from this study showed both policy makers in Tanzania mainland and Zanzibar on the supporting functions situations for charcoal actors including producers, wholesalers and retailers on payment of charcoal government fees. Also, it will be used to improve the charcoal business and the trading system under the formal condition in Tanzania mainland and Zanzibar.

1.4 Objectives

1.4.1 Overall objective

The overall objective of this study was to analyse the charcoal market system and assess the key actors along the value chain in Handeni, Kinondoni and Magharibi A districts.

1.4.2 Specific objectives

The specific objectives of the study were to:

(i) To analyse the roles of each actor in the charcoal value chain,

(ii) To examine the profitability of charcoal business in study areas,

(iii) To analyse supportive functions of charcoal business in study areas,

(iv) To assess enabling environments for charcoal business in study areas.

1.5 Research questions

(i) Who were the key charcoal value chain actors in the study areas?

(ii) What were the roles played by each actor in charcoal value chain in study areas?

(iii) What was the difference of profits gained between registered and non-registered charcoal actors in the charcoal value chain?

(iv) How are supportive functions for paying charcoal government fees in study areas?

(v) How are enabling environments of charcoal business in study areas?

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Theoretical Framework

2.1.1 Marketing Chain Analysis

Market chain analysis identifies and describes all points in the chain that includes chain actors producers, transporters, wholesalers, retailers, and consumers, prices in and out at each point, functions performed at each points, market demand or rising, constant, declining, approximate total demand in the channel, market challenges and strategies to improve the products (Tadesse, 2011).

Analysis and understanding of charcoal market chain in sub- Saharan Africa is important to promote and improve the livelihoods of actors in the value chain (Ingram *et al.,* 2014; Worku *et al.,* 2021). However, the major constraints in the charcoal market chain in Northwest Ethiopia and other countries in sub- Saharan Africa are lack of government support, problems of government policy and lack of access to credits (Worku *et al.,* 2021).

2.1.2 Value Chain Governance

Value chain governance refers to the relationships among the buyers, sellers, services providers and regulatory institutions required to bring a product or services from production to its end use (Kaplinsky, 2001). According to Tanzania Forest Act. No. 14 of 2002 the Tanzania Forest Services (TFS) has the power to collect charcoal

royalty from the actors in value chain and Local governments given an authority to collect cess fees from charcoal business.

Good governance of charcoal value chain is achieved if there are transparent, consistent and coordinated regulatory institutional mechanisms that support and penalize illegality along the whole value chain (Bourne *et al.,* 2020). Charcoal sector to East African countries is currently needing better governances as it supports the value chain actors` income and national economy (Nyamoga and Solberg, 2019; Ndegwa *et al.,* 2020).

2.1.3 The Benefit Theory

The benefit theory of tax advocate for charcoal actors to pay charcoal government fees on the basis of the supports gained from the authorities collect the government fees such as Tanzania forest services agency (TFS) and local governments (Anim *et al.,* 2020).

2.2 Empirical Review

2.2.1 Charcoal chain actors and their roles

The charcoal value chain actors involved are the producers, transporters, traders and retailers (Schure *et al.,* 2013). These charcoal actors are required to pay the charcoal government fees and registering their business. Indirect actors who are chain supporters provide financial or non-financial support services such as banks, credits agencies, business services provider, government, researchers, and extension's (Kaplinsky and Morris, 2001; Bellù, 2013). Indirect actors should recognize all

charcoal actors who are playing a role of paying the charcoal government fees and being registered. Study conducted in Tanzania show that charcoal producers playing a role of selling their products to middlemen who transport it to the major urban centres (Malimbwi and Zahabu, 2008). Charcoal movement from production areas to charcoal markets may increase a chance for charcoal producers to avoid paying the charcoal government fees. But the rural people benefit through their roles in charcoal production or as small transporters, wholesalers or contract laborer involved in loading, repairing or driving trucks (Minten *et al.,* 2013). Charcoal actors might be aware of other roles apart from paying the charcoal government fees.

2.2.2 Profitability of charcoal business

The profit distribution is examined by the price of the charcoal and margin (income) gained between charcoal actors (Agyei *et al.,* 2018). Recent scholarly works on charcoal commodity chains suggests that charcoal production and trade is profitable but that profits are unequally distributed along the chain (Baumert *et al.,* 2016). The middlemen are portrayed as the most exploitative actors in the value chain due to high price setting by wholesalers and retailers (Smith *et al.,* 2017). This is contrary to the study by Luoga *et al.,* (2000) who perceived that charcoal producers' profit to be positive because of the low capital they invest for charcoal production despite the very low charcoal price. There was a need to examine the profit distribution between registered and non registered charcoal actors in the value chain.

2.2.3 Supporting functions of charcoal business

There is a lack of government control over charcoal market, and the only Tanzania local government authorities linking and interacting directly with charcoal producers and traders (Sander *et al.,* 2013). Central government supports to charcoal actors required to improve formalisation of charcoal business in Tanzania. According to Blodgett (2011) argued that the charcoal producers lack the market Information on price, business training that would enable the charcoal producers to manage their business better and market their product. Market information and business training related to charcoal business are required to support the charcoal actors and motivate them to pay the charcoal government fees and being registered. Motorcycles and bicycles usually transport charcoal from production point primarily to roadside, but in some cases, they transport charcoal to urban wholesalers, retailers and even to final consumers (Ishengoma and Abdallah, 2016). Using of motorcycles and bicycles to transport charcoal indicate roads are in poor conditions and charcoal productions are in remoted areas that increasing the chance for charcoal actors to evade charcoal government fees. Local producers are seldom organised into groupings such as associations, thus having the little bargaining power and are usually not integrated beyond the production level (Van Beukering *et al.,* 2007; Zulu and Richardson, 2013; Baumert, 2016). Charcoal groups supporting the charcoal business as they are easily managed by government officials and building capacity to improve their trade to be under formal conditions.

2.2.4 Enabling environments for charcoal business

Informal charcoal market in many parts of the tropical world is seen as it caused by unclear policy and legal framework (Chidumayo and Gumbo, 2013). Unclear of charcoal regulations may result to charcoal actors not paying the charcoal government fees and registering their business. Tanzania, energy policies focus on energy transition from biomass to other choices of fuel but charcoal remains the cheapest fuel compared to other choices of fuel excluding firewood (Doggart *et al.,* 2020). The government of Tanzania should ensure improvement of charcoal actors to perform their trade under formal basis that means paying charcoal government fees and registering their business. In Tanzania the importance of charcoal revenue collected by Tanzania government is not admitted publicly by policymaker though the charcoal business is legally formalized and government of Tanzania is collecting revenue from charcoal producers, wholesalers and retailers (Mabele, 2020a). The government of Tanzania required to enable charcoal actors to be aware of charcoal regulations in order to have effective implementation that means paying of charcoal government fees and being registered.

2.3 Conceptual framework of the study

The formalisation of charcoal market system depended on supporting functions that included trainings, accessing of financial services, membership to charcoal groups, selling areas of charcoal, accessing of market information and roads. Intermediate variables are depending both to independent and dependent variable. Therefore, intermediate variables were Forest Policy, Act, Regulations, village and district

bylaws which were important to enhance charcoal value chain actors to trade under formal conditions (Fig. 1).

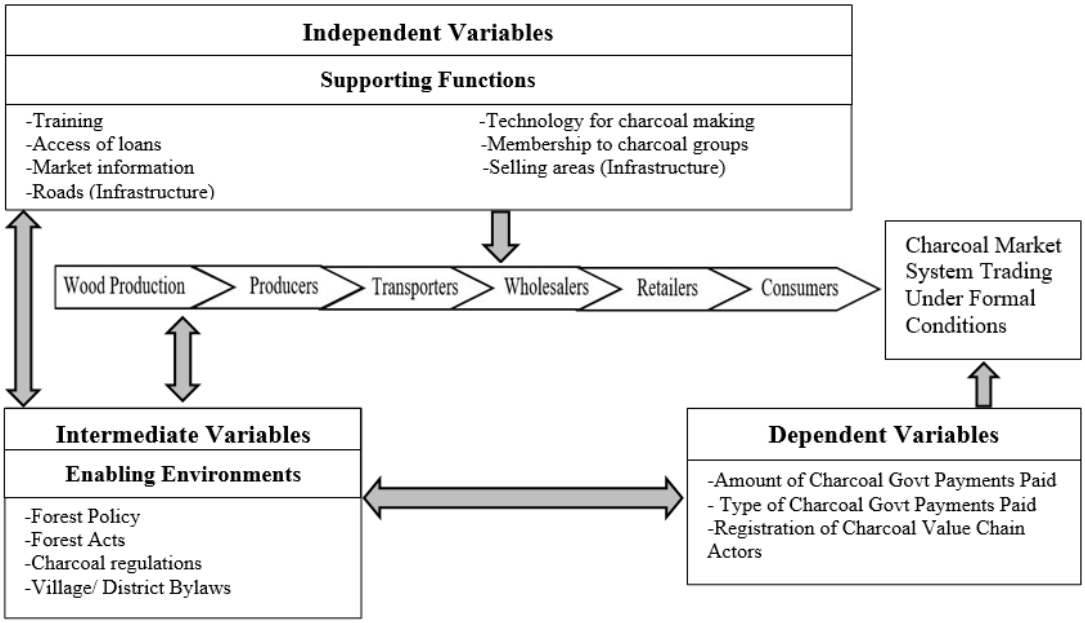


Figure 1: Conceptual framework for analysing the charcoal market system.

Source: Own Construction (2020).

CHAPTER THREE

3.0 RESEARCH DESIGN AND METHODOLOGY

3.1 Study area

3.1.1 Geographical location and economic activities

This study was conducted in Handeni, Kinondoni and Magharibi A districts. Handeni district is one of the 10 districts of Tanga region in Northern Eastern part of Tanzania, it is situated within the Latitude 4^0 9' and 6^0 0' South of the Equator and between Longitudes 36^0 8' and 38^0 5' East of Greenwich (URT, 2018). The major economic activities in Handeni district includes farming, hunting and gathering, fishing and forestry activities (URT, 2018).

Kinondoni district is located in the Northern part of Dar es salaam city. It lies within Latitude of 6^0 47' S and 39^0 16' E. The east, it is bordered with the Indian Ocean, to the North and to the West is bordered by Pwani region and to the South is bordered by Ilala district (Bukwelles, 2015). The major economic activities include trade, manufacturing, tourism, transport and communication, urban livestock, forestry, fishing and utility services (Bukwelles, 2015).

The Magharibi A district is one of the two new districts that were established in 2015 from Magharibi district in the Mjini Magharibi region. Magharibi A is bordered in the North by the Kaskazini Unguja Region; to the East by the Central/South Region; in the South by Kiwani Bay; and in the West by the Urban District (URT, 2017). The

main economic activities in Zanzibar urban district are tourism, fishing, trade and farming (URT, 2017).

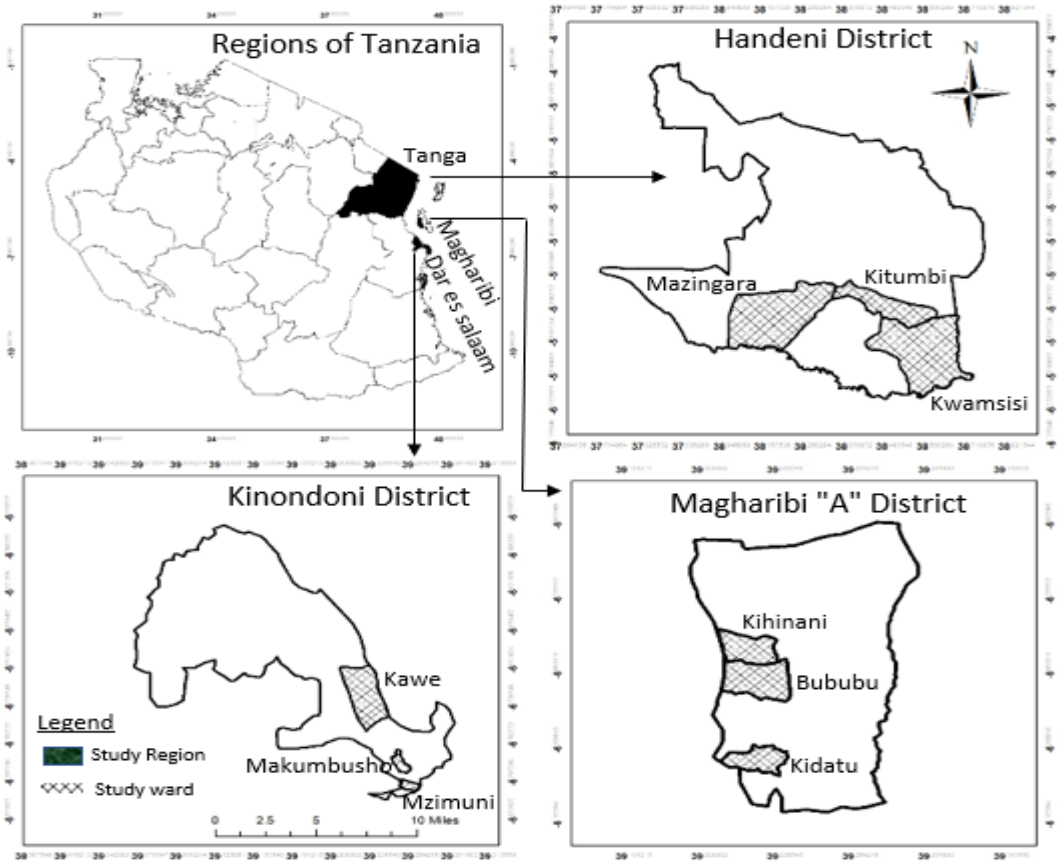


Figure 2: **Study areas in Handeni, Kinondoni and Magharibi A districts.**

Source: Own construction (2020).

3.1.2 Rationale for selecting the study areas

Analysis of the charcoal market system required linking between the production area Handeni district and the market areas which in this case are end users Kinondoni and Magharibi A districts. By doing so, the entire charcoal value chain was assessed.

The study conducted on forest produces market system analysis by URT (2018) shows that Handeni district is a potential for charcoal production in Tanzania that

serving the largest charcoal markets Dar es salaam and Zanzibar. Also, according to Nyamoga and Solberg (2019) till 2019 there was no national survey done to rank the top district listed for charcoal production in Tanzania. Kinondoni district is highly serviced by charcoal produced in Handeni district compared to other districts found in this largest charcoal market in the country (Ishengoma and Abdallah, 2016). Handeni district especially Kwedikabu village is arguably sending charcoal to larger charcoal markets in Zanzibar since it is very close to Magharibi A district (URT, 2018).

3.2 Research design and sampling procedure

3.2.1 Research design

This study used a cross-sectional design where data are collected at a single point in time. The major focus of the study was to analyse the charcoal trading and market systems as well as assessing the actors along the value chain in the three selected districts.

3.2.2 Sampling frame

This study used both non-probability and probability sampling techniques. Non-probability sampling technique was used to purposively select three districts (n=3) where charcoal business was a part of economic activities, and within each district three wards (n=9) were purposively selected. In study areas; ward executive officers, district forest conservators and secretary of Kihinani wholesalers trade association prepared lists of charcoal producers, wholesalers and retailers to construct a sampling frame.

3.2.3 Sampling unit and procedure

Charcoal producers, wholesalers and retailers were obtained by census sampling technique where all charcoal actors found in the lists prepared by ward executive officers, district forest conservators and secretary of Kihinani charcoal association had an opportunity to participate in the study. According to Cooper and Schindler, (2008) census sampling technique is used when selecting all subjects found in a prepared list and each subject has equal chance of being selected. It was also used since the population was small and manageable by researcher.

Handeni wholesalers were found in charcoal selling centres at Kwenkwale and Chang`ombe and TFS checkpoints at Mkata and Manga. In Kinondoni district, wholesalers were found in market places at Magomeni, Makumbusho and Ukwamani and TFS gates at Mapinga. These places were used to address questionnaires to Kinondoni wholesalers who took charcoal from Handeni district. Kihinani charcoal selling centre was used to conduct questionnaires to Magharibi A wholesalers who took charcoal from Handeni district (Appendix 1 and 2).

Convenience sampling was used to address questionnaire to charcoal transporters found in the charcoal market places, passing the TFS check points (Mkata, Manga and Mapinga). This method used since there was no list for charcoal transporters. The sample size depended on the willingness of the respondents to share information about charcoal market (Appendix 3).

Purposive sampling technique was used to select the household consumers usually use the charcoal and conducted questionnaire (Appendix 4). The sample size depended on district socio economic profiles which showed the percentage of charcoal users in Handeni (12.5%), Kinondoni (56%) and Magharibi A (32.5%).

