

## Supporting business functions influencing the formalization of charcoal business in Tanzania

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### ABSTRACT

Charcoal business, production, and sustainability are all under the control of government regulations. In Tanzania, the entire charcoal value chain employs approximately two million people. As a result, there are unreliable records for registered actors, and it is difficult to accurately quantify the annual amount of charcoal production and revenue collected by the Tanzanian government. Supporting functions are legally provided activities and services to support charcoal actors to formalize their business, including participation in the formulation of forest laws, market infrastructure development, training, access to information, and financial services. Supporting business functions available for charcoal actors such as producers, wholesalers, and retailers to facilitate the formalization of the charcoal business in Tanzania. This study was conducted to determine the supporting functions that are important to charcoal actors in Tanzania to formalize their activities. A total of 107 charcoal actors were administered a semi-structured questionnaire using the multiple sampling technique, which involved 31 wholesalers and 42 retailers trading in two of the largest markets, one in Dar es Salaam and the other in Zanzibar. Both markets depend on charcoal production in Handeni district, located in Tanga Region. Principal component analysis (PCA) indicated that formalizing the charcoal sector in Tanzania necessitates public-private partnerships (22.9%), financial services and legal environments (21.9%), and market infrastructures (15.6%). We concluded that the charcoal business needs the collaboration of the government with non-government organizations to share resources such as forest staff, vehicles, and incentives to motivate the participation of actors in the training of the legal procedure of charcoal business management, the formulation of registered charcoal groups or associations, and the establishment of charcoal selling centres. Moreover, the development of forest laws should be participatory to involve charcoal business stakeholders to have a reasonable cost of issuing licenses and other permits.

### 1. Introduction

The charcoal business significantly contributes to the economies of developing nations and reduces poverty through the creation of employment opportunities (Brobbe et al., 2019; Branch et al., 2022). It is anticipated that this sector will contribute to the income of approximately twelve million people by 2030 (Mwampamba et al., 2013). This is a result of charcoal consumption in sub-Saharan countries increasing from 23 million tons in 2000 to 46.1 million tons in 2030 (Arnold et al., 2006; Zulu and Richardson 2013). Despite the importance of the sector to charcoal actors, large quantities of charcoal are produced in African countries without official permits, which shows the predominantly informal and illegal character of the sector and the difficulties in

accessing the formal system (Schure et al., 2013; Smith et al., 2017; Mutta et al., 2021; Branch et al., 2022).

Tanzania's forests meet 85% of its energy needs, with charcoal being the largest product, providing substantial employment and reliable energy (Nyamoga and Solberg, 2019; MNRT, 2021). Charcoal accounts for nearly 50% of household energy use, alongside electricity, firewood, liquid petroleum gas, and kerosene (MNRT, 2019). Therefore, the charcoal sector significantly contributes to the country's GDP and necessitates efforts to enhance revenue collection (MNRT, 2021). As a result, the government earned US\$ 819.4 million per year from business (MNRT, 2021). However, a 2014 study on local forest governance found that government fees for charcoal generated US\$ 838,000 in 23 districts. Furthermore, some of the charcoal government fees that are mostly paid

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by actors (such as producers, wholesalers, and retailers)- are royalties, i. e., a government fee of US\$ 4.9 per 50 kg of the charcoal bag, business license fees, and district levies (Doggart et al., 2020). However, the government incurs an annual loss of \$100 million from charcoal revenue (Nyamoga and Solberg, 2019). The annual production of charcoal in East African nations, including Rwanda, contributes to the GDP of US\$ 77 million and Kenya's US\$ 1.6 billion (Ablo et al., 2022).

Supporting business functions are legal activities and services that assist actors in the production of goods or services, such as participation in the formulation of forest laws, market infrastructure development, training, access to information, and financial services (Nadja and Merten, 2015; Nielsen, 2018). In most African countries, the involvement of charcoal actors such as producers, wholesalers, and retailers in the formulation of forest policies and regulations improves the formalization of business (Nyamoga and Solberg, 2019; Schure et al., 2019; Adeniji et al., 2022). Formalization refers to the explicit rules, procedures, and norms that dictate the rights and obligations of charcoal actors (Schure et al., 2013). In Tanzania, supporting functions that would motivate actors to formalize their activities are not well known and are insufficiently understood.

