Sokoine University of Agriculture

MSc Dissertation

Value Chain Analysis of Medicinal Plants in Liwale District, Tanzania

Akiza Victor Kamagenge

May 2024

VALUE CHAIN ANALYSIS OF MEDICINAL PLANTS IN LIWALE DISTRICT, TANZANIA

Dissertation Submitted to Sokoine University of Agriculture in Fulfilment of the Requirements of Masters of Science in Environmental and Natural Resource Economics

By

Akiza Victor Kamagenge

Supervisors

Prof. Abdallah, J. M
Dr. Nyamoga, G. Z

Department of Forest and Environmental Economics
College of Forestry, Wildlife and Tourism
Sokoine University of Agriculture, Morogoro, Tanzania

May 2024

EXTENDED ABSTRACT

Medicinal plants as non-timber forest products have been playing a crucial role in the health care sector. The acceptance of herbal products by the developed world has to a large extent fuelled the current demand for medicinal plants and it is expected to grow even further with time in terms of herbal supplements and remedies. However, the medicinal plants business in Tanzania has faced and continues to face a significant number of regulatory and institutional challenges. Also, most of the research activities on medicinal plants value chain development have paid more attention to food crops and food security with few focused on the development of a friendly business environment for medicinal plants. This study examined the value chain analysis of medicinal plants in the Liwale district, Tanzania. A cross-sectional study design was adopted. The sample size was 100 medicinal plant value chain actors, where a 5% sampling intensity was used in each village under study. Quantitative data was obtained; descriptive and binary logistic regression analyses were used with the aid of SPSS software. Qualitative data was obtained from key informant interviews and focused group discussions. Later the data was analyzed using content analysis. The study found that there was a lack of awareness (82.4%) and low compliance with the business environment (83.2%). The study also found that a large number of herbal clinics and traditional healers lacked training for improving their business skills (85%). Most of the herbal clinics and traditional healers had access to financial services, especially mobile money, but few tend to use such services (79%). Furthermore, the study found out through the Binary logistic regression results that only three actors/collectors, middlemen (transporters and processors), herbal clinics, and traditional healers were found to exist along the value chain of medicinal plants. Additionally, it was concluded that the actors' profits differ, with herbal clinics and traditional dealers benefiting (1,500,000 Tshs) more than other actors along the value chain. Finally, it can be said that the medicinal plant industry has been impacted by several

factors, with the capital issue being the most frequent among the respondents, indicating that it was the main issue affecting the majority of actors in the value chain for medicinal plants. The study recommends that the government should implement policies that prioritize product quality by investing in capacity-building skills and innovations to make the business more lucrative. Financial institutions should also work closely with herbal clinics and medicinal plant dealers to assist them financially. Training in the medicinal plants business is thus recommended to assist them in lowering operational costs. Different responsible organizations and authorities should provide more education to enhance awareness of the rules and regulations to herbal clinics and other traditional healers for enhancing revenue collection and also ensuring the safety of users of the medicinal plants.

IKISIRI KUU

Mitishamba imekuwa mhimili muhimu katika sekta ya afya. Hata hivyo, biashara ya mitishamba nchini Tanzania imekabiliwa na inaendelea kukabiliwa na changamoto nyingi za udhibiti na kitaasisi. Pia, shughuli nyingi za utafiti wa ukuzaji wa mnyororo wa thamani wa mitishamba zimezingatia zaidi mazao ya chakula na usalama wa chakula huku chache zikilenga maendeleo ya mazingira rafiki ya biashara ya mitishamba. Utafiti huu ulichunguza mnyororo wa thamani wa mitishamba katika wilaya ya Liwale, Tanzania ambapo wahusika 100 walihusishwa katika utafiti huu. Utafiti uligundua kuwa kulikuwa na ufahamu hafifu kuhusiana na mbinu bora za kufanya biashara (82.4%) na wengi kutokufuata kanuni na taratibu za uendeshajiwa biiashara hii (83.2%). Utafiti pia uligundua kuwa idadi kubwa ya kliniki za mitishamba na waganga wa jadi walikosa mafunzo ya kuboresha ujuzi wao wa biashara (85%). Zaidi ya hayo, utafiti uligundua kupitia matokeo ya uchanganuzi wa maudhui (Binary logistic regression) kwamba ni watendaji/wakusanyaji watatu tu, wafanyabiashara wa kati (wasafirishaji na wasindikaji), kliniki za mitishamba, na waganga wa jadi ndio walikua wahusika wakuu katika mnyororo wa thamani wa mitishamba. Utafiti ulihitimishwa kwa kutambua kuwa faida ya wahusika inatofautiana, huku kliniki za mitishamba na wafanyabiashara wa jadi wakinufaika zaidi (Tshs 1,500,000) ya wahusika wengine kwenye mnyororo wa thamani. Inaweza kusemwa kuwa biashara ya mitishamba imeathiriwa na mambo kadhaa, ukosefu wa mtaji ukiwa changamoto kuuililoathiri wahusika wengi katika mnyororo wa thamani wa mitishamba. Utafiti unapendekeza serikali iboreshe sera zihusianazo na ubora wa bidhaa kwa kuwekeza katika ujuzi wa kujenga uwezo na ubunifu ili kuifanya biashara kuwa na faida zaidi. Mafunzo katika biashara ya mimea ya dawa yanapendekezwa ili kuwasaidia katika kupunguza gharama za uendeshaji. Mashirika na mamlaka mbalimbali zinazohusika zinapaswa kutoa elimu zaidi ili kuongeza uelewa wa sheria na kanuni kwa kliniki za mitishamba na waganga wengine wa

kienyeji kwa ajili ya kuimarisha ukusanyaji wa mapato na pia kuhakikisha usalama wa watumiaji wa mimea hiyo ya dawa.