Commercial business consumers (street food kiosk, chips fryers and hotels) were selected and questionnaires were administered to them by using the convenience sampling technique (Appendix 4). The sample size depended on the willingness of the respondents to share information about charcoal market.

3.2.4 Sample size

The study involved 262 respondents from different categories namely charcoal producers (n=34), transporters (n=36), wholesalers (n=31), retailers (n=42) and charcoal consumers (n=119) found in study areas (Table 1). The sample size was in each category was more than 30 respondents (n≥30) which deemed sufficient for statistical data analysis as explained by Barlett *et al.*, (2001).

Table 1: Distribution of charcoal actors involved in study areas

Charcoal actor	Handeni	Kinondoni	Magharibi A	Total
Producers	34	-	-	34
Transporters	15	11	10	36
Wholesalers	8	10	13	31
Retailers	17	14	11	42
Consumers	16	63	40	119
Total	90	98	74	262

Source: Field Data (2021).

3.3 Data collection methods, processing and analysis

3.3.1 Roles of each actor in the charcoal value chain

Questionnaire surveys were used to collect data from charcoal producers, transporters, wholesalers, retailers and consumers. The aim was to identify the roles of each actor in the charcoal value chain (Plate 1a). One focus group discussion (FGD) was undertaken in each district and comprising of 11 to 12 representatives of producers, transporters, wholesalers, retailers and consumers to supplement information from questionnaires. The focus group discussion assisted in getting information related to the stage of charcoal supply, identifying different types of charcoal actors, their roles and showed the linkages between them (Plate 1b and Appendix 5).

Descriptive statistics was used to analyse quantitative data obtained using questionnaires by determining the number and percentage of charcoal actors playing different roles in each stage of charcoal value chain. Qualitative data from focus group discussion was used to triangulate and supplement information obtained from questionnaire related to the roles played by different actors in the value chain. Quantitative data obtained from focus group discussions were used to depict the relationship among chain actors as their roles concerned by counting the number of participants agreed to include a particular actor in charcoal value chain.

Plate 1: (a) Questionnaire survey method conducted in Handeni district (b) Focus group discussion at Kihinani ward in Magharibi A district.

Source: Field Data (2021).

3.3.2 Profitability of Charcoal Business

Questionnaire surveys were used to collect the data from charcoal producers, wholesalers and retailers related to their charcoal price per charcoal bag (53 Kg) and expenses incurred by charcoal actor. The expenses included the charcoal government fees, cost of charcoal production and transportation.

According to Agyei *et al.,* (2018) the profit (net income or net margin) received by each producer, wholesaler and retailer was calculated by subtracting the average expenses (Ci) from selling price (Ri) of one bag of charcoal (53 Kg).

Profit (Pi) received by each value chain participant will be calculated as following:

$$Pi = Ri - Ci \quad \text{.....(i)}$$

Furthermore, the study compared the charcoal profits gained between producers, wholesalers and retailers for both registered and unregistered charcoal dealers by using Man- Whitney test, the profit between actors was skewed. In this study,

charcoal transporters were those who do not own the charcoal as defined by Agyei *et al.,* (2018). Therefore, charcoal transporters were not responsible for paying the charcoal government fees.

3.3.3 Supporting functions of charcoal business

Questionnaire surveys were used to collect data from producers, wholesalers and retailers found in study areas to acquire information on supporting functions including trainings, roads infrastructures, selling areas infrastructures, memberships to charcoal groups, access of loans and market information. Descriptive was used to analyse the supporting functions for charcoal actors to pay charcoal government fees and registering their business.

3.3.4 Enabling environments of charcoal business

Questionnaire surveys were addressed to charcoal actors to assess the charcoal business enabling environment that included the existing forestry policy, acts and regulations guiding charcoal trading and business. In depth interview with key informants was used to supplement information obtained from questionnaire surveys (Appendix 6). Key informants were district forest conservators (DFS), district forest officers (DFOs), representatives from Zanzibar forest department and Ward executive officers. Descriptive and Thematic analysis were used to assess charcoal business enabling environment (Plate 2a and b).

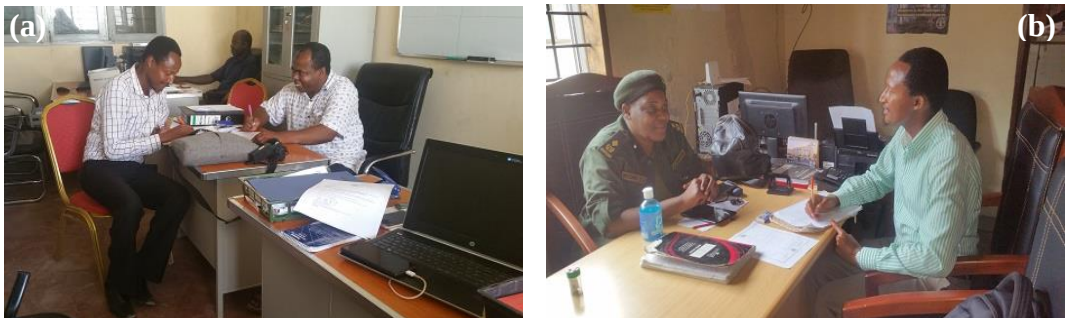


Plate 2: Key informant interview (a) Head of department for forest at Magharibi A district (b) Forest conservator at Kinondoni district.

Source: Field Data (2021).

3.4 Detailed field work

Researcher used a list of 2020/ 21 registered charcoal traders for nine wards provided by Handeni and Kinondoni district forest conservators and Magharibi A district council which helped to differentiate the between registered and unregistered charcoal dealers from the lists provided by ward executive officers in respective wards and secretary of Kihinani wholesalers trade association.

The questionnaires administered with the help of villages and shehia representatives to charcoal producers and retailers. Charcoal trucks from Handeni were stopped at Mapinga gate in Kinondoni district by TFS representatives to give a researcher chance to conduct questionnaire to wholesale traders. Chairman and secretary of Kihinani charcoal association introduced the researcher to wholesalers who take charcoal from Handeni district before the researcher conducted the questionnaire to wholesalers at Magharibi A district.

3.6 Data processing and presentation

Quantitative data obtained from questionnaire were organized, coded, cleaned by detecting the missing values and analyzed by using the Statistical Package for Social Science (SPSS Version 23) computer software. Qualitative data obtained from indepth interview and open-ended questions in questionnaires were analysed using thematic analysis and used to build themes and interpretation. The key findings were summarized into frequency, percentage, mean and standard deviation and presented in tabular formats, graphs and figures.

3.7 Limitations of the study

The researcher faced the following limitations when carrying out the study:

(i) Some charcoal actors did not believe that the information they provide will be used for research purposes only. The researcher was required to create a good rapport to respondents and explained to all respondents the purpose of study, and asking their consent to assure of anonymity and confidentiality of all information they provided in order to clear the doubt to respondents.

(ii) Some charcoal actors did not have their business licenses and charcoal government receipts at their business places. Therefore, the study considered them as unregistered charcoal dealers since the forest regulation 2019 for Tanzania mainland and Zanzibar forest resources and products (fees and royalties) regulation of 2013 and Zanzibar government notice no. 159 of 2020, the Local government services regulation of 2020 require the charcoal dealers to have these documents at the business places.

(iii) Some charcoal producers, wholesalers and retailers were not willing to mention out their names. The researcher get assistance from hamlet/ village and ward representatives to confirm the charcoal producers and retailers' names. Also, researcher used TFS gate officers in Handeni and Kinondoni districts; Representatives from Kihinani charcoal association, Magharibi A district and forest department to confirm the names of wholesalers. It is obvious that, those respondents who hide their names they were unregistered charcoal dealers. Names of respondents were very important for researcher to differentiate registered and unregistered charcoal actors which was very important to examine the profitability of charcoal business.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSIONS

4.1 Socio-demographic characteristics of the respondents

Result in Table 2 shows that all interviewed producers (100%) and transporters (100%) in the study areas were male. Most wholesalers were male (90.3%) but most of the retailers (90.5%) and consumers (61.3%) were female. The nature of these roles of charcoal production, transportation and wholesaling are dominated by male because the nature of these responsibilities require a lot of energy (Adeniji *et al.*, 2015; Ishengoma and Abdallah, 2016; Agyei *et al.*, 2018).

Table 2: Distribution of respondents by Socio-demographic characteristics

Roles	Producers N (%)	Transporters N (%)	Wholesalers N (%)	Retailers N (%)	Consumers N (%)
Sex					
Male	34 (100)	36 (100)	28 (90.3)	4 (9.5)	49 (38.7)
Female	0 (100)	0 (100)	3 (9.7)	38 (90.5)	73 (61.3)
Age (Years)					
18-30	4 (11.9)	10 (27.8)	0 (0)	8 (19.0)	20 (16.8)
31-43	12 (35.3)	13 (36.1)	8 (25.8)	16 (38.1)	53 (44.5)
44-56	10 (29.4)	8 (22.2)	18 (58.1)	13 (31.0)	31 (26.1)
56+	8 (23.5)	5 (13.9)	5 (16.1)	5 (19.1)	15 (12.6)
Level of Education					
Illiterate	8 (23.5)	1 (2.8)	0 (0)	6 (14.3)	6 (5)
Primary school	26 (76.5)	24 (66.7)	16 (51.6)	30 (71.4)	58 (48.7)
Secondary school	0 (0)	9 (25.0)	11 (35.5)	6 (14.3)	47 (39.5)
Tertiary education	0 (0)	2 (5.6)	4 (12.9)	0 (0)	8 (6.7)
Household size					
1 to 4	4 (11.8)	9 (25.0)	7 (22.6)	7 (16.7)	21 (17.6)
5+	30 (88.2)	27 (75.0)	24 (77.4)	35 (83.3)	98 (82.4)
Experience (Years)					
≤2	7 (20.6)	16 (44.4)	4 (12.9)	11 (26.2)	7 (5.9)
3-5	13 (38.2)	9 (25.0)	7 (22.6)	15 (35.7)	11 (9.2)
≥6	14 (41.2)	11 (30.6)	20 (64.5)	16 (38.1)	101 (84.9)

Source: Data Field (2021).

Age is an important socio-economic variable in charcoal value chain. In this study it divided age into four groups as shown in Table 2. The grouping of the age was based on the considerations of an active economical and productive age category in Tanzania (Mbwana, 2013). Results showed that age between 31-43 years was active group constituting of about 35.3% of charcoal producers, 36.1% of transporters and 38.1% of retailers. The same age group was noticed by a study conducted by Adeniji *et al.,* (2015) in Nigeria. On other hand, more than half (58.1%) of wholesalers were aged between 44-56 years. These results are in line with the study by Olugbire and Aremu (2014) which found that roles found in charcoal business can be done by both young and old people. About 44.5% of the interviewed households consuming charcoal were aged 31-43 years and very few (12.6%) were aged above 56 years. These results show people with 31-43 years found at home playing a role of cooking while aged people avoid exposing themselves to adverse effects of indoor air pollution (Kpalo *et al.,* 2021).

Most of charcoal producers (41.2%), wholesalers (64.5%), retailers (38.1%) and consumers (84.9%) had an experience more than six years in the charcoal market. This is similar to the study conducted in Morogoro which showed that most of charcoal producers and wholesalers experienced the charcoal market more than six years of which means the higher the marketing experiences a charcoal actor realizes higher profit margin (Olugbire and Aremu, 2014; Ishengoma and Abdallah, 2016; Table 2).

In current study, majority of charcoal wholesalers (87.1%), retailers (59.5%) were business persons in bricks making, poultry farming and retailing shops except for charcoal transporters (88.9%) who were employed as drivers in private companies. Most of charcoal producers (70.6%) were playing a role in farming activities to cultivate main food crops such as maize, beans and cassava (Table 3). This study is inline with observation made by Mabele (2020b) that most of charcoal producers in Tanzania they produce charcoal as by product when clearing new farmlands and as income generating activity in off-farm season. This is similar to charcoal producers in Central Mozambique who make the charcoal as a part of the new farm preparation (Jones *et al.*, 2016).

Table 3: Respondents by socio-economic activities and income (n = 262)

Roles	Producers N (%)	Transporters N (%)	Wholesalers N (%)	Retailers N (%)	Consumers N (%)
Economic Activities					
Farming	24 (70.6)	0 (0)	4 (12.9)	14 (33.3)	6 (5.0)
Agropastoral	10 (29.4)	0 (0)	0 (0)	3 (7.1)	5 (4.2)
Business person	0 (0)	4 (11.1)	27 (87.1)	25 (59.5)	41 (34.5)
Employed public	0 (0)	0 (0)	0 (0)	0 (0)	7 (5.9)
Employed private	0 (0)	32 (88.9)	0 (0)	0 (0)	60 (50.4)
Income					
≤300 000	22 (64.7)	21 (58.3)	0 (0)	16 (38.1)	18 (15.1)
≥300 001	12 (35.3)	15 (41.7)	31 (100)	26 (61.9)	101 (84.9)

Source: Data Field (2021).

Finding in Table 3 shows that most of wholesalers (100%), retailers (61.9%) and consumers (84.9%) are earning above 300 000 TZS per month. However, more than half (64.7%) of charcoal producers and transporter (58.3%) are earning income below the average of Tanzania minimum government wage 300 000 TZS (NBS,

2019). These results mean that charcoal wholesalers and retailers are depending on charcoal business to meet their basic needs since the business is paying better compared to charcoal producers and transporters.

4.3 The Roles of each actor in the charcoal value chain

The study revealed that charcoal value chain in study areas comprises of charcoal producers, transporters, wholesalers, retailers and consumers who are playing different roles (Fig. 3). According to Nyamoga and Solberg (2019), the primary actors in Tanzania charcoal value chain are producers, transporters, wholesalers, retailers and end consumers. Other stakeholders as shown are engaged in charcoal business to ensure that the main charcoal actors paying the government charcoal fees and comply the charcoal regulations during the charcoal movement from charcoal producers to the end consumers (Fig. 3).

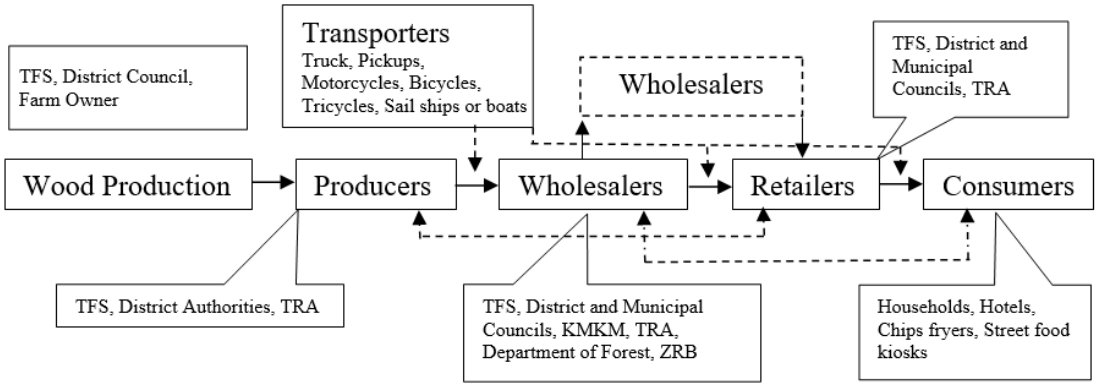


Figure 3: The key charcoal value chain actors in the study areas

Source: Field Data (2021).

4.3.1 Roles of charcoal producers

It was observed that, the main source of wood used for charcoal production were from individual family farms (91.2%) during the preparation of the new farms (Table 4). These results are in line with study conducted by Camco (2014) in Tanzania and Jones *et al.*, (2016) in Central Mozambique. Furthermore, study reveals charcoal business producers in Handeni have no specific forests to harvest trees for charcoal making that is the reason for decreasing of charcoal revenue collected by TFS in Handeni decreased from 2 188 070 266 TZS in year 2016 to 704 298 750 TZS in year 2020 (Appendix 7). The government had royalties and conservation fees loss of 157 316 250 TZS for five years from 2015 to 2020 (Appendix 8).

Table 4: Roles of charcoal producers (n=34)

Roles	Frequency	Percent (%)
Farm clearance	31	91.2
Selling to wholesalers	25	73.6
Selling to retailers	9	26.4
Grading and packing	7	20.6
Hire labor	6	17.6
Tree planting	2	5.9
Paying charcoal govt. fees	16	47.1

*Data were based on multiple responses

Source: Field Data (2021).