In central and western African countries, informal institutions lead to unsustainable charcoal production, corruption, and tax revenue loss due to large actors' involvement (FAO, 2007; Schure et al., 2013). However, the governments of African countries used some of the fees paid by registered actors to maintain forest plantations and secure the sustainability of charcoal production (Schure et al., 2013; Neufeldt et al.,

2015). The charcoal business in Tanzania employs roughly two (2) million people across the whole value chain, and since barriers to entry are relatively low (Nyamoga and Solberg, 2019), many are unregistered and evade paying government royalties. This levy evasion results in a considerable loss of government revenue, and it is difficult to establish the annual amount of charcoal production from reliable records that serve as information to regulate the charcoal business in Tanzania.

This study focuses on identifying the most important supporting functions that would motivate charcoal actors to formalize their businesses and then pay government royalties.

## 2. Materials and methods

### 2.1. Study areas

The United Republic of Tanzania is a union of Mainland Tanzania and Zanzibar, it is located between longitude 29° and 41° East and latitude 1° and 12° South (Mauya et al., 2019). The data were collected on the mainland of Tanzania and the islands of Zanzibar. On Tanzania's mainland, charcoal actors found at Handeni and Kinondoni were surveyed, and these districts are located in Tanga and Dar es Salaam regions, respectively. Charcoal produced in the Handeni District is largely sold at charcoal markets in Kinondoni District at Kawe, Mzimuni, and Makumbusho wards (Ishengoma and Abdallah, 2016).

Furthermore, charcoal from Handeni district was sold in Magharibi A district in the wards of Kihinani, Bububu, and Kidatu in the islands of