DECLARATION

I, **AKIZA VICTOR KAMAGENGE**, do hereby declare to the Senate of Sokoine University of Agriculture that, this thesis is my original work and that it has neither been submitted nor concurrently submitted for a degree award in any other institution

_____ _____

Akiza Victor Kamagenge Date
(MSc Candidate)

The above declaration is confirmed by;

_____ _____

Prof. Abdallah, J. M Date
(Supervisor)

_____ _____

Dr. Nyamoga, G. Z. Date
(Supervisor)

ACKNOWLEDGMENT

First and foremost, I would like to thank the Almighty God for his kindness and love that he granted me the good health, strength, wisdom, and knowledge to accomplish this worry.

I extend my special heartfelt gratitude to my supervisors, Prof. Abdallah and Dr. Nyamoga for their valuable guidance in the whole preparation of this dissertation. Besides their tight schedule, they have been informants through the comments and corrections whenever I called upon them for their advice on matters related to the study all of which have enhanced the quality of the work. God bless you abundantly.

My sincere gratitude is extended to my family; my father, Eng. Victor Mwemezi Kamagenge, and my mother Daria Nestory Masasi, who have been persistently pushing me to the fulfillment of this work, be it moral support, material support, and even financial support throughout my studies; also my beloved sisters, Vivian Victor Mwemezi and Asimwe Victor Kamagenge for encouraging me throughout my academic journey.
I extend my special thanks to my friends, for their unmentionable support to carry this dissertation to its completion, God bless you.

Lastly, I would like to acknowledge all the respondents for accepting to participate in this study, their contribution is highly appreciated. Also, I would like to thank all who made it possible for me to accomplish this dissertation report however it is impossible to list all, I owe you a debt of gratitude.

DEDICATION

This work is dedicated to my family and relatives for their love, constant prayers, and support which helped me to be strong through the entire period of my studies.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS AND ACRONYMS

BTA	Baraza la Tiba Asilia
IHI	Ifakara Health Institute
NIMR	National Institute of Medical Research
NTFP	Non-Timber Forest Products
TBS	Tanzania Bureau of Standards
TFS	Tanzania Forest Services Agency
TMDA	Tanzania Medicines and Medical Devices Authority
TNFP	Tanzania National Forest Policy
TRA	Tanzania Revenue Authority
VCA	Value Chain Analysis
VICOBA	Village Community Bank
VLFR	Village Land Forest Reserve

CHAPTER ONE

1.0 Introduction

1.1 Background information

Medicinal plants, together with many other non-timber forest products, are essential in everyday life. Despite their ancient nature, they are still used for not only curing and healing diseases both for people and other living organisms but also to improve their health and well-being. Also, they are among the ingredients of modern medicine in the pharmaceutical industry providing a wide range of bioactive substances with possible medicinal advantages. In developing countries, especially in Africa, about 80% of the population still uses herbal medicine for the treatment of stomach pain, fever, cold, diarrhea, and influenza (Shanley and Luz, 2003; Sofowora *et al.,* 2013; Hishe *et al.,* 2016; Nkuba and Mohammed, 2017; Sánchez *et al.,* 2020; Srivastava & Singh, 2020).

A significant number of people have recently turned back to traditional medicine, with the global market value of medicinal plants exceeding $100 billion (Sofowora *et al.,* 2013). The resurging has primarily been due to an increase in awareness of biodiversity conservation and sustainable use of natural resources which has paved the way for global discussions on the efficiency of medicinal plants resulting in several studies being carried out globally aiming at verifying their effectiveness and efficacy (Joshi and Joshi, 2014; Sofowora *et al.,* 2013).

During the recent COVID-19 pandemic struggle in Tanzania, medicinal plants and herbal medicine have been the key players in the battle (Mlozi, 2022). From March 2020 to early 2021, different herbal medicines such as NIMRCAF, COVIDOL, and BUPIJI have been used in the battle against the COVID-19 pandemic (Materu, 2021). The Government of Tanzania promoted the modified sauna where traditional herbs were one of the main ingredients in the steaming process. Although there is no research information, this

sauna locally known as *kupiga nyungu* was reported to reduce deaths in the country (Simtowe, 2021; BBC Swahili, 30 January 2021; Njogopa, 2021; Mtakasimba, 2021; Kimaro, 2020).

Modern healthcare practices that incorporate medicinal plants can help with medication discovery, complementary therapies, and the treatment of a variety of illnesses, including those that affect maternal and reproductive health (Materu, 2021). Value chain analysis of medicinal plant products involves examining their cultivation, harvesting, processing, distribution, and utilization (Simtowe, 2021). Understanding the intricacies of this value chain can facilitate the sustainable sourcing of medicinal plants, ensure product quality and safety, and support local communities engaged in their cultivation.

1.2 Problem statement and justification

1.2.1 Problem statement

Tanzania has abundant natural tree species. According to Pereus *et al*. (2019), at least 10% of the estimated 12,000 higher plant species found in Tanzania are used as medicinal plants for treating different human health problems providing a cure that is cheap, readily accessible, and available to the vast rural population of Tanzania.