The most five tree species which were cleared during the farm clearance in Handeni for charcoal production were *Combretum mole (22.0%), Brachystegia spiciformis (15.9%), Spirostachys africana (13.4%), Brachystegia tamaridhoides (11.0%)* and *Stereospermum kunthianum (9.8%)* (Appendix 9). These findings show that

Combretum mole its quality meet the satisfaction of charcoal consumers in Handeni, Kindondoni and Magharibi A districts. The quality of charcoal depends on tree species used (Nabukalu and Giere, 2019).

Table 4 show that majority of the charcoal producers (73.6%) were playing a role of selling charcoal directly to wholesalers. These results indicate that charcoal producers had a chance to sell unpaid charcoal bags of charcoal government fees as the means to reduce costs of production. These results are against the study conducted in Ghana where a limited number of producers (15%) sold charcoal directly to wholesalers (Agyei *et al.,* 2018).

Less than half (47.1%) of the producers paid the charcoal government fees (Table 4). This finding indicates that paying of the charcoal government fees was among the role played by charcoal producers in study areas. This observation is supported by the study conducted in Morogoro and Dar es salaam showed that some of the charcoal producers in Tanzania pay taxes and royalties (Ishengoma and Abdallah, 2016; Doggart *et al.,* 2020).

Fig. 4 shows that most of charcoal government fees paid were business registration fees (23.9%), tree planting fees (23.9%), royalties (23.9%) which goes to Tanzania forest services agency and levy fees (16.4%) and village fees (11.9%) were collected by Handeni district and village government respectively. All charcoal producers were not issued with business licenses from district council, not paying the tax fees to TRA. These results imply that there is poor coordination among responsible

government agencies on charcoal government fees collection between Tanzania forest services agency, district council and Tanzania revenue authority.

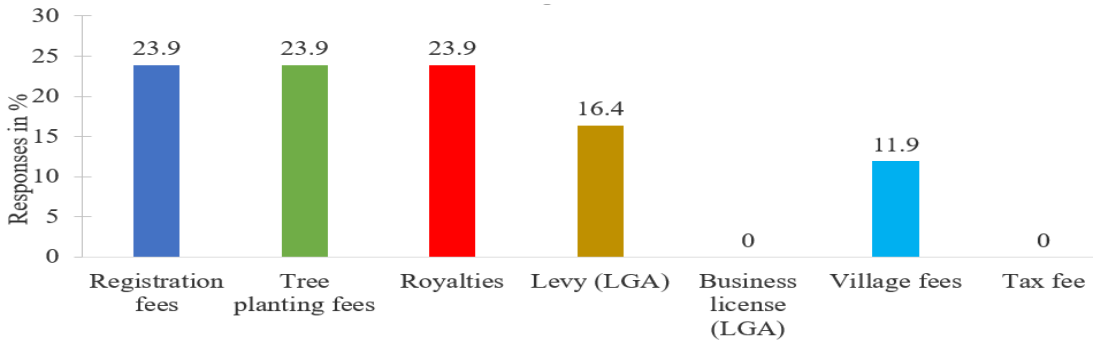


Figure 4: Types of charcoal government fees paid by producers in Handeni district.

Source: Field Data (2021).

4.3.2 Roles of wholesalers

Nearly three thirds (74.2%) of charcoal wholesalers played a role of paying the charcoal government fees. About 6.5% of charcoal wholesalers using the fiscal receipts or electronic fiscal devices while nearly one third (32.3%) of charcoal wholesalers using the manual receipts or receipt books (Table 8). These results indicate the turn over per year for charcoal wholesalers with EFD machines were above 14 000 000 TZS and those using receipt books were below 14 000 000 TZS (URT, 2021).

Table 5: Roles of wholesalers in study areas (n=31)

Roles	Frequency	Percent (%)
Buying from producers	28	90.3
Buying from other wholesalers	3	9.7
Selling to retailers	24	77.4
Selling to consumers	7	22.6
Packing in production areas	11	35.5
Grading and packing	8	25.8
Repacking in different weights	12	38.7
Hire transportation	28	90.3
Paying charcoal govt fees	23	74.2
Possessing EFD machine	2	6.5
Possessing receipt books	10	32.3

*Data were based on multiple responses

Source: Field Data (2021).

In Handeni district, four types of charcoal government fees were paid. About 43% the respondents said that levy fee payment paid efficiently, but for registration fees only 28.6% of the interviewed people declared be paying it (Fig. 5). It was observed that some of the royalties were paid by charcoal producers, thus making wholesalers to use the agreement letter to approve charcoal transported was bought from such producers. In Kinondoni district, six kind of charcoal business fees were paid. Registration fees were mostly collected and only 5.9 of interviewed peoples said were paying the tax collected by TRA was least (Fig. 6). In Magharibi A district, eight kind of charcoal fees were paid by charcoal wholesalers. This result indicates that there are some additional charcoal fees which were paid to the government of Zanzibar. In the United Republic of Tanzania, Forest matters are not listed in union matters (Hikmany, 2015).

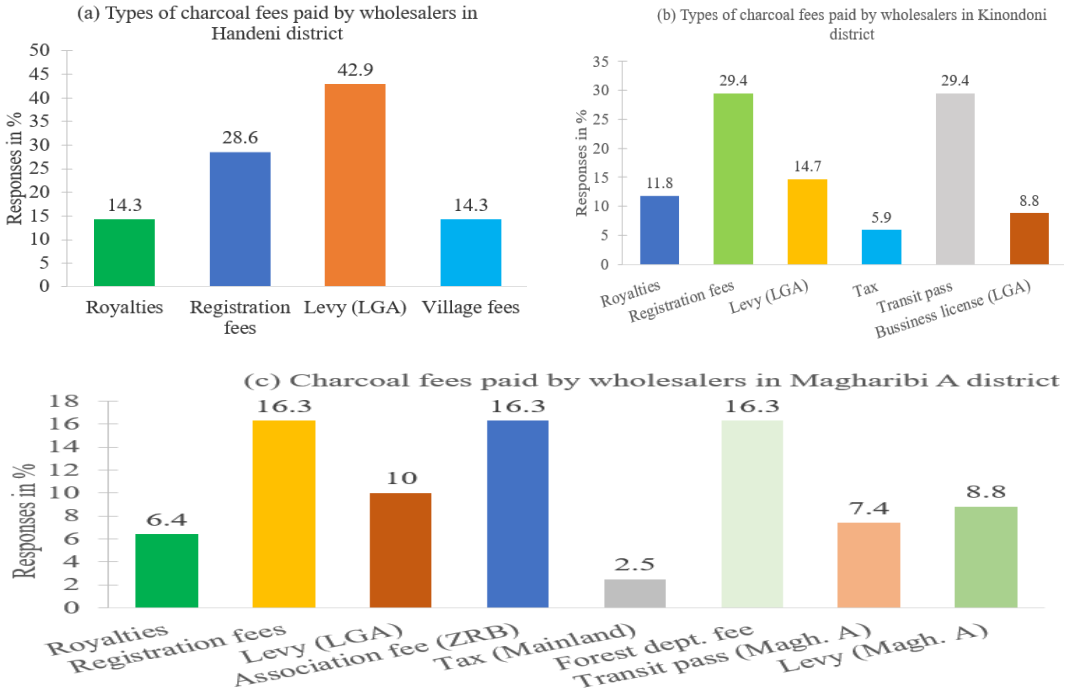


Figure 5: Charcoal fees paid by wholesalers (a) Handeni district (b) Kinondoni district (c) Magharibi A district.

Source: Field Data (2021).

4.3.3 Roles of retailers

Results in Table 6 show that about 35.7% of retailers reported to have paid the charcoal government fees but very few (11.9%) had possessed the legal documents from wholesalers to show that royalties, levy fees and transit pass were paid. Only 4.8% of charcoal retailers handled legal documents from producers. These results revealed that charcoal retailers were unaware of one of their roles was to demand original or copies of charcoal government receipts from wholesalers or producers after buying the charcoal. Further, it was observed that only 2.4% of charcoal retailers are using EFD machines while 7.1% are using the manual receipt books.

Table 6: Roles of retailers in study areas (n=42)

Roles	Frequency	Percent (%)
Buying from wholesalers	33	78.6
Buying from producers	9	21.4
Repacking in different weights	42	100
Selling to households	42	100
Selling to commercial business	8	19.0
Paying charcoal govt fees	15	35.7
Handling copies of legal documents from wholesalers	5	11.9
Handling copies of legal documents from producers	2	4.8
Possessing EFD Machine	1	2.4
Possessing a receipt book	3	7.1
Choose charcoal from hardwood	12	28.6
Hire transportation	28	66.7

*Data were based on multiple responses

Source: Field Data (2021).

Two different types of charcoal government fees were paid by retailers in Handeni district. Most of government fees paid were royalties (66.7%) followed by levy fee (33.3%). In Kinondoni district, five different types of charcoal fees were paid by retailers. Business license fees (40.0%) were the mostly paid while levy fees was only 13.3%. The result shows that charcoal retailers from Magharibi A paid three different types of charcoal government fees that are business license fees, levy fees and transit pass fees. About 50.0% of the business license fees were mostly paid and very few (16.7%) were transit pass issued by Magharibi A district council (Fig. 6). These results show that types of charcoal fees paid were depending on the location of charcoal business conducted that might be due to strategies used by different government authorities to cover their areas for raising awareness and law enforcement. Handeni district is slightly larger in terms of the geographical areas compared to Kinondoni and Magharibi A districts.

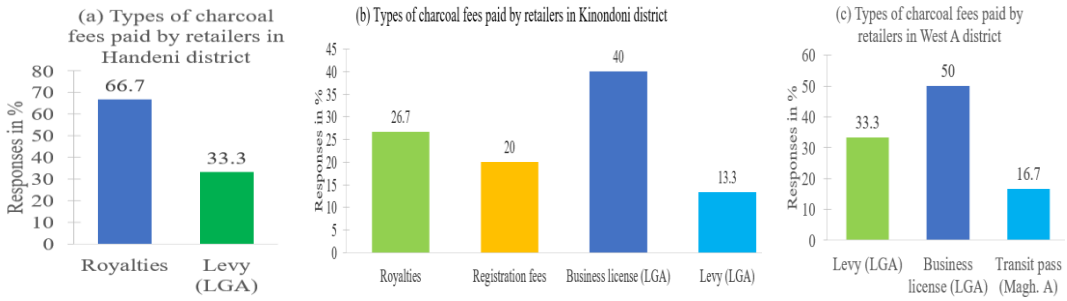


Figure 6: Types of charcoal fees paid in (a) Handeni district (b) Kinondoni district (c) Magharibi A district.

Source: Field Data (2021).

All charcoal retailers in the study areas mentioned to have repacked charcoal in different weights. Charcoal retailers from Handeni and Kinondoni districts repacked the charcoal into large charcoal sacks (53 Kg), plastic buckets (20 Ltr≈ 6.5 Kg) and small plastic containers (1.2 Kg). The Magharibi A charcoal retailers repacked the charcoal into large sacks (32 Kg), plastic buckets (20 Ltr≈ 4.5 Kg), small plastic containers (0.7 Kg). This study finds that no charcoal bag weighted 53 Kg in Magharibi A district that means charcoal wholesalers from Magharibi A district after buying charcoal in Handeni, they repacked charcoal into weight of 32 Kg, this might be due to purchasing power of charcoal consumers because charcoal price for 53 Kg could be high. Further, it was observed that difference in weights for plastic buckets with 20 Ltr was due to charcoal retailers in Handeni district had overpacked the bucket compared to charcoal retailers in Kinondoni and Magharibi A districts.

Furthermore, findings show that about 28.6% of charcoal retailers searched charcoal with high quality. The quality of charcoal causes the price variation in the market (Nabukalu and Giere, 2019; Table 6).

4.3.4 Roles of transporters

Findings indicate that about 53% of transporters handled charcoal transportation documents to show government officials when required to do so (Fig. 7a). Most of the transporters who used the transportation such as vehicle truck ≥ 7 tons, vehicle truck ≤ 7 tons, sail ships and sail boats handled charcoal transportation documents (100%), (86%), (100%) and (100%) respectively. However, transporters under small transportation category did not handle charcoal transportation documents. Findings in this study, show that truck≥ 7 tons can carry on average of 121 charcoal bags, sail ships (143 charcoal bags) and motorcyles (2 charcoal bags) per trip (Plate 3; Appendix 10). It was observed that about 79% and 100% of transporters using motorcycle and bicycles respectively did not have any transportation documents i.e transit pass or TP. These findings mean that modes or types of transportation used to carry charcoal may influence a driver to play key roles in complying to various regulations and searching for all legal documents before carrying the original or copies of charcoal payment documents such as receipts for royalties and copies of license and permit for clearing the land and producing charcoal. A study conducted in Uganda shows that motorcycles are much easier than bicycles on carrying heavier loads and access remote areas from production kilns to main roads and market places though it increases a risk of avoiding paying charcoal government fees (Nabukalu and Giere, 2019). Trucks and sail ships are mostly used for large quantities and long

distance are easily being noticeable by government officials (Nabukalu and Giere, 2019).

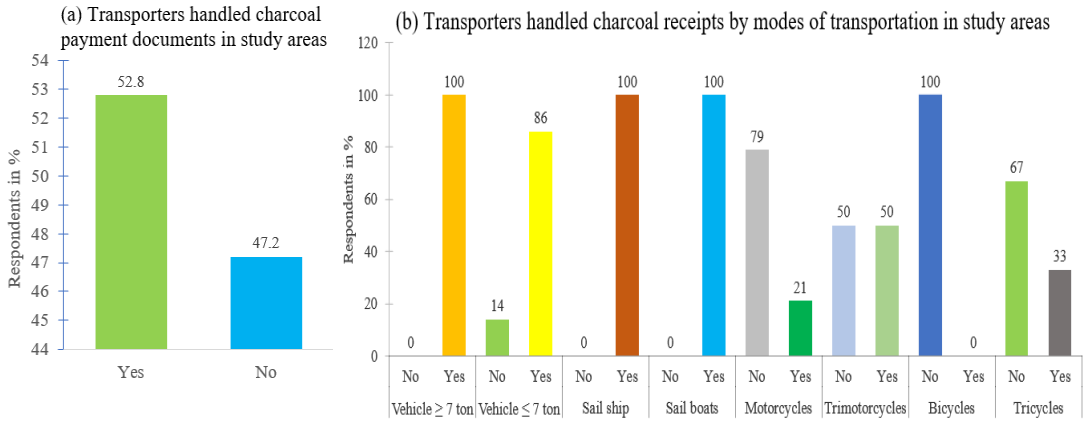


Figure 7: (a) Transporters handled charcoal documents in study areas (b) Transporters handled charcoal documents by different modes of transportation in study areas.

Source: Field Data (2021).

In Handeni district, charcoal transporters handled three types of charcoal transportation documents that are transit pass, royalties receipts and levy receipts. About 50.0% of transportation documents were royalty receipts and very few (12.5%) were transit pass (Fig. 8a). This indicates that majority did not have transit pass documents. Charcoal transporters in Kinondoni district handled five different types of charcoal transportation documents that are transit pass, copies of business licenses, receipts for royalties, levy receipts and agreement letter. In the district, about 36.4% were charcoal royalty receipts and very few (9.1%) were levy receipt issued in the district (Fig. 8b). Charcoal transit pass were mostly (24.1%) handled by Magharibi A charcoal transporters and only 10.3% were levy fees (Fig. 8c). These

results give a snapshot that charcoal transporters are unaware of their roles before transporting charcoal that are required to handle proper documents for charcoal movement.