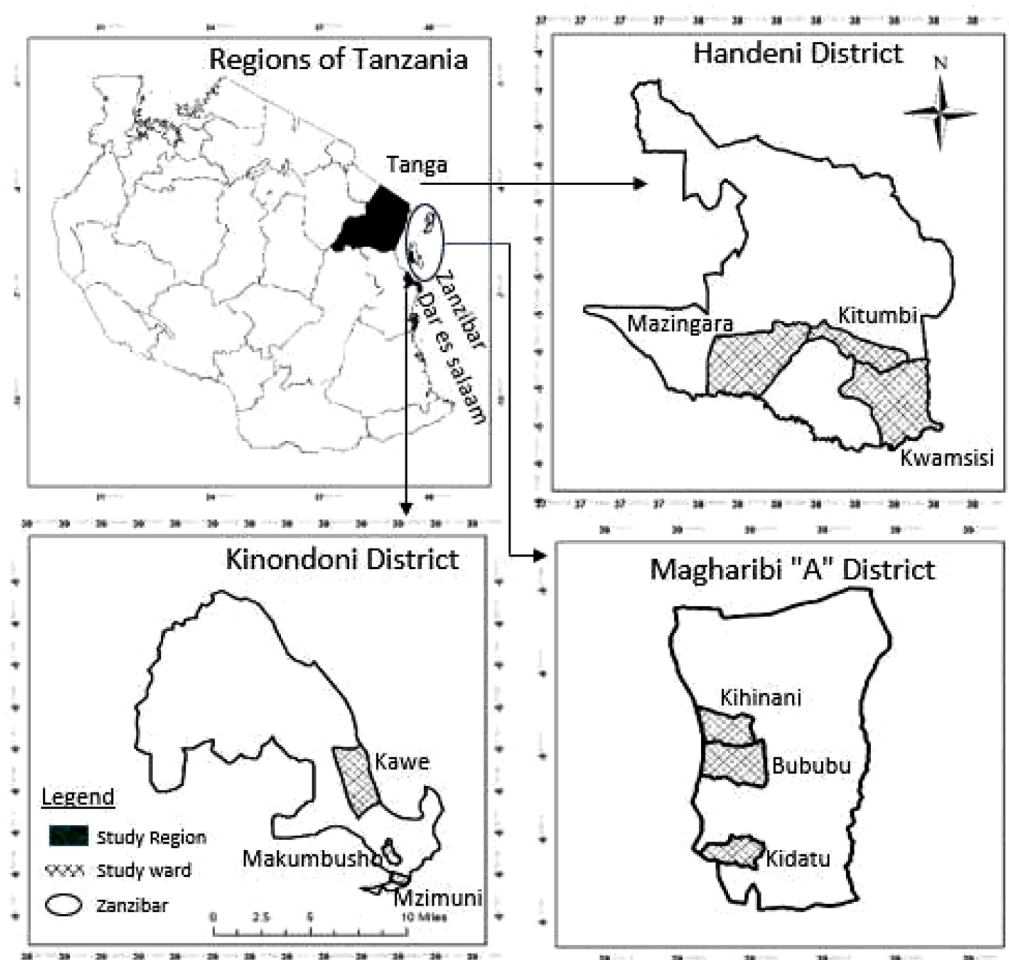


Fig. 1. Location of the study areas: Handeni District in Tanga region, Kinondoni District in Dar es Salaam region, and Magharibi A district in Mjini Magharibi region, Zanzibar.

Source: ArcGIS 10.1

Zanzibar. Kwedikabu village in Handeni district is in proximity to the main charcoal markets in Magharibi A district; therefore, charcoal is shipped from the Tanzanian mainland to the islands of Zanzibar (URT, 2018; Fig. 1). Therefore, this study involved Tanzania's largest charcoal market districts (Ishengoma and Abdallah, 2016; URT, 2018).

## 2.2. Sampling procedure

This study used multistage sampling procedures to select charcoal actors (Mensah et al., 2024). The sampling frame consisted of charcoal actors in the respective districts who participated in the charcoal business. First, three districts were purposefully selected based on the areas of charcoal production (Handeni District) and its largest markets (Kinondoni and Magharibi A Districts) in Tanzania (Ishengoma and Abdallah, 2016; URT, 2018). Second, from the selected districts, three wards (administrative units of the Tanzanian government) were purposefully selected based on their charcoal business performance. Third, charcoal producers, wholesalers, and retailers were selected randomly from available lists prepared by ward executive officers and district forest conservators. These charcoal actors either participated in the charcoal training or made any of the required payments—such as business registration fees, district royalties, village levies, and taxes—as stipulated by the charcoal regulations.

## 2.3. Data collection methods

A cross-sectional survey was used to collect data on supporting business functions that influence the formalization of the charcoal business in Tanzania. A mixed methods research strategy was employed to gather the primary data, which included methods of both qualitative and quantitative nature (Bennett-Curry et al., 2013). Primary quantitative and qualitative data were gathered through interviews, using both semi-structured and unstructured questionnaire procedures.

We used a semi-structured questionnaire survey to gain valuable insights about the types of supporting functions and initiatives from government and non-government organizations on the formalization of the sector from charcoal producers, wholesalers, and retailers. The lottery method was used to select a total of 107 charcoal actors, including charcoal producers ( $n=34$ ), wholesalers ( $n=31$ ), and retailers ( $n=42$ ) (Agyeman et al., 2012). These sample sizes ( $n \geq 30$ ) were sufficient to administer questionnaires to charcoal actors (Barlett et al., 2001).

The unstructured questionnaire examined key informants, including nine (9) ward executive officers, three (3) district forest conservators, and one (1) secretary of the Kihinani Charcoal Association (KCA). Interviews with key informants focused on the current situation and initiatives to formalize the charcoal industry. The merit of the unstructured questionnaire to key informants triangulated the information given by charcoal actors (Agyeman et al., 2012). The data was collected from March 2021 to February 2022, when charcoal production was prominent in Handeni district.

## 2.4. Data analysis

Data were analysed using Statistical Package for Social Sciences (SPSS) software version 26 to perform principal component analysis (PCA) which was used to group eight variables that are highly correlated into three principal components, which are underlying clusters of the essential information gathered by using a semi-structured questionnaire related to charcoal business functions that influence charcoal actors to formalize the sector in Tanzania (Leech et al., 2005).

The Kaiser-Meyer-Oklín measure of sampling adequacy of this study was (0.6) and Bartlett's test of sphericity ( $p < 0.05$ ) was used to ensure the use of principal component analysis (Field, 2009). This result indicates that the data are appropriate for principal component analysis. Moreover, descriptive analysis such as percentages was used to summarize the data collected from the semi-questionnaire method.