In their natural environment, medicinal plants tend to have a slow growth rate and space selection (Mbinile *et al.,* 2020). However, they are overharvested with most harvesters ignoring the conservative harvesting methods which protect the plant species and thus impose threats to natural populations and create doubts over their sustainability, especially for the frequently collected medicinal plants such as *Olea capennsis*. Studies show that at least one potential major traditional medicine plant on Earth is lost every two years (Augustino and Gillah, 2005; Pereus *et al.,* 2019; Awotedu *et al.,* 2021).

There are several studies on the medicinal aspects of the plants, however, few explored commercialization challenges of medicinal plants and their commercial potential (Sofowora *et al.,* 2013; Nwafor, 2020; Volenzo & Odiyo, 2020; Nwafor *et al.,* 2021; Abihudi, 2022). This makes it difficult for smallholder producers to trade and make profits (Ndou *et al.,* 2019). This study aims to enhance understanding of value chain actors, business environment, and supportive functions that enhance the performance of medicinal plants value chain business environment and supportive functions that enhance the performance of medicinal plants value chain business in Lindi region.

1.2.3 Justification of the Study

The Lindi region, characterized by its rich biodiversity and indigenous knowledge, is home to an overabundance of medicinal plants that have been traditionally used for therapeutic purposes (Abihudi, 2022). However, despite their potential significance for local healthcare and economic development, there is a lack of comprehensive understanding regarding the value chain of medicinal plants in the Lindi region. The absence of a systematic analysis of the processes involved in the cultivation, harvesting, processing, distribution, and utilization of these plants hinders the development of sustainable practices and equitable benefits for both local communities and wider stakeholders. Hence, this study aims to create an understanding of how the connection between the value chain actors, a conducive business environment, and strong supportive functions can improve the value chain processes in the medicinal plants business in the Lindi region.

The study is in line with the National Forest Policy of Tanzania of 1998 which intends to create an enabling environment for the prospering of the forest industry, employment generation, sector development and also, and promotion of the rural industries development (TNFP, 1998). The study also aligns with sustainable

development goals number 1 and 12 which focus on poverty reduction and responsible consumption and production (UN, 2015).

Findings from this study are important as they may provide knowledge and a better understanding of the actors, their linkages, profitability, and value-addition activities. This will help to enhance the value chain development of medicinal plants and to understand how medicinal plant value chains create efficiencies, increase profits, and how competitiveness is attained from the grassroots harvesters to wholesalers, hence improving the livelihood of all key players and the country at large. The decision-makers can also use the study findings to create good supportive functions for the business.

Understanding the value chain for medicinal plants in the Lindi region will assist the government in planning conservation activities to ensure sustainable management of these plants. In addition, the study findings will provide information for further research on medicinal plants in Tanzania at the same time contribute to the existing literature on medicinal plants. Furthermore, the study findings are useful to Tanzania's efforts to raise the profits of smallholder medicinal plants value chain actors meet the second goal among the 17 Sustainable Development Goals, which is to end hunger and promote sustainable agriculture (UNDP, 2015)**.**

1.3 Research objectives

1.3.1 Overall objective

The overall objective of the study was to analyze the value chain of medicinal plants in the Liwale district.

1.3.2 Specific objectives

The specific objectives of this study were to:

i. Map all actors along the medicinal plants' value chain and profitability

ii. Assess the medicinal plants business environment in the Liwale region
iii. Assess the supportive functions for the trade of medicinal plant products in the Liwale district.
iv. To ascertain challenges facing traditional healers and herbal clinics in the Liwale district.

1.4 Research Questions

The study aimed to answer the following questions

i. Which medicinal plants exist in the Liwale district?
ii. Who are the key actors along the chain, their connections and how do they function?
iii. What are the challenges faced by actors in the value chain?
iv. How are profits distributed along the value chain?

1.5 Conceptual Framework

The study assumed that value chain analysis for medicinal plants and products could be analyzed by looking at three main areas, which are value chain development, supportive functions, and assessing the business environment. The study assumed that value chain development can be influenced by different independent factors such as raw materials, quantity demanded of a product, market (customer of a product), education level, and experience. The supportive functions can be explained in terms of skills, availability of extension services, market information, and financial services such as Village Community Bank (VICOBA) and commercial banks and Research Institutions such as National Institute for Medical Research (NIMR) and Ifakara Health Institute (IHI). The business environment was assessed through influences of policies such as the National Forest Policy of Tanzania of 1998, rules, regulations norms, and customs.