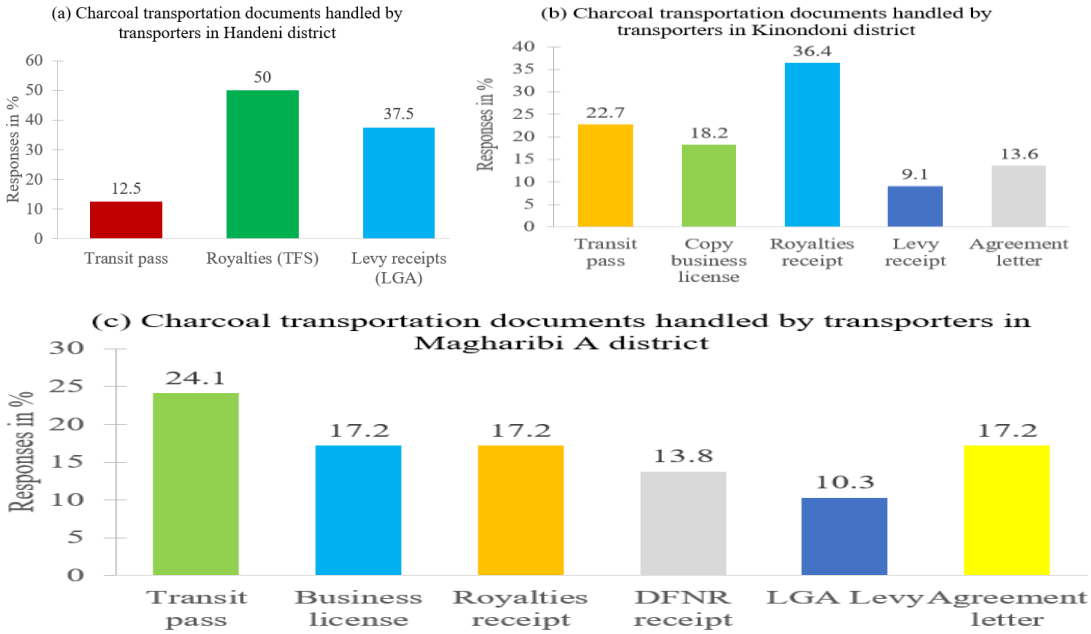


Figure 8: Charcoal transportation documents handled by transporters (a) Handeni district (b) Kinondoni district (c) Magharibi A district.

Source: Field Data (2021).

Plate 3: Modes of transportation (a) Truck vehicle ≥ 7 ton (b) Sail ships in Kihinani (c) Motorcycle (d) Bicycle (e) Trimotorcycle (f) Vehicle ≤ 7 ton (g) Tricycle (h) Sail boat arrived at Kihinani selling center.

Source: Field Data (2021).

4.3.5 Roles of consumers

In study areas, 75% of charcoal consumers were household consumers and very few (25.2%) were charcoal commercial business such as hotel, chips fryers and street food kiosks (Table 7). Appendix 11 shows that on average the weekly charcoal consumption were five tins for households, two bags for hotels, one bag for chips fryers or meat and street food kiosks. These findings also support other studies which indicated that charcoal is the main type source of cooking energy in Tanzania (Nyamoga and Solberg, 2019; Doggart *et al.*, 2020).

Most of charcoal consumers (95.0%) bought charcoal from retailers and very few (5.0%) bought from wholesalers (Table 7). These results indicate that, majority of charcoal consumers were buying charcoal from retailers that might be due to purchasing power that most of consumers were able to buy charcoal in small quantity.

Table 7: Types of consumers and their roles in study areas (n=119)

Variables	Frequency	Percent (%)
Types of Consumers		
Household	89	74.8
Hotels	7	5.9
Chips fryers or meat	10	8.4
Street food kiosks	13	10.9
Roles*		
Buying from retailers	113	95.0
Buying from wholesalers	6	5.0
Using for cooking food	109	91.6
Using for frying chips or meat	10	8.4
Using for ironing	4	3.4
Receiving receipt from wholesalers	3	2.5
Receiving receipt from retailers	8	6.7
Choose charcoal made from hardwood	38	31.9
Hire transportation	17	14.3

*Data were based on multiple responses.

Source: Field Data (2021).

Fig. 9 show that about 69% of the charcoal consumers bought charcoal from retailers found at home places and very few (12.4%) bought from selling centers in Chang`ombe and Kwenkwale in Handeni district. Furthermore, the result shows that less than half (45.3%) bought charcoal on market places and very few (15.6%) of charcoal consumers bought from stores in Kinondoni district. Most of charcoal consumers (71.8%) in Magharibi A, most of them bought charcoal from sellers found

in home places and very few (12.8%) consumers bought from the formal charcoal stores. These results indicate that charcoal consumers are buying charcoal from informal and formal places. This might be due to charcoal consumers are unaware of formal charcoal places to buy their charcoal that are selling centres, store and yards.

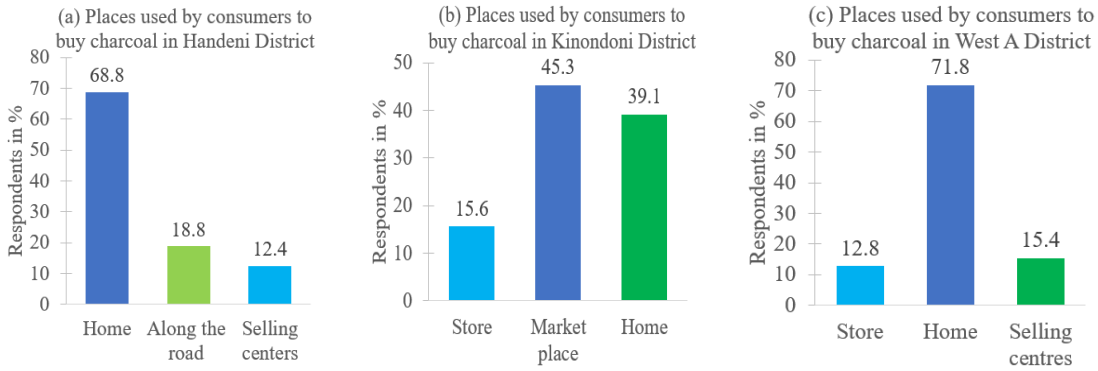


Figure 9: Charcoal places used to sell charcoal by retailers (a) Handeni district (b) Kinondoni district (c) Magharibi A district.

Source: Field Data (2021).

Very few charcoal consumers play a role of receiving or keeping receipts from wholesalers (2.5%) and retailers (6.7%) in study areas (Table 7). In Handeni district, no any of charcoal consumers received receipts after buying charcoal. In Kinondoni district, very few (17.2%) charcoal consumers received receipts after buying charcoal. Only 2.6% of charcoal consumers from Magharibi A received receipts (Fig. 10). It was observed that, charcoal consumers were unaware that they are required to receive the charcoal payment receipts and its importance on formalising the charcoal business.

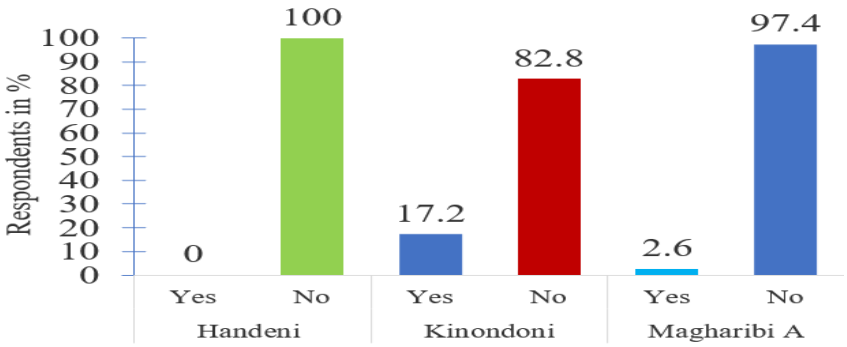


Figure 10: Charcoal consumers who received receipts (a) Handeni district (b) Kinondoni district (c) Magharibi A district.

Source: Field Data (2021).

4.4 Profitability of charcoal business

Charcoal contributes substantially to incomes of charcoal actors who are involved in charcoal production and trade in Sub Saharan Africa (Sola *et al.,* 2019). This study found that there was a statistically significant difference of profit gained between charcoal actors who were registered and those who are not registered (Table 8). Within the group of charcoal wholesalers there was a high statistically significant difference between wholesalers who were registered and the unregistered ones. Moreover, within each group of charcoal producers and retailers, there were no statistically significant difference between the registered and non registered (Table 8). These findings are in line with studies conducted by Vos and Vis (2010), Smith (2017), Baumert *et al.,* (2016) and Agyei (2018) which indicated income profit differences between the charcoal producers, wholesalers, and retailers.

Table 8: Profits differences by registered and non-registered charcoal actors

	Mean Rank		
Charcoal Actors	**Registered**	**Not Registered**	**P**
All charcoal actors	64.6*	45.7	0.002
Producers	16.0	18.8	0.407[a]
Wholesalers	19.0**	3.0	0.000
Retailers	27.4	20.5	0.200[a]

*P <0.01, **P <0.001, [a]P > 0.05, Man- Whitney test

Source: Field Data (2021).

4.4.1 Profit of charcoal producers

Findings show that within the group of charcoal producers, there was no statistical significant difference of the profits between who the registered and non registered producers (Table 8). The profits were 2 130 TZS and 2 190 TZS for registered and non-registered charcoal producers respectively (Table 9). The small difference of profit of 60 TZS can be a result of unregistered charcoal producers are indirectly forcing the registered charcoal producers to set their charcoal selling price that will compensate the costs incurred for paying charcoal government fees with less consideration of profits. Further, it was observed that small in profit difference between registered and unregistered charcoal producers might be the reason for discouraging charcoal producers to register and formalise their business.

Table 9: Average price and profit gained by producer for one charcoal bag (53Kg)

	Registered		Not Registered	
Variable	**N (%)**	**μ ± S.D**	**N (%)**	**μ ± S.D**
Profit (/53 Kg bag)	16 (47%)	2 130 ± 474	18 (53%)	2 190 ± 335
Price (/53 Kg bag)	16 (47%)	23 050 ± 1 543	18 (53%)	10 520 ± 1 744
Cost (/53 Kg bag)	16 (47%)	20 910 ± 1 601	18 (53%)	8 325 ± 1 739

Source: Field Data (2021).

Findings from this study indicate that the average of on farm price for one bag charcoal weighing 53Kg was 23 050 TZS and 10 520 TZS for registered and non-registered producers respectively. The price for registered producers was high to compensate the charcoal government fees paid at different stages.

The costs incurred by registered and non-registered charcoal producers were 20 910 TZS and 8 325 TZS respectively (Table 9). Additional costs (15 929 TZS per 53 Kg of charcoal) for registered charcoal producers was due to payment of charcoal government fees as indicated in Table 10. These findings indicate that unregistered charcoal producers do not incur these costs for charcoal government fees. However, these results indicate that charcoal market would still be profitable if charcoal government fees was paid by the charcoal producers (Nyamoga and Solberg, 2019).

Table 10: Costs incurred by producers to pay government per one charcoal bag

Cost items	**Cost (TZS)**	**Registered** (I charcoal bag≈ 53Kg)
Registration fees (/year)	300 000	1 304
Royalties fees (/bag)	12 500	12 500
Conservation fees (/bag)	625	625
Levy (LGA) (/bag)	1 000	1 000
Village fees (/bag)	500	500
Total	**314 625**	**15 929**

Source: Field Data (2021).

According to Luoga *et al.*, 2000 costs may be negligible but labor is the major input cost for charcoal production. In Handeni district, charcoal producers used traditional earth mound kilns which labor involves costs for felling the trees, collection of wood, kiln construction, burning control (carbonization), unloading charcoal from kilns, loading charcoal into bags (Ishengoma and Abdallah, 2016).

Appendix 12 shows that registered charcoal producers spent 58 500 TZS to produce 28 charcoal bags (53Kg) for almost two weeks (13 days), that means average labor

costs for registered charcoal producers was 4 500 TZS while the average labor costs for non-registered charcoal producers was high 7 230 TZS since it costs about 94 000 TZS for one producer to spend almost two weeks (14 days) to produce 28 charcoal bags (53Kg). These findings show that labor costs for registered charcoal producers is low to compensate the costs incurred as payment for charcoal government fees.

In charcoal production, many days were used on carbonization stage as one charcoal producer spent six to seven days to this activity while one day was spent for felling the trees in the forest. It was observed that, charcoal producers used chainsaw to cut trees that might be the reason for them to spend few days for cutting trees. However, there were other equipment or tools such as bush knives, hoe, spade and axe which were used for charcoal production (Appendix 13). Other equipment had longer life span hence were used more than one year for the same activity reducing the production costs.

4.4.2 Profit of charcoal wholesalers

Result show that within the group of charcoal wholesalers, there was a statistically highly significant difference between wholesalers who were registered and not registered (Table 8). The profits gained by registered charcoal wholesalers in Kinondoni and Magharibi A districts were 18 300 TZS and 18 385 TZS respectively which was two times higher than the profits 8 750 TZS gained by registered wholesalers in Handeni district (Table 11). The profits accrued by the registered wholesalers depends on the charcoal market location.

Table 11: Average price and profit gained by wholesalers for one charcoal bag

	Registered		Not Registered	
Variables	**N (%)**	**μ ± S.D**	**N (%)**	**μ ± S.D**
Handeni	**2 (6.5%)**		**6 (19.3%)**	
Profit (/53 Kg bag)	2	8 750 ± 1 060	6	7 150 ± 1 468
Price (/53 Kg bag)	2	22 300 ± 2 545	6	19 000 ± 545
Cost (/53 Kg bag)	2	13 550 ± 1 485	6	11 850 ± 1 245
Kinondoni	**10 (32.3%)**			
Profit (/53 Kg bag)	10	18 300 ± 2 840		
Price (/53 Kg bag)	10	51 860 ± 2 412		
Cost (/53 Kg bag)	10	33 560 ± 1 978		
Magharibi A	**13 (41.9%)**			
Profit (/53 Kg bag)	13	18 385 ± 2 836		
Price (/53 Kg bag)	13	72 660 ± 4 189		
Cost (/53 Kg bag)	13	54 275 ± 2 484		

Source: Field Data (2021).

Most of the charcoal wholesalers (80.7%) were registered in Handeni, Kinondoni and Magharibi A districts and very few (19.3%) were not registered found in Handeni district. Both registered and unregistered charcoal wholesalers were found at Kwankwale and Chang`ombe charcoal selling centres. The following was the quote from one of the unregistered respondent:

> *"We are not able to pay for charcoal business license that is why we decided to bring our charcoal bags here in selling centres because TFS does not disturb us if we sell within the selling centers premises and not along the road. If customers want these charcoal bags they will be responsible for paying the required charcoal royalties"*

The above quotation indicates that unregistered charcoal wholesalers in Handeni district had a chance to sell their charcoal in selling centers without disturbances.

The absence of non-registered wholesalers in Kinondoni and Magharibi A district might be due to the fact that non-registered wholesalers transport their charcoal at night and using other routes or roads where there are no TFS gates. It was not easy to meet non registered wholesalers who regularly take their charcoal from Handeni district at charcoal market places found in Kinondoni and Magharibi A districts since they use all the means to avoid being detected by TFS staffs.

The charcoal price per bag weighting 53 Kg for non-registered wholesalers in Handeni district was 19 000 TZS which was lower than price of charcoal bags weighed 53Kg for registered wholesalers in Handeni, Kinondoni and Magharibi A districts. The price in the later districts were 22 300 TZS, 51 860 TZS and 72 660 TZS respectively (Table 11). The prices were therefore the function of the costs incurred by charcoal wholesalers including payment of government charcoal fees.

The findings show that there were costs incurred by both registered and non registered charcoal wholesalers from Handeni, Kinondoni and Magharibi A districts which included costs of packaging, loading, unloading and transportation (Appendix 14). These costs are unavoidable to charcoal wholesalers either being registered or unregistered.

Table 12 shows that government charcoal fees paid by wholesalers from Handeni, Kinondoni and Magharibi A costed on average 15 801 TZS per 53Kg of charcoal bag which included registration fees, royalties, village fees, levy, tax, transit pass, business licenses and village fees. These results indicate government collection fees

(15 801 TZS per 53Kg of charcoal bag) are collected by Government of Tanzania mainland.

Table 12: Charcoal government fees paid by wholesalers in study areas

Cost items	**Govt. charcoal fee per** (I charcoal bag≈ 53Kg)
Registration fees (/bag)	735
Royalties fees (/bag)	12 500
Levy (LGA) (/bag)	1 000
Tax	890
Transit pass	130
Business license (LGA)	46
Village fees	500
Total	**15 801**

Source: Field Data (2021).

There were additional costs 2 656 TZS per 53Kg of charcoal bag incurred by the charcoal wholesalers from Magharibi A district. These costs included three percent of 200 TZS per 32Kg charcoal bag that collected by charcoal association fees which goes to Zanzibar Revenue Board (ZRB), Forest department fees, levy fees and transit pass which were collected by Magharibi A district (Table 13). These results indicate that due to charcoal produced in Tanzania mainland, the government of Zanzibar are benefiting by collecting about 2000 TZS or 2 656 TZS per 32 Kg and 53 Kg of charcoal bag respectively.

Table 13: Additional charcoal government fees for Magharibi A wholesalers

Cost items	Govt. charcoal fee per (I bag≈ 32Kg)	Govt. charcoal fee per (I bag≈ 53Kg)
Association fees (ZRB)	200	331.25
Forest dept. fees	500	828.13
Transit pass (Magh. A)	1 000	1000
Levy (Magh. A)	300	496.88
Total	**2 000**	**2 656.26**

Source: Field Data (2021).