## 3. Results

Based on Kaiser's criterion, three factors out of a total of eight supporting functions that were grouped into three-factor components to explain supporting functions that are important for the formalization of charcoal business with eigen value  $> 1$  and factor loadings  $> 0.5$  were retained as important factors in a given supporting function for the formalization of the charcoal sector.

The first supporting function was public-private partnerships (22.9%), including government and non-government support, and actors being in charcoal groups. The second supporting function was loaded by financial services and legal environment factors (21.9%). The third supporting function was market infrastructures (15.6%) that were loaded by the infrastructures of the marketplaces and modes for transportation of charcoal in study areas, explained by the variation of 60.4% (Table 1).

### 3.1. Public-private partnership

The presence of public-private partnerships (22.9% of the variance) was the most critical factor associated with actors' willingness to formalize the charcoal sector in Tanzania (Table 1). Government and non-government organizations enabled training related to registration and government fees for charcoal actors. However, few charcoal actors attended the training in the study areas (Fig. 2).

Furthermore, the results showed that charcoal groups or associations were dominated by charcoal wholesalers in the study areas (Fig. 3). Government and non-government organizations facilitated the formation of charcoal groups or associations in study areas.

### 3.2. Financial services and legal environment

The second essential information is financial services and the legal environment, which explain 21.9% of the total variance (Table 1). The results showed that few charcoal actors accessed bank loans (Fig. 4). It indicated that charcoal actors perceived that the business was a non-priority to secure loans from banks.

Most charcoal actors (94.4%) perceived that forest laws had not supported their charcoal business in terms of charcoal government fees, charcoal business licenses, and receipts that were not accepted by banks as legitimate and trustworthy documents for loan applications to expand business. This was the reason for charcoal actors to perceive that the participation of charcoal actors, including financial institutions, was very low during the development of charcoal regulations. One of the charcoal producers in the Handeni district, saying that:

*"The lack of recognition of charcoal licenses and receipts indicated that banks were not involved during the formulation of forestry laws that guide the charcoal markets, which is why we are not surprised banks do not give us*

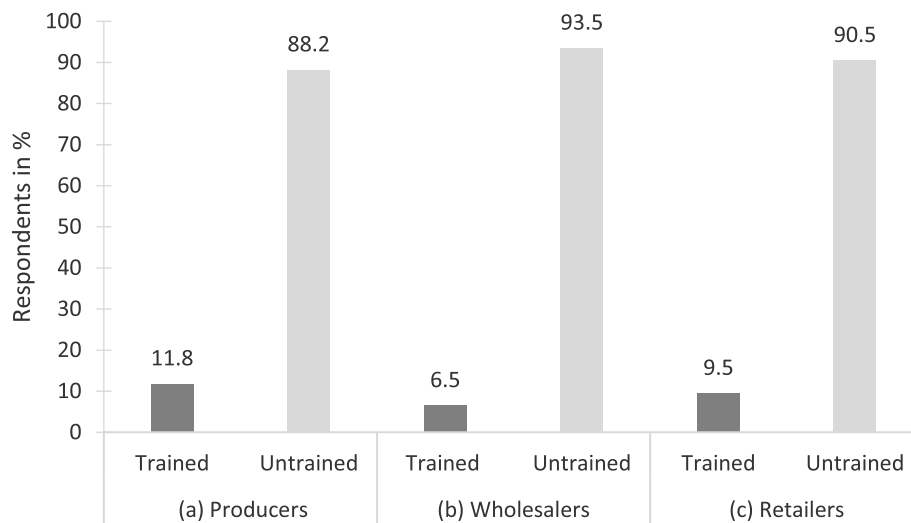
**Table 1**

Rotated component matrix for charcoal actors to pay charcoal royalties.