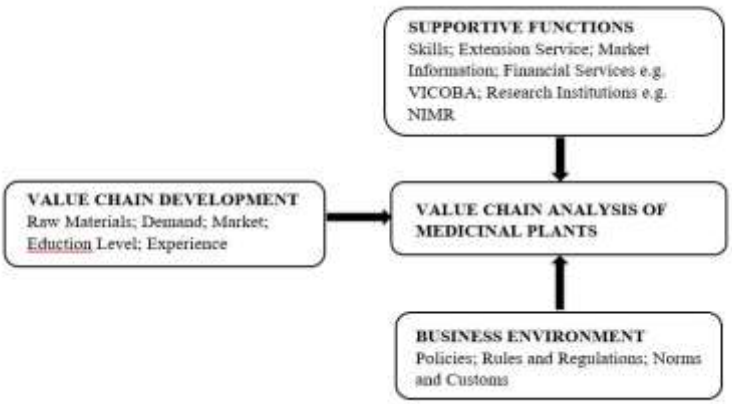

Figure 1.1: Conceptual framework for value chain analysis
Source: Own construct, 2021

1.6 Literature review

1.6.1 Value chain and village land forest reserves in Tanzania

A forest management technique where people who are directly affected by the forest resources have a direct stake in the forest resources has been praised as a practical alternative to forest resources protection. It is believed that a community-based monitoring system could bring large benefits to poverty reduction, livelihood security as well as providing important indirect benefits to the poor in terms of improved local governance and empowerment (Haji *et al.,* 2015). The VLFRs perform the role of protecting the forests while also promoting development for the communities living in and around the forests. These communities have long been using the forest for several uses, but there is a need for the local communities to have assistance for the development of forest value chains. The establishment of these value chains will increase the significance of the protection of forest resources since they also have an economic benefit to the local communities.

1.6.2 Medicinal plants and value chain

In the modern complementary and alternative medicine sector, medicinal plants hold a significant importance. They are not only

essential constituents of NTFPs used in traditional healthcare interventions but also play a central role not only as traditional medicines but also as trade commodities and the livelihood contribution to a large number of communities (Shakya, 2016; Nwafor, 2020).

It is estimated that at least 80% of the global population depends on Medicinal Plants with a market value above $72 billion (Rathore and Mathur, 2018) with 25% of modern medicine being derived from plants tested and used by traditional medicinal practitioners (Awotedu *et al.,* 2021). The acceptance of herbal products by the developed world has to a large extent fueled the current demand for medicinal plants and it is expected to grow even further in terms of herbal supplements and remedies (Noorhosseini *et al.,* 2017; Nwafor, 2020).

In Tanzania however, most of the value addition is limited to cleaning, drying, and sorting of the NTFPs due to the lack of resources and market knowledge and there is a scarcity of information on the potential of the Medicinal Plants' Value Chain and profitability (Tanga *et al.,* 2018). In this light, an analysis of the potential to increase the value of medicinal plant products is needed hence the need to conduct a Value Chain Analysis.

Value Chain Analysis (VCA) is an effective way to determine the interaction between actors in a business. It identifies trends in production, consumption systems, competition, and mechanisms to upgrade activities (value addition) and links producers and consumers in local, national, and global economies. Concerning forest products, value chain development explains how all the activities are done along the chain and how the different actors involved in the passing of forest products from the area of production to the consumer/end-user are interconnected (El Tahir and Vishwanath, 2015).

1.6.3 Value chain actors

With regards to the medicinal plants business, harvesters in the forests, wholesalers, or retailers through to the final user, also, financial services, transport services, and research and development (R&D) facilities and institutions all played a role in the value chain, either as direct or as supporting actors (Hellin and Meijir, 2006; Stein and Barron, 2017). Tanga *et al*. (2018) noted that there is a scarcity of information on the potential of the Medicinal Plants Value Chain and profitability. With the existing value chains, there is the existence of a large number of middlemen and the smallholder producer(collector), who is the primary producer of the medicinal plant usually finds it very difficult to make a profit out of the business (Awotedu *et al.,* 2021). This study will thus focus on the value chain analysis of the medicinal plants in the Lindi Region, mapping the actors and how well the profitability of the medicinal plants business can be achieved.

1.6.4 Business Enabling Environment

Business enabling environment deals with the regulatory framework, governance, and institutional factors such as the level of trust, transparency, and accountability, the eradication of misconduct, control of corruption, and policies and infrastructures at the local, national, and international levels that in one way or another could hinder or facilitate the performance of the value chain. The environment could include norms, customs, laws, regulations, policies, and public infrastructure (Hellin and Meijir, 2006; Piboonrungroj *et al.,* 2017).

Regulations imposed by government agencies such as the Tanzania Medicines and Medical Devices Authority (TMDA) and Tanzania Bureau of Standards (TBS) significantly impact the value chain of medicinal plants (Mpelangwa *et al.,* 2022). Compliance with quality standards, testing, and certification can lead to delays and increased costs. Lack of awareness of these regulations among actors in the value chain can hamper smooth operations and affect the value

delivered to consumers. Also, on compliance and certification, the compliance of actors in the medicinal plant value chain with various regulations and certifications from organizations like the Tanzania Revenue Authority (TRA), Tanzania Forest Services Agency (TFS), and *Baraza la Tiba Asilia* (BTA) is vital (Mbinile *et al.,* 2020). Non-compliance can lead to disruptions in the value chain, affecting reputation, legal implications, and the ability to access certain markets. The complexity of compliance requirements and the lack of awareness mentioned in your statement can hinder value chain efficiency. Also, the business environment, including market access and distribution channels, has a profound impact on the value chain of medicinal plants (Kilima *et al.,* 2020). Access to different markets, both domestic and international, depends on factors such as transportation infrastructure, trade agreements, and market demand. Constraints in these areas can lead to inefficiencies, higher costs, and limited market reach for medicinal plant products. Further, a lack of training and business skills among actors within the medicinal plant value chain can affect their ability to optimize operations at each stage. Training programs focused on cultivation, harvesting, processing, packaging, and marketing can enhance value chain performance. Improved skills can lead to higher product quality, reduced waste, and increased competitiveness. Furthermore, the availability and utilization of financial services, including loans and credit facilities, can impact the value chain analysis of medicinal plants. Adequate funding is essential for investing in infrastructure, technology, and market expansion. Limited access to finance can slow down value chain activities and hinder growth opportunities.