4.4.3 Profit of charcoal retailers

Within the group of charcoal retailers, there was no statistically significant difference between those who are registered and those who are not registered (Table 8). Registered charcoal retailers in Kinondoni and Magharibi A districts had profits of 4 230 TZS and 4 030 TZS respectively which were higher than profits gained by non-registered charcoal retailers in Handeni (3 410 TZS), Kinondoni (3 990 TZS) and Magharibi A (3 485 TZS) districts (Table 14). Based on these, one may say that profits of retailers depend on registration status and location of charcoal market.

Table 14: Average price and profit gained by retailers for one charcoal bag

	Registered		Not Registered	
Variables	**N (%)**	**μ ± S.D**	**N (%)**	**μ ± S.D**
Handeni			**17 (40.5%)**	
Profit (/53 Kg bag)			17	3 410 ± 1 025
Price (/53 Kg bag)			17	22 305 ± 4 896
Cost (/53 Kg bag)			17	18 890 ± 4 856
Kinondoni	**3 (7.1%)**		**11 (26.3%)**	
Profit (/53 Kg bag)	3	4 230 ± 1 625	11	3 990 ± 580
Price (/53 Kg bag)	3	65 330 ± 485	11	60 125 ± 2 295
Cost (/53 Kg bag)	3	61 100 ± 3 903	11	56 135 ± 2 140
Magharibi A	**3 (7.1%)**		**8 (19.0%)**	
Profit (/53 Kg bag)	3	4 030 ± 450	8	3 485 ± 840
Price (/53 Kg bag)	3	81 100 ± 781	8	79 610 ± 1 569
Cost (/53 Kg bag)	3	77 015 ± 828	8	76 000 ± 1 110

Source: Field Data (2021).

It was observed that there were no registered charcoal retailers in Handeni district. A study conducted by Lyambai (2017) found that charcoal retailers selling their charcoal in small measures such as plastic tins, buckets and small plastic bags had a chance to avoid paying charcoal government fees. This may be due to the small capital they have and also to the lower turnover of their business.

The study reveals that the price of charcoal bag weighed 53Kg sold by registered charcoal retailers in Magharibi A was 81 100 TZS which was nearly four times the price of charcoal sold by registered charcoal producers in Handeni district (Table 14). The higher prices in Magharibi A district may be attributed by charcoal government fees paid and other additional costs along the value chain.

Mainly costs incurred by both registered and unregistered charcoal retailers in study areas were costs for buying charcoal of 53Kg and transportation cost (Appendix 15). It means these costs are inevitable for retailers to conduct their business regardless a dealer registered or non registered.

Table 15 showed that charcoal government fees (14 915 TZS per 53Kg of charcoal bag) paid by registered charcoal retailers in Kinondoni district was nearly 13 times the charcoal government fees paid by registered charcoal retailers in Magharibi A district. This difference of charcoal government fees might be due to some of charcoal government fees were paid to the government of Tanzania mainland by charcoal wholesalers from Magharibi A district that have different policies guiding the charcoal market. Results show impressive information that some of charcoal bags were illegally purchased, that means the government fees were not paid and thus

make both registered and non-registered charcoal retailers responsible to pay for the government fees. The types of charcoal government fees paid varied according to location of charcoal market used by retailers.

Table 15: Government charcoal fees paid by retailers in study areas

Cost items	**Registered** Cost per bag (53Kg)	**Non registered** Cost per bag (53Kg)
Handeni		
Royalties		12 500
Levy (LGA)		1 000
Total		**13 500**
Kinondoni		
Registration fees	1 330	
Business license (LGA)	85	195
Royalties	12 500	12 500
Levy (LGA)	1 000	1 000
Total	**14 915**	**13 695**
Magharibi A		
Registration (LGA)	627	
Levy (LGA)	476	476
Transit pass (Magh. A)	50	
Total	**1 153**	**476**

Source: Field Data (2021).

4.5 Supportive functions of charcoal business

4.5.1 Trainings

Very few charcoal producers (23.5%), wholesalers (12.5%) and retailers (5.9%) who attended trainings related to charcoal business were only found in Handeni district (Table 16). These findings indicate that most charcoal actors did not have knowledge and skills of setting the price which consider the amount of fees that are required to pay as the charcoal government fees. Tanzania country does not have the charcoal price guidelines (Blodgett, 2011; Camco, 2014; Nyamoga and Solberg (2019). This study reveals that business development skills would allow the producers, wholesalers and retailers to set the charcoal price by reflecting the cost incurred as government charcoal fees and manage their business. It was observed that an ongoing Forestry Value Chain (FORVAC) Development project under Tanzania-Finland partnership (FANIDA) has currently started to train charcoal actors from Kitumbi, Kwamsisi and Mazingara villages. This study is similar to observation made by Doggart and Meshack (2017) shows that in the Government of Tanzania and non-government organisation under the development partnerships scheme among the activities undertaken capacity building in the forest sector in which they training charcoal actors on procedure of paying the government charcoal fees.

Table 16: Supportive functions experienced by charcoal actors in study areas

Supporting Functions	**Handeni (%)**		**Kinondoni (%)**		**Magharibi A (%)**	
Producers	**Yes**	**No**				
Training	23.5	76.5				
Access of loans	5.9	94.1				
Road[a]	44.1	55.9				
Selling centres[a]	14.7	85.3		N/A		N/A
Charcoal groups[b]	8.8	91.2				
Market information	29.4	70.6				
Earth mound kiln[c]	100.0	0.0				
Wholesalers	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**
Training	12.5	87.5	0	0	0	0
Access of loans	12.0	88.0	40.0	60.0	46.0	54
Road[a]	12.5	87.5	30.0	70.0	15.4	84.6
Selling centres[a]	62.5	37.5	80.0	20.0	100.0	0
Charcoal groups[b]	0	0	0	0	100.0	0
Market information	75.0	25.0	80.0	20.0	92.3	7.7
Retailers	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**
Training	5.9	94.1	0	0	0	0
Access of loans	0.0	0.0	28.6	71.4	18.2	81.8
Road[a]	23.5	76.5	0	0	0	0
Selling centres[a]	0	0	42.9	57.1	36.4	63.6
Charcoal groups[b]	5.8	0	0	0	0	0
Market information	17.6	82.4	35.7	64.3	27.3	72.7

[a] Infrastructures; [b] Charcoal Group Memberships; [c] Technology

Source: Field Data (2021).

4.5.2 Access of financial services

Results show that very few charcoal producers (5.9%) in Handeni accessed the bank loans while charcoal wholesalers were 12.0%, 40.0% and 46.0% in Handeni, Kinondoni and Magharibi A districts respectively (Table 16). These results indicate that charcoal wholesalers accessed loans in order to buy charcoal in large quantities and were able to pay back their loans since they are accruing more profits compared

to other actors in charcoal value chain. Charcoal wholesalers were able to buy more charcoal because they have more financial capital (Ishengoma and Abdallah, 2016; Agyei *et al.*, 2018). The study found that few charcoal producers were able to meet loan bank conditions including the collateral properties concerning from commercial banks such as CRDB and NMB banks located at Mkata town and Handeni town respectively. These findings were different from a study conducted by Agyei *et al.,* (2018) who urges that charcoal producers are dependent on wholesalers or retailers for advances to finance production and have to accept the price offered by lender. Charcoal retailers in Kinondoni and Magharibi A districts were about 28.6% and 18.2% respectively who accessed the bank loans (Table 16). Similar findings observed by Ishengoma and Abdallah (2016), in ilala district only 16.7% of the retailers acquired capital from financial institutions. These findings mean that charcoal retailers are not meeting the loans bank conditions since they are conducting their charcoal business informally.

4.5.3 Roads infrastructure

Charcoal producers in Handeni district more than half (55.9%) urged that roads were not accessible by vehicles and were hardly accessed by motorcycles while majority of charcoal wholesalers about 87.5%, 70.0% and 84.6% from Handeni, Kinondoni and Magharibi A districts respectively (Table 16). These results indicate type of transports used by charcoal producers to send their charcoal bags to buyers such as motorcycles and bicycles but wholesalers due to buy in large quantities are using vehicles. Sabuhungu *et al.,* (2015) noticed that roads in the rural areas were not easily accessible and the areas for charcoal production were not permanent thus

increasing the chance to some charcoal dealers who are not faithful to evade charcoal royalties since government officials could rarely go to the production areas for charcoal government fees collection.

It was observed that charcoal dealers used outdated copies of charcoal licenses for felling trees with reason that they spent many days to transport their charcoal from production areas due to difficult accessible roads making charcoal dealers to illegally transport charcoal in order to avoid paying charcoal royalties. According to the key informant from TFS at Mapinga gate near Dar es salaam, it was observed that:

> *"Some of the charcoal dealers are cheating at the TFS gate. They use one license to fell and transport some charcoal bags which are not counted and included in the license. This is simply because they try at their best to make sure that their TPs are not signed at TFS gates by using different ways. Once they are caught, they defend themselves by saying that the roads were in poor condition in rural areas. It is therefore very difficult to differentiate these two scenarios"*

The study observed that instead of roads for charcoal wholesalers from Magharibi A districts are still experiencing the incomplete charcoal order from Handeni district. Ocean conditions as the mode of transportation was not supporting charcoal dealers. One of the Magharibi A respondents said that:

> *"Some of the charcoal bags were thrown to ocean by sail ship captains during the high tides because the size of sail ships were smaller compared to number of charcoal bags transported. So as businessmen should do something to*

compensate for this kind of loss. For charcoal wholesalers, it is very difficult for them to pay charcoal royalties for all the bags because not all the charcoal bags reach the Kihinani selling center"

This observation indicates that payment of charcoal royalties related to ocean condition and size of the sail ships or boat ships.

Furthermore, the results in Table 16 shows that only charcoal retailers (76.5%) from Handeni district urged about roads infrastructures were poor since they were taking charcoal directly from producers. These findings indicate that charcoal retailers from Kinondoni and Magharibi A districts were buying charcoal from wholesalers found in their respective districts.

4.5.4 Selling area infrastructures

Most of charcoal wholesalers from Handeni (62.5%), Kinondoni (80.0%) and Magharibi A (100.0%) districts used allocated selling areas. These results indicate that selling areas support government officials to collect government fees and support wholesalers to meet charcoal consumers (Table 16). Ghana charcoal wholesalers selling their charcoal in designated market areas in the cities, they pay royalties, thus increasing the chance for formal charcoal business. Very few charcoal retailers from Handeni, Kinondoni and Magharibi A districts were about 0.0%, 42.9% and 36.4% respectively used the charcoal selling areas. These results indicate that charcoal retailers had a chance to avoid paying charcoal government fees. Most charcoal dealers traded in front of their homes and outside market areas, they do not incur the cost that could be paid as the charcoal government fees (Agyei *et al.*, 2018).

The study found that in Handeni district there are places allocated as the charcoal selling areas such as Kwenkwale and Chang`ombe selling centres (Plate 4)

It was also observed that Kihinani charcoal landing area was located by the Government of Zanzibar as the charcoal center for unloading charcoal from Tanzania mainland where charcoal wholesalers meet charcoal retailers before ending to consumers (Plate 4). This was reason for all charcoal wholesalers from Magharibi A district using selling area to sell their charcoal.

However, there are charcoal wholesalers continue using Malindi to unloading their charcoal. One of the respondents in Kihinani charcoal selling center said that:

> *"Charcoal unloading at Malindi discouraged our market here because Kihinani is very far from Zanzibar urban city where there are many charcoal consumers"*

The above quotation meant that there was illegal charcoal selling center at Malindi in urban distict after shifting the charcoal selling center from Malindi to Kihinani selling centers in Magharibi A district.

Plate 4: (a) Kwenkwale selling centre in Handeni district (b) Kihinani selling centre in Magharibi A district.

Source: Field Data (2021).

4.5.5 Membership to charcoal groups

Very few charcoal producers (8.8%) in Handeni district joined the charcoal groups while all charcoal wholesalers from Magharibi A district and only retailers from Handeni district (5.8%) joined the groups (Table 16). These findings indicate that management and controlling of charcoal actors was difficult for training to raise awareness, get loans (10%) from district authorities and banks. However, in Handeni district, the forestry value chain (FORVAC) project development has been facilitating district and TFS staffs to synthesize charcoal actors to establish charcoal groups where Kitumbi, Mazingara and Kwamsisi villages have already formulated groups. In Magharibi A district all charcoal wholesalers joined Kihinani charcoal association due to those who were not joining the association they were considered as unregistered and sold the charcoal in low price of which could cause registered charcoal wholesalers to get loss. Also, the presence of one landing site at Kihinani being a starting meeting point for charcoal wholesalers who buying charcoal from Handeni district and influenced wholesalers to join Kihinani charcoal association. Organization of charcoal actors would increase a reachable environment in terms of compliance to rules, regulations and guidelines as well as paying the charcoal royalties (Camco, 2014; Doggart and Meshack, 2017). It was also observed that charcoal actors joined the groups controlling the charcoal price and business by reporting charcoal actors who are not registered to responsible forest government authorities. That means, non registered charcoal actors might avoid to join the group and selling their charcoal at low market price since their prices are not taking into account the costs for government charcoal fees. However, this scenario of

organising, training and registering charcoal actors is essential if Tanzania's forest resources are to become sustainably managed and consumed (Camco, 2014).

4.5.6 Market information

Most of charcoal wholesalers from Handeni, Kinondoni and Magharibi A district were about 75.0%, 80.0% and 92.3% respectively urged that charcoal market information supporting the charcoal business while they were very few charcoal producers (29.4%) and retailers about 17.6%, 35.7% and 27.3% from Handeni, Kinondoni and Magharibi A districts respectively (Table 16). These findings show that charcoal wholesalers accessed the market information before deciding and going to buy charcoal in order to avoid the loss of transportation expenses. It was observed that charcoal actors accessed charcoal market information through mobile phones to exchange the charcoal market information such as changes of amount of charcoal royalties, price and availability of charcoal. Market information supporting the charcoal actors since charcoal from different areas have different prices (Camco, 2014; Nyamoga and Solberg, 2019). Therefore, understanding of these expenses through market information before going to buy charcoal may motivate charcoal actors to pay charcoal government fees by consideration of other costs.

4.5.7 Technology for charcoal making

All charcoal producers (100%) in study areas used the traditional earth mound kiln which mainly involved felling of the trees, collection of wood, stacking of the logs, covering with grasses and dump soil, controlling supply of oxygen, grading and packing (Table 16 and Plate 5). Traditional earth mound kilns are easy to build and

not expensive in terms of material required. These types of kilns also reduce transportation cost and labours since they are built where the raw materials are found (Amugune, 2020). It was observed that on average 28 charcoal bags were produced per kiln in Handeni district. In Tanzania, traditional earth mound kilns have poor kilns efficiency below 25% (Mabele, 2020a; Appendix 16). Moreover, traditional earth kilns are one of the major drivers of unsustainable charcoal production due to inefficiency on wood consumption for production (Ishengoma and Abdallah, 2016). Therefore, technology used by charcoal producers does not support the sustainability of the charcoal trade in Handeni district.

Plate 5: Charcoal making procedures in Handeni district (a) Felling the trees (b) Stacking of the logs (c) Covering with grasses (d) Covering with dump soil (e) Controlling supply of oxygen (f) Packing of charcoal.

Source: Field Data (2021).

4.6 Charcoal business enabling environments

Successful charcoal market depends on the existing policy, rules and regulations that are implemented by the actors along the value chain (Sola *et al.*, 2020). In the United Republic of Tanzania, the charcoal business is a nonunion matter (Benjaminsen, 2017). The study found that producers, wholesalers, retailers and transporters perceived that the forest policy, rules and regulation are not enabling the charcoal business except charcoal consumers in Handeni (56.2%), Kinondoni (82.5%) and Magharibi A (87.5%) districts (Fig. 11). Furthermore, five themes emerged from data to explain the reasons for charcoal actors` opinions on business enabling situations; business registration, charcoal business documents, memorandum of understanding, charcoal revenue records and unsustainable charcoal production.