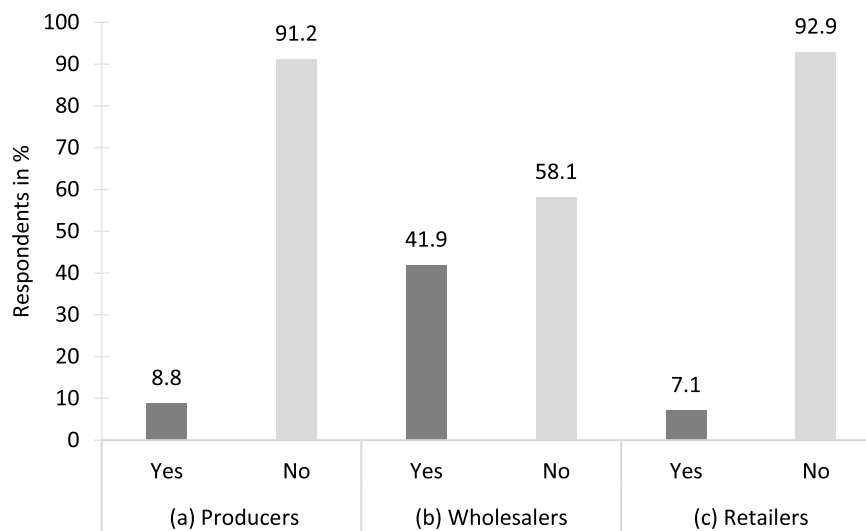
Factor	Rotated factor loadings		
	1	2	3
Government support	0.891		
Non-government support (NGOs)	0.839		
Member of charcoal groups	0.695		
Legal environment		0.874	
Financial services		0.815	
Market places			0.767
Modes of transportation			-0.696
Market information			0.411
Variance	22.9	21.9	15.6

Extraction method: Principal component analysis. Results are based on the Rotation method, Varimax with Kaiser Normalization. Factor loadings with absolute value  $\geq 0.5$ .

Source: Field Survey.



**Fig. 2.** Charcoal actors attended the training related to the formalization of the business.  
Source: Field Survey.



**Fig. 3.** Charcoal actors joined charcoal groups.  
Source: Field Survey.

loans”.

Moreover, they perceived that the cost of business registration and loyalty was also high. For example, government royalties (Tanzania Forest Services Agency) cost US\$ 4.9 per 50 kg, conservation fees US\$ 0.25 per 50 kg, local government levies US\$ 0.4 per 50 kg, and charcoal business licenses US\$ 119.7 per year.

### 3.3. Market infrastructures

The third key factor highly correlated with willingness to formalize one's business and pay levies was the availability and quality of market infrastructure. This was explained by 15.6% of the total variance (Table 1). The supporting functions highly loaded in this information comprise marketplaces, modes of transportation, and market information. Marketplaces where the meeting points to trade, negotiate, and exchange information about the charcoal market needs including prices, changes of government fees, and requirements for legal business. For example, in the Kwenkwale charcoal selling centre, one of the charcoal producers was quoted as saying;

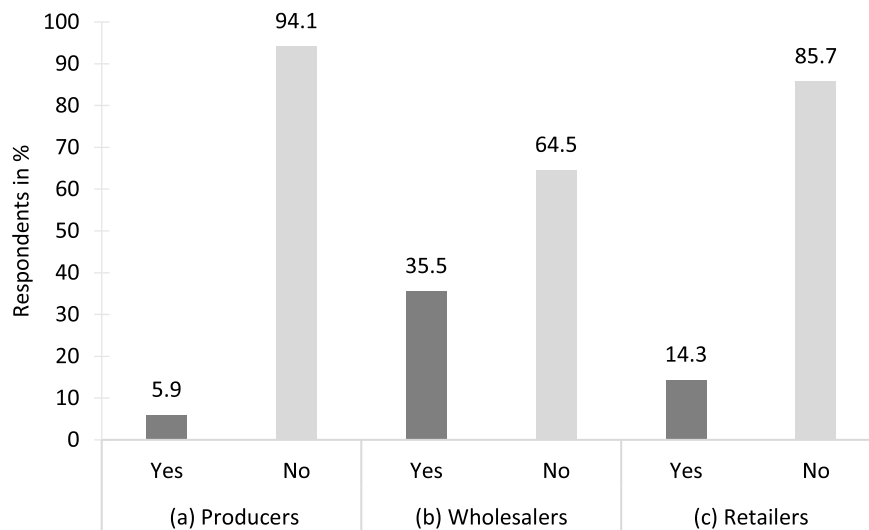
“Selling charcoal in areas allocated helped us sell our charcoal without

disturbances from forest officers. However, we did not register our business by paying Tsh. 300 000/=, we are here waiting only for charcoal wholesalers to buy charcoal and pay for charcoal royalties of Tsh. 12 500/= . The money we were required to pay but did not have.”