The medicinal plants business in Tanzania faces a significant number of regulatory and institutional challenges such as Regulation of traditional medicine practices and products, Conservation and management, and Limited accessibility to medicinal plant products (Mbinile *et al.,* 2020; Mpelangwa *et al.,* 2022). In Tanzania, a lot of research activities on value chain development have paid a lot of attention to food crops and food security issues and very few on the

development of the medicinal plants' value chain. For the growth of the industry thus, its business environment must be assessed and see if there are modifications to be done all aiming at improving the business.

1.6.5 Supporting functions

Supporting functions play a crucial role in value chain upgrading and they include financial services and cross-cutting services. They comply with several things such as sector-specific input and equipment providers, financial services, business management services, market information access and dissemination, technology suppliers, advisory services, etc (Tadesse and Fayera, 2018). For actors in value chain development to perform efficiently their role it is important to have assistance from business development support providers (FAO, 2014). Nandi *et al*. (2018) noted that not all services could be provided by value chain actors so the supporting function came in handy in-service provision.

Support such as training and financing for research needed implementation, therefore the VCA identified opportunities to improve service access to value chain actors to simultaneously reinforce the supporting functions instead of deflating them. Several people/organizations are not directly involved in the medicinal plants' value chain but their role is very important. An example of supporting actors in the medicinal plant business includes research institutions such as NIMR and the Ifakara Health Institute which are involved in capacity building and provision of information through research information. To understand the value chain of medicinal plants it is important to go into detail looking at the performance of these service providers who enhance the medicinal plant business.

1.6.6 Theoretical framework

1.6.6.1 Institutional theory

This theory explores how formal and informal rules, norms, and institutions shape behaviors and decisions within organizations or industries (Amenta & Ramsey, 2010). In the context of medicinal plant value chains, the Institutional Theory can help uncover how cultural, legal, and regulatory factors influence the practices and dynamics within the value chain. This theory can be valuable in understanding how traditional knowledge, local practices, and legal regulations interact and impact the various stages of the medicinal plant value chain. For instance, it could shed light on how adherence to traditional harvesting methods is influenced by cultural norms and how compliance with regulations affects distribution and commercialization.

1.7 Methodology

1.7.1 Study area

Lindi region was established in 1971 and comprises six districts namely Lindi Rural, Kilwa, Nachingwea, Liwale, Ruangwa, and Lindi Urban. The region has an area of about 66 000 km^2 which is almost 7.56% of Tanzania Mainland's area. The district selected as the study area was Liwale due to the presence of several forests where Village Land Forest Reserves (VLFRs) are frequently conducted including Nyera Kiperere Forest Reserve. The study area has been selected due to the presence of a large Miombo forest (Angai Forest) which consists of plenty of important plant species which are not only good for timber but also used for medicinal purposes.

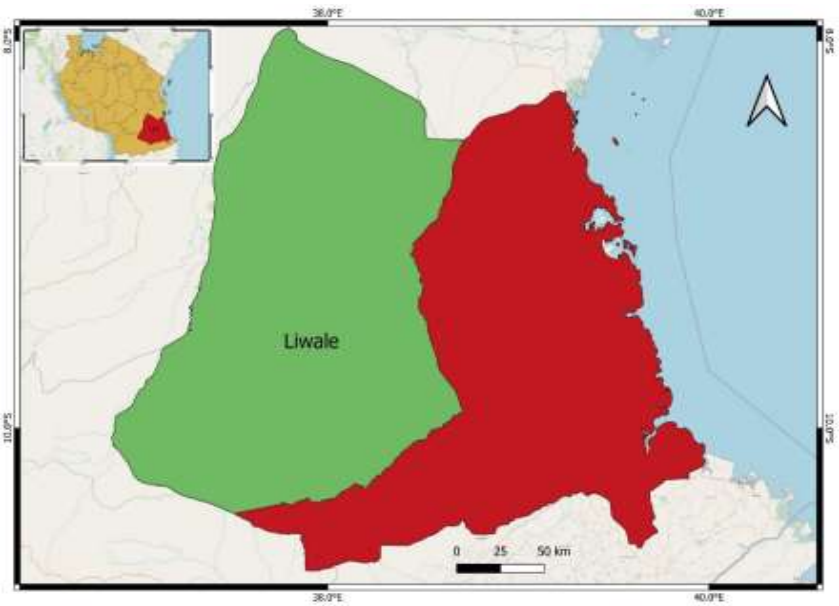

Figure 1.2: A map showing the Lindi Region and the chosen study areas

(Source: Own Construct, 2022)

1.7.2 Research design and sampling procedures

1.7.2.1 Research design

The study employed a cross-sectional research design. The design was chosen because the cross-sectional designs are conducted at one point in time, thus, being cost-effective, and providing a "snapshot" of the population of interest. The design is thus best used to identify patterns, correlations, and incidence rates of a subject of study within a population and the data generated can be used to describe the population of interest and is better suited to establishing cause-and-effect relationships (Cummings, 2017).