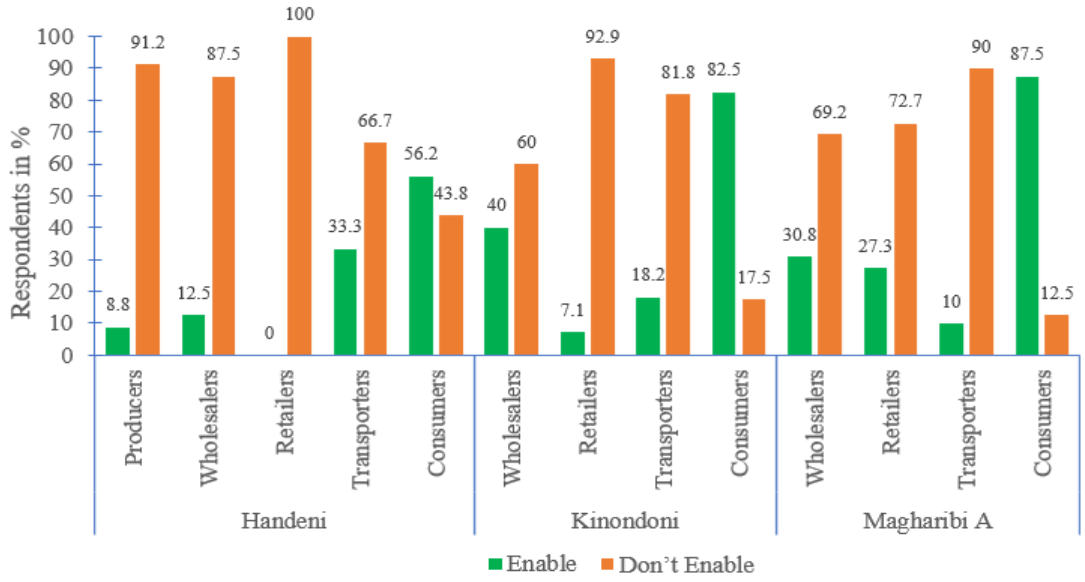


Figure 11: Opinions of charcoal actors on business enabling environments

Source: Data Field (2021).

4.6.1 Charcoal business registration

Table 17 shows that very few charcoal producers (8.8%) in Handeni perceived that charcoal business registration amount was appropriate for actors to pay government fees while it was about 12.5%, 10.0%, and 23.1% of wholesalers in Handeni, Kinondoni and Magharibi A districts respectively. The study observed that charcoal actors are reluctantly registering their business due to changes of registration fees from the former amount of 256 000 TZS to the current charcoal registration fees 300 000 TZS as advertised in the Government Notice (GN) number 627 published on fourteenth of August 2020.

Charcoal producers despite of registering their charcoal business are also required to ask permission before removal of trees for charcoal making from district forest produce harvesting committee in order to comply Section 17 of Forest act No. 14 of 2002 and Regulation no. 5 of Forest regulation 2019. In Handeni district, most of charcoal producers (94.1%) urged that their requests took time for the harvesting committee to respond (Table 17). It was observed that two to three harvesting committee meetings conducted in Handeni district per year. Therefore, it needs extra ordinary meetings to give permissions to charcoal producers where TFS are firstly required to get permission before conducting the meetings from Chief executive to comply Regulation no. 6 (2) of Forest regulation 2019.

Table 17: Reasons of charcoal actors` opinions on business enabling situations

Reasons	Producers Yes (No) %	Wholesalers Yes (No) %	Retailers Yes (No) %	Transporters Yes (No) %	Consumers Yes (No) %
Handeni*					
Registration requirements	8.8 (91.2)	75.0 (25.0)	23.5 (76.5)	-	-
Registration fees	2.9 (97.1)	12.5 (87.5)	11.8 (88.2)	-	-
Keep documents	76.5 (23.5)	62.5 (37.5)	17.6 (82.4)	33.3 (66.7)	-
Time to transport	41.2 (58.8)	87.5 (12.5)	76.5 (23.5)	50.0 (50.0)	-
Receipts/ EFD	35.3 (64.7)	37.5 (62.5)	41.2 (58.8)	-	14.3 (85.7)
Selling areas	-	-	-		57.1 (42.9)
Permit to harvest	5.9 (94.1)	-	-	-	-
Kinondoni*					
Registration requirements		80.0 (20.0)	21.4 (78.6)	-	-
Registration fees		10.0 (90.0)	14.3 (85.7)	-	-
Keep documents	N/A	50.0 (50.0)	35.7 (64.3)	50.0 (50.0)	-
Time to transport		30.0 (70.0)	85.7 (14.3)	37.5 (62.5)	-
Receipts/ EFD		90.0 (10.0)	28.6 (71.4)	-	31.7 (68.3)
Selling areas		-	-	-	85.4 (14.6)
Magharibi A*					
Registration requirements		7.7 (92.3)	62.5 (37.5)	-	-
Registration fees		23.1 (76.9)	25.5 (75.0)	-	-
Keep documents	N/A	30.8 (69.2)	37.5 (62.5)	28.6 (71.4)	-
Time to transport		23.1 (76.9)	-	14.3 (85.7)	-
Receipts/ EFD		15.4 (84.6)	22.2	-	23.1 (76.9)
Selling areas		-	-	-	61.5 (38.5)

*Data were based on multiple responses

Source: Data Field (2021).

Most of charcoal wholesalers (92.3%) from Magharibi A district had negative opinion on business registration requirements followed by charcoal producers (91.2%) in Handeni district (Table 17). These results indicate that wholesalers from Magharibi A district were from Zanzibar where the charcoal trade are nonunion matters (Benjaminsen, 2017). This means they were required to comply the Tanzania mainland forest regulation of 2019 and Zanzibar forest resources and products (fees and royalties) regulation of 2013. Moreover, charcoal producers claimed that having

tax identification number (TIN) during business registration means were not differentiated from charcoal wholesalers who are arguably accruing more profits in charcoal value chain. Therefore, according to forest laws the business registration requirements were national ID, tax identification number (TIN), business licenses from respective district authorities regardless of charcoal producers, wholesalers or retailers. Moreover, Section no. 25 of Zanzibar local government authority Act no. 7 of 2014, all district councils are responsible for registering all types of businesses upon submission of the approval of letter from Shehia executive officer and the identification card from the government of Zanzibar.

4.6.2 Charcoal business and movement documents

More than three thirds of charcoal producers (76.5%) from Handeni district urged that keeping of charcoal business documents enable charcoal actors to avoid disturbances from government officials (Table 17). These results indicate that charcoal producers were asked by wholesalers from Kinondoni and Magharibi A districts to surrender copies of forest produce allocation certificates, licenses to fell, government receipts for royalties and local government levy in order to comply Regulation no. 20 (1) of Forest regulation 2019 to avoid fines and loss of charcoal bags during charcoal transportation from Handeni to Kinondoni and Magharibi A districts.

Less than half (30.8%) of charcoal wholesalers from Magharibi A district urged keeping of charcoal documents enabling the business while Kinondoni and Handeni districts were about 50.0% and 62.5% respectively (Table 17). It was observed that

charcoal wholesalers from Magharibi A district their documents allowed by TFS officials in Tanzania mainland but some documents may be rejected by Kikosi Maalum cha Kuzuia Magendo (KMKM) or Department of forests in Zanzibar. These results indicate that no charcoal trade guidelines set between government of Tanzania mainland and Zanzibar.

Very few charcoal consumers in Handeni (14.3%), Kinondoni (31.7%) and Magharibi A (23.1%) districts urged to receive charcoal receipts was important to enable charcoal business. However, most of charcoal consumers in Handeni (57.1%), Kinondoni (85.4%) and Magharibi A (61.5%) districts perceived that establishment of charcoal selling centres was important to enable charcoal business. These findings indicate that without having charcoal selling centres to control the business, yet there will be a chance for unregistered charcoal dealers to give consumers invalid receipts. These was observed by Government of Tanzania mainland and mentioned charcoal selling areas are registered store and selling centres as per Regulation no. 19 (1) of Forest regulation 2019. Moreover, according to Regulation no. 18 of Forest regulations of 2019, charcoal consumers are required to show proofs that charcoal was purchased from a registered and licensed dealer for mainland Tanzania. While, Magharibi A charcoal consumers are also required to handle charcoal receipts due to Zanzibar government notice no. 159 of 2020, the Local government services regulation of 2020 and Zanzibar forest resources and products (fees and royalties) regulation of 2013.

Charcoal transporters from Handeni (33.3%), Kinondoni (50.0%) and Magharibi A (28.6%) districts perceived that handling of charcoal movement documents enable the charcoal business. These results indicate that transporters from Magharibi A district in Zanzibar they are allowed to transport charcoal at any time regarding charcoal being paid by charcoal government fees. In Tanzania mainland, charcoal should be transported between 6.00 a.m and 6.00 p.m as per Regulation no. 17 (1) of Forest regulation 2019.

4.6.3 Charcoal revenue collection and records

Handeni district council collected charcoal levy fee based on Section 7(g) of the local government finance act Cap 290 R.E 2019 that requires 5% of the royalty that means should collect 660 TZS per 53Kg. The study noticed that Handeni district council collected 1 000 TZS per 53Kg without being stated in the district bylaw for sources of district revenue. Moreover, it was observed that charcoal revenue collected at village level as own sources for villages by using village bylaws was not properly recorded that means there were few evidences such as book receipts.

In Magharibi A district charcoal actors paid 500 TZS per charcoal sack weighed 30 or 50 Kg. This indicates that revenue collectors from Magharibi A district council to collect the levy fees did not pay attention to measurement based on weight of charcoal though it has been stated in Zanzibar government notice no. 159 of 2020, the Local government services regulation of 2020 that requires to pay 500 TZS per charcoal sack weighed 50 Kg. Department of forest in Zanzibar were also collecting

500 TZS per 50 Kg of charcoal sack to comply to the Zanzibar forest resources and products (fees and royalties) regulation of 2013.

Appendix 17 shows records of the charcoal revenue collected by TFS in mainland Tanzania and the department of forest and natural resources in Zanzibar were available and accessible. However, there were absence of official records for charcoal revenue collected by Kinondoni and Magharibi A districts. The revenue collection in Handeni from 2011 to 2015 was about 2 billion TZS (Appendix 18). Among other reasons for the missing data was that charcoal revenues were not distinguished from other forest products hence underestimated its contribution as a source of government revenue to the districts (Mabele, 2020a). However, if records are properly kept, separated the various forest products could be possible.

4.6.4 Memorandum of understanding between TFS and DFNR- Zanzibar

In the united republic of Tanzania, forest resources were not pointed out as one of the union matters (Hikmany, 2015). Therefore, Tanzania mainland forest resources are under Tanzania Forest Services Agency (TFS) in the Ministry of Natural Resources and Tourism and forest resources in Zanzibar are under the Department of Forestry and Non-renewable Natural Resources in the Ministry of Agriculture and Natural Resources. In November 2015, these two governments signed the Memorandum of Understanding (MoU) that are implemented by a period of five consecutive years to ensure that governance in forest management and trade of forest products including charcoal business are efficient and effective. It was observed that, the MoU could establish trade guidelines for charcoal trade between mainland Tanzania and

Zanzibar since the charcoal business was not a part of union matter. Therefore, these scenarios might be against the regulation no. 21 (1) of forest regulation of 2019 which prohibiting the export of charcoal.

4.6.5 Unsustainable charcoal production

Charcoal revenue collection in Handeni district council were about 8 Billion (TZS) within a period of five year from 2015 to 2020. However, the study noticed very few wards under the FORVAC project started to introduce the sustainable charcoal production in their village management plan. That meant charcoal revenue collection in Handeni still need some promotion and awareness creation to attain the Goal no. 15 of sustainable development goals (SDG) to protect, restore, and promote life on land (forest) by 2030.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusions

The study aimed to analyse the charcoal market system analysis in Handeni, Kinondoni and Magharibi A districts. Based on the specific objectives of this study, it is concluded as following;

The role played by each actor in the charcoal value chain: Payment of charcoal government fees is the role, that should be played by charcoal producers, wholesalers and retailers. Charcoal transporters played a role of handling the charcoal movement documents during the transportation of charcoal in study areas. On the other hand, charcoal consumers should ensure that they are responsible for receiving charcoal receipts all the time they buy charcoal from the traders. This will ensure that no royalties from charcoal trading is evaded.

The profitability of charcoal business: Registered charcoal actors were more profitable than unregistered charcoal actors. Also, charcoal business is still be profitable even when charcoal actors comply to registration and paying the charcoal government fees. Moreover, the more the profits gained by value chain actor the higher the willingness to comply various regulations and rule and the ability to pay the charcoal government fees.

Supporting functions of the charcoal business: Most of charcoal actors were not in groups for government responsible agencies such as TFS, district authorities, DFNR-Zanzibar to conduct trainings on charcoal business and getting loans (10%) from both district authorities and banks as one of condition. Also, earth mound kilns used to make charcoal the technology does not support the sustainability of business.

Business enabling environments: Most of charcoal actors had negative opinions on the forest policy, Act and regulations related to business registration procedures, amount required to pay as charcoal government fees and time for charcoal movement. Charcoal making practices in Handeni district does not reflect the sustainable development goals on ensuring sustainability of charcoal production.

5.2 Recommendation

Based on the conclusion, the study recommends the followings;

The role played by each actor in the charcoal value chain: Government responsible agencies should raise awareness to charcoal actors on their roles in charcoal business including paying charcoal government fees, legal documents that should be handled by charcoal transporters and consumers.

The profitability of charcoal business: Formalisation of charcoal actors through registration will enable maximasation of the profit to charcoal traders and the government through revenue collection.

Supporting functions of the charcoal business: Forestry authorities (TFS, DFNR-Zanzibar and Local governments) should collaborate with non-governmental

organisations to join the efforts to help charcoal producers, wholesalers and retailers to formulate charcoal groups to increase the reachable environments for trainings, get loans from district authorities and banks. Also, constructions of selling centres and improvement of roads and establishing of the sustainable charcoal production projects which inturn will assist in ensuring that forest resources are harvested sustainably.

Business enabling environments: The government and non-government organisations should raise awareness on forest policy, acts and regulation that guiding the charcoal business in both Tanzania mainland and government of Zanzibar. Moreover, there is a need of establishing charcoal trade guideline between the government of Tanzania mainland and Zanzibar.

REFERENCES

Adeniji, O. A., Zacchaeus, O.S., Ojo, B. S. and Adedeji, A. S. (2015). Charcoal production and producers` tree species preference in Borgu local government area of Niger state, Nigeria. *Journal of Energy Technologies and Policy* 5(11): 1 - 8.

Agyei, F. K., Christian, P. H. and Emmanuel, Acheampong. (2018). Profit and profit distribution along Ghana's charcoal commodity chain. *Energy for Sustainable Development* 47: 62 - 74.

Amugune, I. M. (2020). Technological factors influencing the quality and quantity of charcoal produced in western Mau forest. Unpublished Dissertation for Award of Degree of Doctor of Philosophy at Africa Nazarene University, Kericho county. Kenya. 1 - 60 pp.

Anim, I. K., Awotwe, E., Nyarku, K.M. and Kusi, L. Y. (2020). Tax administration, Tax incentive and SMEs Growth: The moderating effect of firms size. *Journal of Business and Entrerprise Development* 9: 81 – 100.

Barlett, J. E., Kotrlik, J. W. and Haggins, C. C. (2001). Organizational research: Determining appropriate sample size in survey research. *Information Technology, Learning, and Performance Journal* 19 (1): 43 - 50.

Baumert, S., Luz, A. C., Fisher, J., Vollmer, V., Ryan, C. M., Patenaude, G., Zorilla-Miras, P., Artur, L., Nhantumbo, I. and Macqueen, D. (2016). Charcoal supply chains from Mabalane to Maputo: Who benefits?. *Energy for Sustainable Development* 33: 129 - 138.

Bellù, L. G. (2013). *Value Chain Analysis for Policy Making, Methodological Guidelines and country cases for a Quantitative Approach*. Food and Agriculture Organisation. 178pp.

Benjaminsen, G. (2017). The bricolage of REDD+ in Zanzibar: from global environmental policy framework to community forest management. *Journal of Eastern African Studies* 11(3): 506 - 525.

Blodgett, C. (2011). *Charcoal Value Chain and Improved Cook stove Sector Analyses*. SNV Rwanda positioning document. 53pp.

Bourne, M., Sola, P., Njenga, M., Koech, G., Kirimi, M., Ignatius, S. and Otieno, E. (2020). *Towards sustainable charcoal production and trade in Baringo County*. Centre for International Forestry Research. 8pp.

Brobbey, K. L., Hansen, P. C., Kyereha, B. and Pouliot, M. (2019). The economic importance of charcoal to rural livelihoods: Evidence from a key charcoal-producing area in Ghana. *Forest Policy and Economics* 101: 19 - 31.

Bukwelles, M. S. (2015). Social Economic Importance of Local Chicken Production in Peri-urban Areas of Kinondoni District, Tanzania. Unpublished Dissertation for Award of MSc Degree at Sokoine University of Agriculture. Morogoro, Tanzania. 3 - 26 pp.