Most charcoal actors had access to market information including price and availability of the charcoal in study areas. Moreover, all factor loadings in this information had factor loadings > 0.5, which were considered important supporting functions, except for market information, which had a low positive coefficient (0.4) (Table 1; Fig. 5a).

The modes of transportation had negative factor loadings (−0.696), and most of the charcoal actors perceived that roads were not accessible by vehicles and were hardly accessed by motorbikes (Table 1; Fig. 5b). In the case of Zanzibar, charcoal wholesalers experienced the loss of charcoal bags during the high tides and received incomplete charcoal orders from the Handeni district (Fig. 5c). One of Magharibi A wholesaler was quoted as saying,

“Some charcoal bags were thrown into the ocean by sail ship captains during the high tides because the size of sail ships was smaller compared to the number of charcoal bags transported. So, my friend researcher, we as businessmen should do something to compensate for this kind of loss. For charcoal



**Fig. 4.** Charcoal actors accessed loans from financial institutions. Source: Field Survey.



**Plate 1.** Charcoal selling centers in Handeni District in Tanga Region (Top left), Kinondoni District in Dar es Salaam Region (Top Right), and Magharibi A district, Zanzibar (bottom). Source: Field Survey.

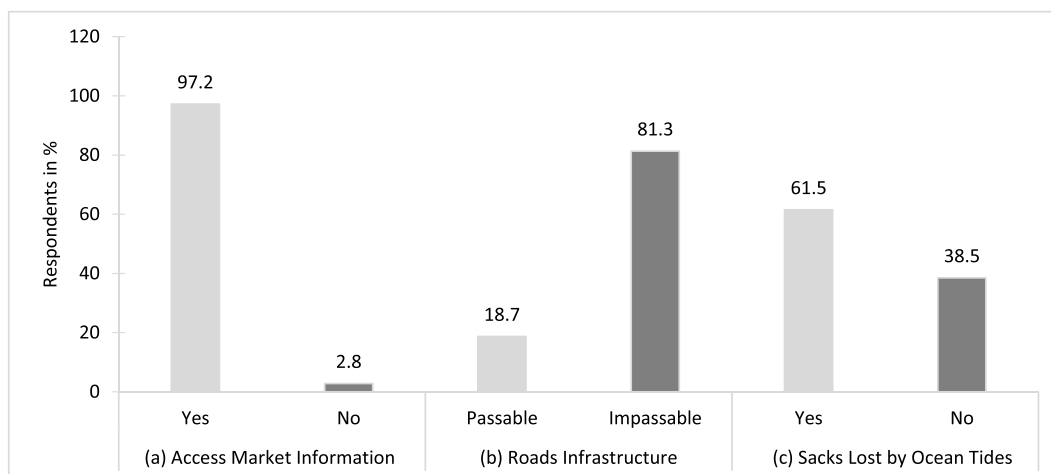
*wholesalers, it is very difficult to pay charcoal royalties for all bags, though they experienced that not all charcoal bags reached the Kihinani selling centre”*

**4. Discussion**

The formalization of the charcoal sector is a commonly proposed solution for the sustainability of charcoal production, improving the collection of government royalties, compliance with regulations, and the livelihood of charcoal actors. However, most charcoal actors in Tanzania perform their activities informally. Business supporting functions that would make charcoal actors register their business activities and pay government royalties were not well documented. This study identified

supporting functions that are important for the formalization of the charcoal sector in Tanzania.

We examined the business-supporting functions such as government support, non-government support (NGOs), charcoal actors being in groups, the legal environment, financial services, marketplaces, modes of transportation, and market information that influence charcoal actors to formalize the sector. We identified that public-private partnerships were the most important business-supporting function for the formalization of the sector. These findings are in line with a study conducted in ten (10) countries in Eastern Africa, which showed governments in Uganda and Tanzania were the most likely to encourage private and individual forest owners in the management and protection of forest products (Kiplonge et al., 2018). Previous studies conducted in



**Fig. 5.** Charcoal market infrastructure: (a) Access to the charcoal market information, (b) Road infrastructure, and (c) Wholesalers of charcoal orders affected by oceanic high tides.