1.7.2.2 Sampling frame, unit, and procedure

The study employed both probability and non-probability sampling techniques. The sample respondents were household heads (unit of analysis) where actors from forest industries, Tanzania Forest

Services Agency (TFS), Tanzania Medicines and Medical Devices Authority (TMDA), and research institutions such as NIMR were used as key informants. Purposive sampling was used to select 3 villages (Ngongowele, Likombola, and Ngunja) that are practicing VLFR from the Liwale district. An updated list of registered medicinal plant business traders in the sampled villages was requested from chairpersons and executive officers in the selected villages. Afterward, simple random sampling was employed to get the representative sample, where a 5% sampling intensity was used in each village under study. The sample size determined was 100 respondents from the three villages. McClanahan *et al*. (2005) reported that investigations on socio-economic studies in Sub-Saharan Africa require a sample size of between 80 to 120 household respondents.

1.7.3 Data collection and analysis

Both primary data and secondary data were employed during data collection in the study. Primary data was obtained from the respondents or household members whereas the secondary data was obtained from secondary sources such as scientific reports, journals, and various books.

Objective 1: Mapping actors along the value chain and profitability

Data Collected

Identification of the actors in the medicinal plants' value chain and the roles they play was performed. Also, identification of the medicinal plants, where they are harvested, how they are harvested, the parts harvested, and the diseases they cure will be done. The data was presented in two tables indicating the actors and the roles they play and the medicinal plants mostly harvested.

Data Collection Tools

Focus Group Discussions (FGD) and Questionnaire-based surveys were used in the collection of the data. Focus group discussions consisted of the traditional healers, midwives, and key informants

such as village leaders, the leaders of the village environmental committee, District Natural Resource Officers, and District Agricultural and Extension Officers. Snowball sampling was also used in tracing the actors of the medicinal plants such as the herbalists and the harvesters.

Data Analysis Method

Descriptive statistical analysis was used in the analysis describing the actors, the roles they play, and also, the identification of the medicinal plants, and the diseases they cure. Content Analysis was also used in the analysis to trace the themes. Net Profit Margin analysis was also used to analyze the profitability of the medicinal plants business.

Objective 2: Assess the medicinal plants business environment in Liwale District

Data to be collected

Here, both primary and secondary data on the assessment of the respondents' awareness, compliance, and performance of the Policies, Rules, Regulations, Norms, and Customs and how they influence consumption were collected.

Data Collection Tools

Primary data was collected through Questionnaire-based surveys, Focused Group Discussions with 10 people in each village under study, and Key Informant interviews.

Secondary data was obtained through a review of policies, regulations, and journal articles.

Data Analysis Method

Content analysis was employed in the analysis by tracing the different themes and patterns and looking for relations in the data. Also, Descriptive Analysis was used in the analysis.

Objective 3: Assess the supportive functions of the medicinal plant's products and the medicinal plant trade in general.

Data to be collected

The data on skills, availability of extension services, market information, financial services, and the roles played by research institutes such as NIMR and IHI in creating a good supportive function for the business was collected.

Data Collection Tools

Questionnaire-based Survey and Key Informants Interviews.

Data Analysis Method

Descriptive Analysis and Binary Logistic Regression. A binary logistic regression analysis model was used to determine the influence of supporting functions and the business environment in the Liwale district. The model consisted of dependent and independent variable(s). The dependents and independent variables are presented in the equation below;

$$Y = \beta Xi + \mathcal{E}i$$

where Y = dummy dependent variable (1 = Yes, 0 = otherwise)

β = constant variable,

Xi = explanatory variables that are expected to affect the medicinal plant business, and

ε = Error Term

Differences or associations between variables were considered statistically significant if the p-value was (<0.05).

Table 1.1: Measurement of Variables (Categorization and definitions of explanatory factors)

Variables	Expected outcome	Measurements
Information access	(±)	Measured on nominal
Financial services	(±)	Measured on nominal
Training	(+)	Measured on nominal

Objective 4: To identify the challenges facing the herbal clinics and traditional healers in Liwale district.

Challenges were identified in the study area. Questionnaires were used as the tool for data collection. Also, Descriptive statistical analysis was used as the method of data analysis.

CHAPTER TWO

Manuscript One

Medicinal Plants in Liwale district: An Assessment of the supporting functions and the business environment

[1]Kamagenge, A.V.*, [1]Abdallah, J.M. and [1]Nyamoga G.Z.

[1]Department of Forest and Environmental Economics, Sokoine University of Agriculture,
P.O. Box 3011, Chuo Kikuu, Morogoro, Tanzania

*Corresponding author, Email: akizavictor97@gmail.com

Status: Accepted for Publication

2.1 Abstract

The medicinal plants business in Tanzania has faced and continues to face a significant number of regulatory and institutional challenges. Research activities on medicinal plants' value chain development in Tanzania have paid much attention to food crops and food security issues without focusing on the development of the medicinal plants' business environment. This study aimed to assess the supporting functions of medicinal plants in the Liwale district, in the Lindi Region located in the Southern part of Tanzania. Specifically, the study examined the rules and regulations as well as supportive functions for the medicinal plants business in the Liwale district. Data were collected through questionnaire surveys, key informant interviews, focus group discussions, direct observations, and secondary materials. The information gathered was analyzed both content-wise and statistically using descriptive statistical analysis and binary logistic regression. Results generally revealed that for supportive functions, 79% of the herbal clinics and traditional healers have access to financial services and only 21% do not. On matters of business environment, the findings showed that most of the respondents lack awareness of the rules and regulations governing the medicinal plants business, and for those who are aware, others do not comply with rules and regulations. It is concluded that a lack of awareness of regulations, particularly from TMDA and TBS, presents a challenge for medicinal plants and traditional dealers, impacting their compliance and leading to non-adherence to rules from TRA, TFS, and BTA. Although some awareness exists, compliance remains low. The herbal industry's ties to customers and support functions play a crucial role, while limited training and underutilization of financial services are observed among these actors. From these findings, the study recommends the implementation of policies that prioritize product quality (skills, capacity, and innovation), financial assistance for enterprises (financing), and lower operational costs (taxes, levies).