CamCo, (2014). *Tanzania Biomass Energy Strategy and Action Plan Report.* Africa-EU Renewable Energy Cooperation Programme. 138pp.

Chidumayo, E. N and Gumbo, D. J. (2010). *Dynamics of the charcoal and indigenous timber trade in Zambia: A Scopic study in Eastern, Northern and Northwestern provinces*. Center for International Forestry Research Publisher. 191pp.

Cooper, D. R. and Schindler, P. S. (2008). *Business research methods*. McGraw-Hill. 746pp.

Doggart, N. and Meshack, C. (2017). The marginalization of sustainable charcoal production in the policies of modernizing African Nation. *Frontier in Environmental Science* 5: 1 - 13.

Doggart, N., Ruhinduka, R., Meshack, C. K., Ishengoma, R.C., Morgan-Brown, T., Abdallah, J.M., Spracklen, D. V. and Sallu, S. M. (2020). The influence of energy policy on charcoal consumption in urban households in Tanzania. *Energy for Sustainable Development* 57: 200 - 213.

Hikmany, A.H. (2015). A Legal Analysis of the Land Planning Authorities and Sustainable Tourism in Zanzibar. *Journal of Asian and African Social Science and Humanities* 1(3): 58 - 74.

Ingram, V., Schure, J., Tieguhong, J.C., Ndoye, O., Awono, A. and Iponga, D.M. (2014). Gender implications of forest product value chains in the Congo basin. *Forests, Trees and Livelihoods* 23(1): 67 - 86.

Ishengoma, R.C. and Abdallah, J.M. (2016). *Charcoal market conditions in 2016 in Dar es Salaam and Morogoro, Tanzania. Technical Report 4.* Transforming Tanzania's Charcoal Sector Project. 80pp.

Jones, D., Ryan, C. M. and Fisher, J. (2016). Charcoal as a diversification strategy: the flexible role of charcoal production in the livelihoods of smallholders in central Mozambique. *Energy for Sustainable Development* 32: 14 - 21.

Kaplinsky, R. and Morris, M. (2001). *A handbook for value chain analysis*. International Development Research Centre Publisher. 113pp.

Koppers, B. (2001). *Sustainable charcoal production and marketing in Handeni district report.* K Consultancy Publisher. 35pp.

Kpalo, S.Y., Zainuddin, M.F., Abdmanaf, L. and Roslan, A. M. (2021). Evaluation of hybrid briquettes from corncob and oil palm trunk bark in a domestic

cooking application for rural communities in Nigeria. *Journal of cleaner production* 284: 1 - 10.

Liyama, M., Neufeldt, H., Dobie. P., Roy, H., Njenga, M., Ndegwa, G., Mowo, J., Kisoyan, P. and Jamnadass, R. (2015). *Opportunities and challenge of landscape approaches for sustainable charcoal production and use*. World Agroforestry Centre. 16pp.

Luoga, E. J., Witkowski, E. T. F. and Balkwill, K. (2000). Economics of charcoal production in miombo woodlands of eastern Tanzania: some hidden costs associated with commercialization of the resources. *Ecology Ecosystem* 35(2): 243 - 257.

Lyambai, M. (2017). Life Cycle Assessment on Economic Feedbacks in the Charcoal Value Chain in Lusaka District, Zambia. Unpublished Dissertation for Award of MSc Degree at Tlemcen University. Tlemcen, Algeria. 1 - 65 pp.

Mabele, B. M. (2020a). The `war on charcoal` and its paradoxes for Tanzania`s conservation and development. *Energy policy* 145: 1 - 5.

Mabele, M.B. (2020b). In pursuit of multidimensional justice: Lessons from a charcoal ‘greening’project in Tanzania. Environment and Planning: *Nature and Space* 3(4): 1030 - 1052.

Malimbwi, R. E and Zahabu, E. (2008). Situation Analysis of Charcoal Sector in Dar es salaam, Charcoal Supply and Consumption. Sokoine University of Agriculture, Morogoro, Tanzania. 88pp.

Minten, B., Sander, K. and Stifel, D. (2013). Forest management and economic rents: Evidence from the charcoal in Madagascar. *Energy for Sustainable Development* 17: 106 - 115.

Nabukalu, C. and Gieré, R. (2019). Charcoal as an energy resource: Global trade, production and socioeconomic practices observed in Uganda. Resources, 8(4): 1 - 27.

Ndegwa, G., Sola, P., Iiyama, M., Okeyo, I., Njenga, M., Siko, I. and Muriuki, J. (2020). *Charcoal value chains in Kenya: a 20-year synthesis Report*. Centre for International Forestry Research. 62pp.

Nyamoga, G, Z. and Solberg, B. (2019). A review of studies related to charcoal production, consumption, and greenhouse gas emissions in Tanzania. *Agriculture and Ecosystem Resilience in Sub Saharan Africa* 2019: 357 – 399.

Olugbire, O.O. and Aremu, F. J. (2014). Socio economic characteristics of charcoal marketers in bodija market of Ibadan, Oyo state, Nigeria. *Elixir international marketing management* 76: 28422 - 28425.

Owen, M., Van der Plas R. and Sepp, S. (2013). Can there be an energy policy in sub-Saharan Africa without biomass? *Energy for Sustainable Development* 17 (2): 146 - 152.

Sander, K., Gros, C. and Peter, C. (2013). Enabling reforms: Analyzing the political economy of the charcoal sector in Tanzania. *Energy Sustainable Development* 17 (2): 116 - 126.

Schure, J., Ingram, V., Sakho-Jimbira, M. S., Levang, P. and Wiersum, F. K. (2013). Formalisation of charcoal value chains and livelihood outcomes in Central- and West Africa. *Energy for Sustainable Development* 17: 95 - 105.

Smith, H.E., Hudson, M.D. and Schreckenberg, K. (2017). Livelihood diversification: The role of charcoal production in southern Malawi. *Energy for Sustainable Development* 36: 22 - 36.

Sola, P., Schure, J., Eba'a Atyi, R., Gumbo, D., Okeyo, I. and Awono, A. (2019). Woodfuel policies and practices in selected countries in Sub-Saharan Africa-A critical review. *Bois et Forêts des Tropiques* 340: 5 - 19.

URT (2013). *Forest Resources and Products (Fees and Royalties) Regulation of 2013*. Ministry of Agriculture and Natural Resources. United Republic of Tanzania. 2pp.

URT (2014). *Zanzibar Local Government Authority Act No. 7 of 2014*. Ministry of Agriculture and Natural Resources. United Republic of Tanzania. 59pp.

URT (2015). *Forest Act No. 14 of 2002*. Ministry of Natural Resources and Tourism. United Republic of Tanzania. 127pp.

URT (2017). *Magharibi "A" District council Socio Economic Profile*. The Revolutionary Government of Zanzibar. United Republic of Tanzania. 76pp.

URT (2018). *Handeni District Council Socio Economic Profile*. Tanzania National Bureau of Statistics. United Republic of Tanzania. 117pp.

URT (2018). *Market System Analysis*. Ministry of Natural Resources and Tourism. United Republic of Tanzania. 119pp.

URT (2019). *Forest (Sustainable Utilization of Logs, Timber, Withies, Poles or Charcoal) Regulations of 2019*. Ministry of Natural Resources and Tourism. United Republic of Tanzania. 14pp.

URT (2020). *Forest (Amendment) Regulations of 2020*. Ministry of Natural Resources and Tourism. United Republic of Tanzania. 17pp.

URT (2020). *Taxes and Duties at a Glance 2020/2021*. Ministry of Finance and Planning. United Republic of Tanzania. 24pp.

Van Beukering, P., Kahyarara, G., Massey, E., Prima, S., Hess, S. and Makundi, V. (2007). *Optimization of the charcoal chain in Tanzania*. Institute for Environmental Studies, Amsterdam, The Netherlands. 07 March, 2007. 44pp.

Vos, J. and Vis, M. (2010). Making charcoal production in Sub Sahara Africa sustainable. NL Agency Publisher. 59pp.

Worku, A., Andaregie, A. and Astatkie, T. (2021). Analysis of the Charcoal Market Chain in Northwest Ethiopia. *Small-scale Forestry* 20: 407 – 424.

World Bank (2009). *Environmental Crisis or Sustainable Development Opportunity, Transforming the Charcoal Sector in Tanzania. A Policy Note*. Environment and Natural Resources Unit, Washington DC. 72pp.

Zulu, L. C. and Richardson, R. B. (2013). Charcoal, livelihoods, and poverty reduction: evidence from sub-Saharan Africa. *Energy Sustainable Development* 17(2): 127 - 37.

APPENDICES

Appendix 1: Questionnaire for Charcoal Producer

Section A: Particulars of Respondent

1. Name of the ward:…….Name of the village:…….
2. Name of the respondent:……
3. Sex of the respondent: 1= Male [ ] 2= Female [ ]
4. Age of the respondent:……... (In Years)
5. Marital status: 1= Single [ ] 2= Married [ ] 3= Divorced [ ] 4= Separated [ ]
6. Level of Education:…… (In Years) 1= None [ ] 2= Primary [ ] 3= Secondary [ ] 4= College [ ] 5= University [ ]
7. Household size:……
8. Years residing at the area:…….. (In Years)
9. Source of income: 1= Farming [ ] 2= Pastoralism [ ] 3= Agropastoral [ ] 4= Employed in Public Sector [ ] 5= Employed in Private Sector [ ] 6= Others; Mention……

Section B: Roles of the Charcoal Producers

10. For how long have you been in the charcoal business?..... (Months/ Years)
11. What are your roles in charcoal market (*Multiple Response*)? …….....
12. Please, what other kind of charcoal payment have you paid in recent production? (*If payment mentioned in Qn.11, and record if there is evidence*) …….....

13. How many times have you issued the license to fell in 2020/21? (*If mentioned in Qn.11*)…….....
14. What were the purposes of paying the charcoal government fees in your recent production? (*If mentioned in Qn. 11*)…….....
15. What are the most usable tree species in charcoal production? Please, Mention……
16. Where are these trees found in your area? 1= Own Land [ ] 2= Village Forest Land [ ] 3= General Land [ ] 4= Forest Reserve Land [ ] 5= Other; Please, Specify……
17. What is the selling price for the bag of charcoal weighing 50 Kg?.....
18. How many charcoal bag (50 Kg) did you sell for single production?

No	**Customer**	**# Bags (50 Kg)**	**Place to meet customer**
I	Households		
Ii	Public Institutions		
Iii	Private Institutions		
iv	Other (Specify)…….		
	Total		

19. What are/ were the costs involved for current/ recent charcoal production per kiln?

No	**Cost Category**	**Cost/Unit**	**#Item**	**#Days**	**Total**
i	Bush Knife				
ii	Hoe				
iii	Spade				
iv	Charcoal bags				
v	Axes				
vi	Cutting the trees				

vii	Collect the trees to kiln				
viii	Kiln construction				
ix	Carbonization process				
x	Unloading charcoal from the kiln				
xi	Packing charcoal into bags				
xii	Loading charcoal into transports				
xiii	Unloading from transports				
xiv	Transportation cost (50kg)				
xv	Communication costs				
xvi	Forest royalty fees				
xvii	Food expenses (during the work)				
xviii	Indirect cost (Waiting time, etc.)				
xix	Other (Specify)				
		Total Cost			

Section C: Supportive Functions of Charcoal Business

20. Are there any supportive function for your charcoal business in area? 1= Yes [ ] 2= No [ ]
21. If Yes in Qn. 20; What kind of any supportive functions found in your area?.....
22. How do the following supportive functions help you to pay the charcoal government fees or register the business?

No	Statement	Yes	No	How many times/ year *(If possible)*	How does it un- or support you to pay charcoal fees
22.1	Are there any training provided for charcoal business				
22.2	Do you access loans to support your business				
22.3	Are road infrastructures support your business				
22.4	Do you use allocated selling areas to sell your charcoal				
22.5	Are you member of charcoal groups				
22.6	Do you access the market information				

23. What technology did you use for recent charcoal production?

No	Charcoal Production Technology	Reason (s)	# Bags (50 Kg)
i	Earth pit kilns		
ii	Earth mound kilns		
iii	Portable steel kilns		
iv	Improved earth mound kilns		
v	Briquette		
vi	Others (Specify)…….		
		Total Production	

24. Do you have a skill for the improved charcoal kilns? 1= Yes [ ] 2= No [ ]

25. If Yes in Qn. 24; how do you prepare the wood used for charcoal production?

No	Skills	Reason (s)	# Days
i	Dry the wood before charcoal production		
ii	Length of days for drying the wood before production		
iii	Cut the wood in smaller size		

26. If No in Qn. 24; How do you prepare the wood used for charcoal production?.....
27. What season do you engage in charcoal production in a year? 1= Dry season [ ] 2= Wet season [ ] 3= Dry and wet season [ ] 4= Throughout the Year [ ]

Section D: Enabling Environments of Charcoal Business

28. Have you heard of the legal conditions guiding the charcoal business in your area? 1= Yes 2= No
29. If yes in Qn. 28: How do legal conditions enable the charcoal business?..... (*Multiple responses*)
30. If yes in Qn. 28: How are the business enabling situations in your area?

No	Business enabling situations	Yes/ No	Reason (s) for your answer
30.1	Business registration requirements		
30.2	Registration fees		
30.3	Handling of documents for your business		
30.4	Time to transport charcoal		
30.5	Using EFD machines		
30.6	Please, others (Specify) ……...		

31. If no in Qn. 28: What are conditions given by TFS/ DFNR- Zanzibar/ District?..... (*Multiple responses*)
32. What are the challenges hinder your business to work under the formal charcoal market?.....
33. What should be done to formalize the charcoal market in your area?.....

Appendix 2: Questionnaire for Charcoal Wholesalers or Retailers

Section A: Particulars of Respondent

1. Name of the ward:…….Name of the village:…….
2. Name of the respondent:……
3. Sex of the respondent: 1= Male [ ] 2= Female [ ]
4. Age of the respondent:…….... (In Years)
5. Marital status: 1= Single [ ] 2= Married [ ] 3= Divorced [ ] 4= Separated [ ]
6. Level of Education:…… (In Years) 1= None [ ] 2= Primary [ ] 3= Secondary [ ] 4= College [ ] 5= University [ ]
7. Household size:……
8. Years residing at the area:…….. (In Years)
9. Source of income: 1= Farming [ ] 2= Pastoralism [ ] 3= Agropastoral [ ] 4= Employed in Public Sector [ ] 5= Employed in Private Sector [ ] 6= Others; Mention……

Section B: Roles of the Charcoal Wholesalers or Retailers

10. For how long have you been in the charcoal business?..... (Months/ Years)
11. Please, where have you bought your charcoal?…….....*(Producers, other wholesalers, retailers)*
12. What mode of transportation have you used?…….....*(As observed by researcher)*
13. How many bags have you bought?…….....*(Per trip for wholesaler)*

14. How many trips do you conduct per year?…….....*(for wholesalers)*
15. What are your roles in charcoal market (*Multiple Response*)? …….....
16. Please, what other kind of charcoal payment have you paid (*If payment mentioned in Qn.15, and record if there is evidence*) …….....
17. Please, which district did you use to register your charcoal business? (*If mentioned in Qn. 15, and record if there is evidence*) …….....
18. What is the selling price for the bag of charcoal weighing 50 Kg?.....
19. How many charcoal bag (50 Kg) do you sell per month?

No	**Customer**	**# Bags (50 Kg)**	**Places used to meet customer**
I	Households		
Ii	Public Institutions		
Iii	Private Institutions		
iv	Other (Specify)…….		
	Total		

20. What are the costs involved per trip?

No	**Cost Category**	**Cost/Unit**	**#Item**	**#Days**	**Total**
I	Charcoal bags				
ii	Packing charcoal into bags				
iii	Loading charcoal into transports				
iv	Unloading from transports				
v	Transportation cost (50kg)				
vi	Communication costs				
vii	Forest royalty fees				

viii	Food expenses (during the work)				
ix	Indirect cost (Waiting time, etc.)				
xii	Other (Specify)				
		Total Cost			

C: Supportive Functions of Charcoal Business

21. Are there any supportive function for your charcoal business in area? 1= Yes [ ] 2= No [ ]
22. If Yes in Qn. 21; What kind of any supportive functions found in your area?.....
23. How do the following supportive functions help you to pay the charcoal government fees or register the business?