Source: Field Survey.



**Plate 2.** Unloading of charcoal bags transported from Handeni District in Tanga Region to Kihinani charcoal selling centre, Magharibi A District in Zanzibar.

Source: Field Survey.

Tanzania revealed that charcoal actors need to work closely with local authorities, including villages, for sustainable production, register businesses, and improve livelihoods through the benefits generated from the charcoal business (CAMCO, 2014; Schure et al., 2013). Our results suggested that public-private partnerships would identify charcoal actors and the government to understand their constraints, improve the sources of charcoal from public and privately owned forests, and benefit actors as the business would be sustainable.

In Handeni district, we found the government collaborated with a non-government organization, the Finnish International Development Agency (FINNIDA), to train charcoal producers on forest management for charcoal production. This revealed that charcoal producers were not trained in techniques for setting charcoal prices that consider business registration fees and local government levies. Our results support other scholarly works that revealed charcoal actors were satisfied with meeting the price given by wholesalers and retailers; this is because the nation does not have charcoal price guidelines (Blodgett, 2011; CAMCO, 2014; Nyamoga and Solberg, 2019). However, a study conducted in Zambia showed that charcoal has remained underpriced by more than 20–50% of its economic costs, thus affecting the producers, who then exacerbate the negative environmental impacts. In Sudan, the government has the mandate to set the minimum price of charcoal to control the loss to charcoal actors (Taylor et al., 2020). This study suggests that training in charcoal business management would allow charcoal actors

to set the charcoal price, considering the benefits of the business after the payment of government fees, including business registration and local authority royalties, and increasing the chances for business formalization in study areas.

Furthermore, our results showed that the formation of a charcoal group was another important factor in public-private partnerships. This is supported by the study conducted in African countries that revealed that charcoal producers' associations formalize the business (Branch et al., 2022). We found a charcoal association at Kihinani charcoal market that was supported by the government of Zanzibar under the Ministry of Trade and Industrial Development, while in Handeni district it was funded by the forestry value chain development (FORVAC) project. These findings were consistent with other studies conducted in Tanzania and Zambia (CAMCO, 2014; Doggart and Meshack, 2017; Kabisa et al., 2020), which revealed that the formation of charcoal groups is useful for charcoal government staff to meet charcoal producers and raise awareness about compliance with the guidelines of the charcoal business. Based on these results, charcoal groups would be used by the government to monitor the business progress in Tanzania by sharing the constraints and perceptions of actors to improve the sector. Therefore, the business should only be conducted by members who are in charcoal groups.

The results revealed that financial institutions reject charcoal business licenses and receipts for issuing bank loans. However, they are

recognized by forestry laws in study areas regardless of whether the charcoal sector is a non-union matter for which Zanzibar has distinct regulations from that of mainland Tanzania (Benjaminsen, 2017). It means the charcoal business documents required by forest laws were not the only requirement for actors to access bank loans. Therefore, charcoal actors felt discouraged from registering businesses and paying charcoal government fees. These findings are consistent with studies conducted in Tanzania (Mori and Richard, 2012; Magembe, 2017), which showed critical constraints facing small and medium enterprises (SMEs) to access bank loans, including business informality, sectors that are perceived as unsustainable by banks, inappropriate policy, poor business skills, short-term repayment, lack of collateral property, and the unavailability of loan information.

In the current study, we observed that some charcoal actors waited for charcoal wholesalers to pay for government royalties after buying charcoal from producers. This is in line with a study conducted in Ghana, which showed that charcoal producers were dependant on wholesalers for advances to finance production and had to accept the price offered by the wholesalers (Agyei et al., 2018). It means that charcoal wholesalers have invested more financial capital than charcoal producers and retailers, and they are likely avoiding penalties compared to producers and retailers due to the evasion of charcoal royalties. This is supported by Branch et al. (2022) who suggested that increased capital investment may improve the formalization and sustainable management of the charcoal business.