Keywords: Traditional healer, herbal clinic, rules, regulations, value chain, business environment

2.2 Introduction

In the modern complementary and alternative medicine sector, medicinal plants are held in high regard and they hold significant importance. They are not only essential constituents of Non-Timber Forest Products (NTFPs) used in traditional healthcare interventions, but they also play a central role both as traditional medicines and trade commodities that contribute to the livelihood of a large number of communities (Shakya, 2016; Nwafor, 2020). It is estimated that at least 80% of the global population depends on medicinal plants with the market value of the business over $72 billion (Rathore and Mathur, 2018) and also 25% of modern medicine has been known to be derived from plants tested and used by traditional medicinal practitioners (Awotedu *et al.,* 2021). The acceptance of herbal products by the developed world has to a large extent fueled the current demand for medicinal plants and it is expected to grow even further with time in terms of herbal supplements and remedies (Noorhosseini *et al.,* 2017; Nwafor, 2020). Due to the lucrative nature of the business, it is thus of paramount importance that the business environment be well assessed in terms of both the supporting functions and rules and regulations and address the challenges that might hinder the prospering of the industry.

On the issue of value chain upgrading, supporting functions play a very crucial role. These support services come in different shapes and sizes including but not limited to both financial services and also some cross-cutting services. These support functions comprise several things such as sector-specific input and equipment providers, financial services, business management services, market information access and dissemination, technology suppliers, and also advisory services (Tadesse and Fayera, 2018). It is thus very crucial that, for the actors in the value chain development to perform efficiently, support and assistance from the business development support providers is essential (FAO, 2014). Nandi *et al*. (2018) noted that not all services can be provided by value chain actors so the supporting function comes in handy in-service

provision. Support such as training and financing for research need to be implemented, therefore the VCA needs to identify opportunities to improve service access to value chain actors to simultaneously reinforce the supporting functions rather than deflating them. Several people/organizations are not directly involved in the medicinal plants' value chain but their role is very important. A good example in the medicinal plant business is research institutions such as NIMR and the Ifakara Health Institute which are involved in capacity building and provision of information through research information. In this light, to understand the value chain of medicinal plants, it is thus important to go into detail looking at the performance of these service providers who enhance the medicinal plant business.

Business enabling environment deals with the regulatory framework, governance, and institutional factors such as the level of trust, transparency, and accountability, the eradication of misconduct, control of corruption, and policies and infrastructures at the local, national, and international levels that in one way or another could hinder or facilitate the performance of the value chain. The environment could include norms, customs, laws, regulations, policies, and public infrastructure. (Hellin and Meijir, 2006; Piboonrungroj *et al.,* 2017).

The medicinal plants business in Tanzania faces a significant number of regulatory and institutional challenges. Most research activities on medicinal plants' value chain development paid more attention to food crops and food security. A few of these studies have focused on the development of a friendly business environment for medicinal plants (Nwafor, 2020; Volenzo & Odiyo, 2020; Mpelangwa *et al.,* 2022). Medicinal plants in Tanzania play fundamental roles in the health sector in both rural and urban places. This is because several people rely on these plants for curing various diseases. For the growth of the industry thus, its business environment must be assessed and see if there are modifications to be done that aim at improving the business

(Mpelangwa *et al.,* 2022). This study intended to cover the gap by assessing the business environment specifically looking at the supportive functions and also the rules and regulations governing the sector.

The study intended to inform value chain actors, policy-makers, and industrial development stakeholders, about the rules and regulations guiding the industry and how it has been supported. In addition, the study attempts to contribute to the enhancement of the policies and methods that will help herbal clinics and traditional healers grow faster and prosper in the health sector.

2.3 Theoretical framework

The current study was guided by the theory of value chain governance theory, which is mainly focused on the relationships between buyers, sellers, service providers, and regulatory institutions (Kaplinsky, 2001). Consequently, a greater relationship between the actors in the medicinal plants' value chain will aid the marketing system thus improving of substantial and social well-being of the people. Business environment and supporting functions play a major role in the success of any business industry. Therefore, medicinal plant value chain actors doing their business in a conducive business environment with proper supporting functions are expected to raise their business status thus economic growth of the medicinal plant’s actors.

2.4 Conceptual framework

The conducive environment of the medicinal plant business depended on supporting functions that included training, access to financial services, and information access. Also, the business environment variables such as rules and regulations, Forest Policy, Act, and village and district laws were important in enhancing the medicinal plant business.