No	**Statement**	**Yes**	**No**	**How many times/ year *(If possible)***	**How does it un- or support you to pay charcoal fees**
23.1	Are there any training provided for charcoal business				
23.2	Do you access loans to support your business				
23.3	Are road infrastructures support your business				
23.4	Do you use allocated selling areas to sell your charcoal				
23.5	Are you member of charcoal groups				
23.6	Do you access the market information				
23.7	Others (Specify)…				

Section D: Enabling Environments of Charcoal Business

24. Have you heard of the legal conditions guiding the charcoal business in your area? 1= Yes 2= No
25. If yes in Qn. 24: How do legal conditions enable the charcoal business?.....……..…….…….(*Multiple responses*)
26. If yes in Qn. 24: How are the business enabling situations in your area?

No	**Business enabling situations**	**Yes/ No**	**Reason (s) for your answer**
26.1	Business registration requirements		
26.2	Registration fees		
26.3	Handling of documents for your business		
26.4	Time to transport charcoal		
26.5	Using EFD machines		
26.6	Please, others (Specify) ……... ……...		

27. If no in Qn. 24: What are conditions given by TFS/ DFNR- Zanzibar/ District?..... (*Multiple responses*)
28. What are the challenges hinder your business to work under the formal charcoal market?.....
29. What should be done to formalize the charcoal market in your area?.....

Appendix 3: Questionnaire for Charcoal Transporters

Section A: Particulars of Respondent

1. Name of the ward:…….Name of the village:…….
2. Name of the respondent:……
3. Sex of the respondent: 1= Male [ ] 2= Female [ ]
4. Age of the respondent:…….... (In Years)
5. Marital status: 1= Single [ ] 2= Married [ ] 3= Divorced [ ] 4= Separated [ ]
6. Level of Education:…… (In Years) 1= None [ ] 2= Primary [ ] 3= Secondary [ ] 4= College [ ] 5= University [ ]
7. Household size:……
8. Years residing at the area:…….. (In Years)
9. Source of income: 1= Farming [ ] 2= Pastoralism [ ] 3= Agropastoral [ ] 4= Employed in Public Sector [ ] 5= Employed in Private Sector [ ] 6= Others; Mention……

Section B: Roles of the Charcoal Transporters

10. For how long have you been in the charcoal transportation?..... (Months/ Years)
11. Modes of transportation do you use to transport charcoal? …….....
12. How many bags have you recently transported? …….....
13. How many trips do you conduct? …….....(Per month/ year)
14. What are your roles in charcoal market (*Multiple Response*)? …….....

15. Please, what other kind of charcoal transportation documents have you handled? (*If document mentioned in Qn.14, and record if there is evidence*) …….....

16. Please, which place have you used to load charcoal bags? (*If mentioned in Qn. 14*)…….....

17. Please, which place have you used to unload charcoal bags? (*If mentioned in Qn. 14*)…….....

18. What kind of charcoal customers have you used to transport their charcoal bags?

No	**Customer**	**# Bags (50 Kg)**	**Give documents for transporting (Yes or No)**
I	Households		
Ii	Public Institutions		
Iii	Private Institutions		
iv	Other (Specify)…….		
	Total		

19. What are the transportation costs involved per trip?

No	**Cost Category**	**Cost/Unit**	**#Item**	**#Days**	**Total**
I	Charcoal bags				
ii	Packing charcoal into bags				
iii	Loading charcoal into transports				
iv	Unloading from transports				
v	Transportation cost (50kg)				
vi	Communication costs				
vii	Forest royalty fees				
viii	Food expenses (during the work)				
ix	Indirect cost (Waiting time, etc.)				

xii	Other (Specify)				
		Total Cost			

Section C: Enabling Environments of Charcoal Business

20. Have you heard of the legal conditions guiding the charcoal transportation in your area? 1= Yes 2= No
21. If yes in Qn. 20: How do legal conditions enable the charcoal transportation?..……..……...…….(*Multiple responses*)
22. If yes in Qn. 20: How are the charcoal transportation enabling situations in your area?

No	**Business enabling situations**	**Yes/ No**	**Reason (s) for your answer**
22.1	Right documents for charcoal transportation		
22.2	Time to transport charcoal		
22.3	Please, others (Specify) ……... ……...		

23. If no in Qn. 24: What are conditions given by TFS/ DFNR- Zanzibar/ District?..... (*Multiple responses*)
24. What are the challenges hinder your charcoal transportation work under the formal charcoal market?.....
25. What should be done to formalize the charcoal transportation in your area?.....

Appendix 4: Questionnaire for Charcoal Consumers

Section A: Particulars of Respondent

1. Name of the ward:…….Name of the village:…….
2. Name of the respondent:……
3. Sex of the respondent: 1= Male [ ] 2= Female [ ]
4. Age of the respondent:……... (In Years)
5. Marital status: 1= Single [ ] 2= Married [ ] 3= Divorced [ ] 4= Separated [ ]
6. Level of Education:…… (In Years) 1= None [ ] 2= Primary [ ] 3= Secondary [ ] 4= College [ ] 5= University [ ]
7. Household size:……
8. Years residing at the area:…….. (In Years)
9. Occupation: 1= Farmer [ ] 2= Pastoralist [ ] 3= Employed in Public Sector [ ] 4= Employed in Private Sector [ ] 5= Others; Mention……
10. Income per month……
11. Type of consumer……: 1= Household [ ] 2= Street food kiosks [ ] 3= Chips fryers [ ] 4= Hotels [ ] 5= Others; Mention……

Section B: Roles of the Charcoal Actor

12. What are your priority types of source of fuel for cooking?

No	**Source of fuel**	**Order from I to 5**	**Reason**
i	Firewood		
ii	Charcoal		
iii	Charcoal (Briquette)		
iv	Kerosene		
v	Gas		
vi	Electricity		

vii	Others (Specify)…….		

1=Essential 2= High priority 3=Medium priority 4=Low priority 5=Not a priority

13. Where do you buy the charcoal for your uses?

No	Charcoal Supplier	Tick (√)	Receive Receipt (Yes/ No)	Reason (s)
i	Producers			
ii	Retailers			
iii	Wholesalers			
iv	Others (Specify)…….			

Where (Production Area, Aside the road, Market, home, etc)

14. What is the quantity of charcoal do you use per week?

No	Charcoal Unit	Tick (√)	Frequency per Week	Price/ Unit	Total
i	Bucket				
ii	Tin (5Litres)				
iii	Bag (50Kg)				
iv	Others (Specify)…….				

Section C: Enabling Environments of Charcoal Business

15. Have you heard of the legal conditions guiding the charcoal business in your area? 1= Yes 2= No
16. If yes in Qn. 15: How do legal conditions enable the charcoal business?..... ……..…….(*Multiple responses*)
17. If yes in Qn. 15: How are the charcoal business enabling situations in your area?

No	Business enabling situations	Yes/ No	Reason (s) for your answer
17.1	Are the allocated charcoal selling areas enabling a business		
17.2	Receiving of receipts after		

	buying charcoal. Does it enable the business		
17.3	Please, others (Specify) ……... ……...		

18. If no in Qn. 15: What are conditions given by TFS/ DFNR- Zanzibar/ District?..... (*Multiple responses*)
19. What are the challenges hinder your charcoal transportation work under the formal charcoal market?.....
20. What should be done to formalize the charcoal transportation in your area?.....

Appendix 5: Checklist for Focus Group Discussion

1. What are the stages of charcoal supply at district level?
2. Who are the actors in each stage of charcoal supply at district level (by names of individuals or groups)?
3. How many are male and female actors at district level?
4. What are the roles of each actor in the charcoal value chain?
5. Who are the charcoal value chain supporters (by names of institutions, individuals or groups)?
6. What are the roles of the supporters in the charcoal value chain?
7. When did supporter start playing the role mentioned above to the charcoal actors at district (How many years)?
8. Who are the key actors in charcoal value chain at district?
9. How the charcoal product added value between actors?
10. What are their linkages or relationships between charcoal actors in the value chain at district level?

Appendix 6: Checklist to the Key Informants

1. Please, list laws that guiding the charcoal business in your area?
2. What are the strengths of these laws mentioned in Qn. 1 above?
3. What are the weaknesses of these laws mentioned in Qn. 1 above?
4. What supporting functions included in the laws mentioned in Qn. 1 above?
5. How does your district put initiative to register the charcoal actors?
6. How does your district put initiative to make charcoal actors paying the charcoal royalties?
7. What is the current situation (formal or informal) of charcoal market at village/ ward level?
8. What is the reason (s) for your answer in Qn. 7?
9. Does your district have bylaws guiding the charcoal business? 1= Yes [ ] 2= No []
10. If yes in Qn. 9; How many villages or wards having the bylaws guiding the charcoal business?
11. If no in Qn. 9; What is the reason (s)?
12. How does the central government support your district in charcoal business?
13. How does your district share with non-government organisation to support the charcoal business?
14. What are the challenges you face in implementing the laws mentioned in Qn. 1?
15. What are your opinions that may help combating the challenges faced the charcoal business?

Appendix 7: TFS Handeni charcoal revenue collected from year 2015 to 2020

Financial year	Charcoal (TZS)	Poles (TZS)	Firewood (TZS)
2015/ 16	967 228 385	90 000	2 099 900
2016/ 17	2 188 070 266	9 853 933	7 335 965
2017/ 18	1 559 929 886	29 788 895	31 604 350
2018/ 19	2 444 425 898	26 324 650	25 273 293
2019/ 20	704 298 750	11 145 300	630 500
Total	**7 863 953 185**	**77 202 778**	**66 944 008**

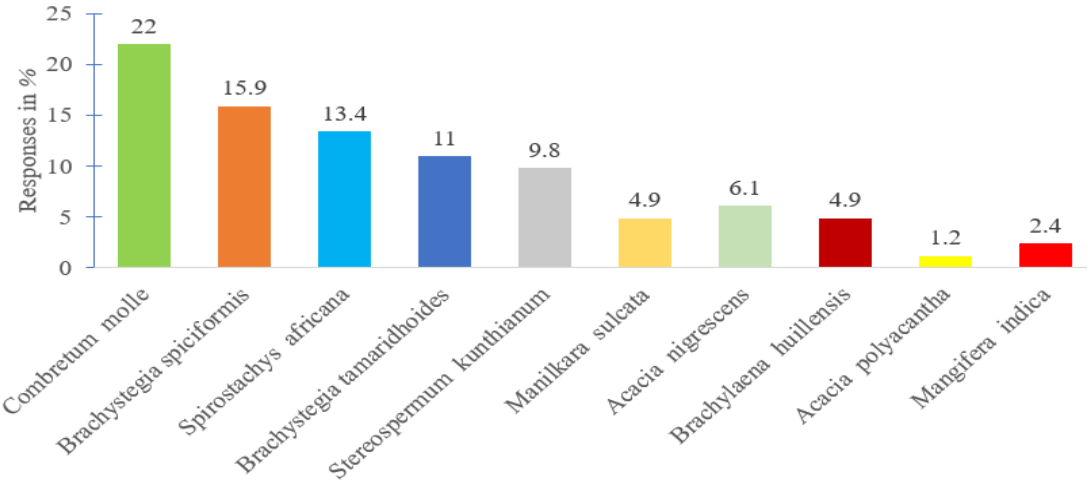
Source: TFS Handeni (2021).

Appendix 8: Charcoal government fees loss in Handeni from year 2015 to 2020

Financial year	No. illegal bags (53 Kg)	Royalties (TZS)	Conservation fees (TZS)
2015/ 16	616	7 700 000	385 000
2016/ 17	1 760	22 000 000	1 100 000
2017/ 18	3 049	38 112 500	1 905 625
2018/ 19	4 736	59 200 000	2 960 000
2019/ 20	1 825	22 812 500	1 140 625
Total	**11 986**	**149 825 000**	**7 491 250**
Overall Total	**157 316 250**		

Source: TFS Handeni (2021).

Appendix 9: Tree species used for charcoal production in study areas



Source: Field Data (2021).

Appendix 10: Bags transported per trip by different modes of transportation

Roles	N	μ ± S.D
Vehicle (above 7 ton)	7	121.3 ± 5.5
Vehicle (below 7 ton)	2	15.5 ± 2.1
Sail ships	4	142.8 ± 4.6
Sail boats	1	27 ± 0
Motorcycle	14	1.5 ± 0.5
Trimotorcycle	4	6.5 ± 0.6
Bicycles	1	1 ± 0
Tricycles	3	3.7 ± 0.6

*Data were based on multiple responses.

Source: Field Data (2021).

Appendix 11: Average quantity of charcoal consumed per week by different consumers

Type of Consumers	N	μ ± S.D
Household (1kg/tin)	89	4.48 ± 1.9
Hotel (53kg/bag)	7	1.43 ± 0.8
Chips or meat fryers (53kg/bag)	10	1.30 ± 0.5
Food merchants (53kg/bag)	13	1.15 ± 0.4

(**Source:** Field Data, 2021.)

Appendix 12: Labour costs per kiln involved in study areas

Cost items	Registered		Not Registered	
	Mandays	Cost (TZS)	Mandays	Cost (TZS)
Felling trees	1	10 000	1	12 000
Collection of wood	2	7 000	2	14 000
Kiln construction	2	11 000	2	18 000
Carbonization	6	22 000	7	35 000
Unloading charcoal	1	5 000	1	7 000
Load charcoal into bags	1	3 500	1	8 000
Total	**13**	**58 500**	**14**	**94 000**

Source: Field Data (2021).

Appendix 13: Average costs of equipment per charcoal bag (53Kg) in study areas

Cost items	Cost	Life time (Years)	No. bags Produced/ Year	Total no. bags Produced/ equip	Tool cost per bag
Bush knives	5 000	2	132	264	19
Hand hoe	5 000	2	132	264	19
Spade	12 000	3	132	396	30
Axe	15 000	3	132	396	37
Rope	5 000	2	132	264	19
Sack	500	-	-	-	500
File	3 500	1	132	132	26
Total	**46 000**	**-**	**-**	**-**	**650**

Source: Field Data (2021).

Appendix 14: Labour and equipment costs incurred by wholesalers in study areas

Cost items	N	μ ± S.D
Price of 53Kg charcoal (paid royalties)	23 160	-
Price of 53Kg charcoal (unpaid royalties)	11 230	9 000
Packing into sacks (53Kg)	500	500
Loading (53Kg)	500	500
Unloading (53Kg)	500	500
Loading (32Kg) Sail ships (at Mkwaja)	500	500
Unloading (32Kg) Sail ships (at Kihinani)	500	500
Sack (53Kg)	500	500
Rope (per sack)	200	200
Transport from production site to Handeni markets (53Kg)	2 000	2080
Transport from Handeni district to Dar es salaam (53Kg)	6 050	-
Transport from Handeni district to Magharibi A (32Kg)	12 115	-
Communication	86	62
Allowances	1 710	515
Miscellaneous	280	180
Total	**42 636**	**15 037**

Source: Field Data (2021).

Appendix 15: Other charges incurred by retailers in study areas

Cost items	Registered Cost/bag (53Kg)	Non registered Cost/bag (53Kg)
Handeni		
Price of charcoal (unpaid royalties)		13 820
Communication		500
Transportation		1 530
Miscellaneous		345
Total cost		**16 195**
Kinondoni		
Price of 53Kg charcoal	48 830	51 270
Communication	134	244
Transportation	2 000	2 045
Miscellaneous	65	135
Total cost	**51 029**	**53 694**
Magharibi A		
Price of 53Kg charcoal	71 765	71 215
Communication	240	314
Transportation	2 165	2 000
Miscellaneous	538	1 093
Total	**74 708**	**74 622**

Source: Field Data (2021).

Appendix 16: Charcoal bags produced per kiln in Handeni district

Charcoal bag (53 kg)	N	μ ± S.D
Charcoal bags produced by producers	34	28.56 ± 5.92

Source: Field Data (2021).

Appendix 17: Charcoal revenue collected from 2015 to 2020 by TFS and DFNR

Year	TFS Handeni (TZS)	TFS Kinondoni (TZS)	Magharibi A- DFNR (TZS)
2015/ 16	967 228 385	N/A	N/A
2016/ 17	2 188 070 266	N/A	N/A
2017/ 18	1 559 929 886	N/A	55 756 000
2018/ 19	2 444 425 898	N/A	54 956 500
2019/ 20	704 298 750	68 653 287	53 322 500
Total	**7 863 953 185**	**68 653 287**	**164 035 000**

Source: Field Data (2021).

Appendix 18: Charcoal revenue in Handeni district council, 2011-2015

Year	TFS Handeni (TZS)
2011	103 817 000
2012	100 060 700
2013	212 009 538
2014	573 965 160
2015	967 228 385
Total	**1 957 080 783**

Source: Handeni DC (2021).

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