Furthermore, other studies conducted in Sub-Saharan Africa revealed that the demand for charcoal is leading to attempts by governments to formalize the sector, including enabling investments that use briquette machines as carbonization techniques (Mensah et al., 2022). In Ghana, forestry machine operators are registered to monitor the technology used to harvest forest products (Brobbe et al., 2021). We suggest that the government should cooperate with charcoal actors to specify the amount as a financial capital investment in regulation that covers registration fees and expenses for buying forestry machines that add value to forest products, such as briquette machines and chainsaws for felling trees, to control the formalization of the sector. These machines could also be used as collateral property to secure loans from banks.

We also identified that market infrastructure was another important business-supporting function to influence charcoal actors to formalize their activities. We found that the Malindi charcoal selling centre had been officially shifted to the Kihinani charcoal selling centre in Magharibi A district. However, charcoal wholesalers continued to sell charcoal illegally in Malindi. A previous study in Ghana revealed that most charcoal dealers trade in front of their homes and outside market areas; they do not register businesses and pay government royalties (Agyei et al., 2018). This study suggested that if forest authorities—Tanzania Forest Services (TFS) and Local Government Authorities (LGAs)—are not enforcing the law effectively, the existence of charcoal-selling centers will not help control the charcoal business.

The results showed that charcoal actors in Handeni district perceived roads as not passable and temporary. Therefore, charcoal actors spent many days transporting their charcoal from production areas to charcoal-selling centers. Our result was similar to the study conducted in Burundi, which revealed that impassable roads increase the chance for some charcoal dealers to evade charcoal royalties (Sabuhungu et al., 2015). This study revealed that forest government officials cannot easily access areas used for charcoal production to control the charcoal business, and so they rarely collect government charcoal royalties. This situation makes dealers illegally transport charcoal since licenses for felling trees, one of the important documents for transporting charcoal, have an expiration date because of time spent due to roads being impassable.

We found that paying charcoal royalties was related to ocean conditions, the size of the sail ships or boat ships, and overloading. These result in the loss of charcoal bags during high tides. Therefore, small

sailships or dhows increase the cost of running a business for charcoal actors, especially for producers and wholesalers, resulting in the evasion of charcoal business registration and payment of government loyalty. This study supports the previous studies, which found that the mode of transportation has a cost implication for transportation fees and results in the price (CAMCO, 2014; Nyamoga and Solberg, 2019; Branch et al., 2022). Therefore, the price of charcoal is different in different areas and depends on the mode of transportation. This study suggested that it would be worth specifying the number of bags in different types of transport, such as trucks and boats, in regulation, specifically for transport permit (TP) documents, to control the loss of charcoal bags and the quality of charcoal.

In this study, we examined business-supporting functions for the formalization of the charcoal business in Tanzania. Several commentators have suggested the effects of charcoal formalization on actors, the sustainability of the business, and the theory of the informal sector (Schure et al., 2013; Williams and Shahid, 2016; Branch et al., 2021). Therefore, understanding the most important business function for formalizing the charcoal sector makes a unique improvement in formalizing the business (Baumert et al., 2016; Ishengoma and Abdallah, 2016; Nyamoga and Solberg, 2019; Mensah et al., 2022). This study was compromised by a methodology limitation; the respondents who participated in the study were only registered by ward executive officers and district forest conservators. Therefore, we suggest that future studies examine the charcoal business supporting function for non-registered charcoal actors in Tanzania.

## 5. Conclusion and recommendations

Public-private partnership support was important to influence charcoal actors to register their charcoal businesses and pay other charcoal government fees. Tanzania Forest Services Agency, Department of Forest Zanzibar, Districts, and Non-Government Organizations (NGOs) are supposed to organize charcoal actors to form charcoal groups or associations, training charcoal producers, wholesalers, and retailers on legal procedures of business management and sustainable methods of charcoal production. Forest staff should implement forest laws effectively to control charcoal business licenses, licenses for felling trees, and transport permits (TPs). This is to capacitate the forest staff to record charcoal production and revenue collection to justify the contribution of the charcoal business to the country's economy. Moreover, the development of forest laws should be participatory to involve charcoal business stakeholders, including financial institutions.

### CRediT authorship contribution statement

**William Didas Marandu:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Greyson Zabron Nyamoga:** Writing – review & editing, Methodology. **Romanus Ishengoma:** Writing – review & editing, Supervision, Funding acquisition.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Data availability

Data will be made available on request.

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### Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.tfp.2024.100542](https://doi.org/10.1016/j.tfp.2024.100542).

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