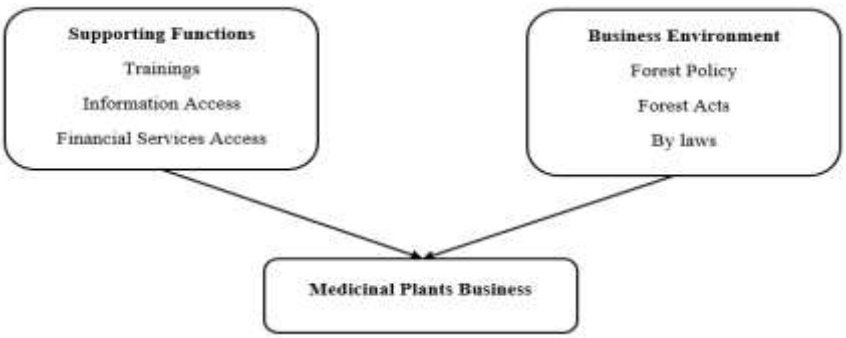

Figure 2.1: Conceptual Framework

2.5 Methodology

2.5.1 Study area

Lindi region was established in 1971 and comprises six districts namely Lindi Rural, Kilwa, Nachingwea, Liwale, Ruangwa, and Lindi Urban. The region has an area of about 66,000 km^2 which is almost 7.56% of Tanzania Mainland's area. The district selected as the study area was Liwale due to the presence of several forests where Village Land Forest Reserves (VLFRs) are frequently conducted including Nyera Kiperere Forest Reserve.

2.5.2 Rationale of study area

The study area was selected due to the presence of a large Miombo forest (Angai forest) which has plenty of important species which are not only good for timber but also used for medicine.

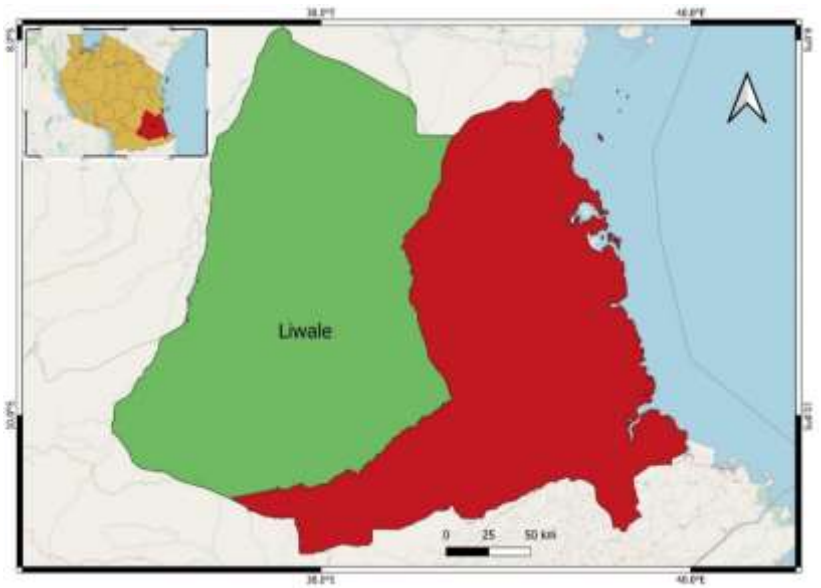

Figure 2.2: Study area map
Source: Own Construct, (2022)

2.6 Research design and sampling procedures

2.6.1 Research design

The study employed a cross-sectional research design. The design was chosen because the cross-sectional designs occur at one point in time, thus, cost-effective, and provide a “snapshot” of the population of interest. The design is thus best used to identify patterns, correlations, and incidence rates of a subject of study within a population and the data generated can be used to describe the population of interest and is better suited to establishing cause-and-effect relationships (Cummings, 2017).

2.6.2 Sampling Frame, Unit, and Procedure

The study employed both probability and non-probability sampling techniques. The sample respondents for the study were actors from forest industries, the Tanzania Forest Services Agency (TFS), the Tanzania Medicines and Medical Devices Authority (TMDA), and research institutions such as NIMR. Purposive sampling was

used to select 3 villages (Ngongowele, Likombola, and Ngunja) which are highly practicing VLFRs from the Liwale district. An updated list of registered medicinal plant business traders in the sampled villages was requested from chairpersons and executive officers in the selected villages. Afterward, simple random sampling was employed to get the representative sample (100 respondents), as a 5% sampling intensity was used in the selected villages.

2.6.3 Data Collection and Analysis

Both primary data and secondary data were collected during data collection in this study. Primary data were obtained from the respondents or household members whereas the secondary data were obtained from secondary sources such as scientific reports, journals, and various books. The study used different data collection techniques (semi-structured questionnaires, FGDs, and Key Informant Interviews to gather information for responding to different specific objectives.

To assess the awareness, compliance, and performance of the Policies, Rules, Regulations, Norms, and Customs and how they influence consumption both primary and secondary data were collected. Primary data were collected through questionnaires, focused group discussions, and key informant interviews. Secondary data were obtained through a review of policies, regulations, and journal articles. For assessment of the supportive functions for the medicinal plants' products and the medicinal plants trading system in general, we collected data on skills, availability of extension services, market information, and financial services such as VICOBA which are key in creating a good supportive function for the business. Data were collected through questionnaire-based surveys and Key Informants Interviews and the information obtained was taken for analysis. Collected data were analyzed using various techniques. Content analysis was employed in tracing the different themes and patterns that appeared and looking for relations in the

data. Descriptive statistic was also used in the analysis. Descriptive statistics using SPSS and content analysis were employed for the analysis and the outputs are presented in figures, charts, and tables. The business environment was assessed through the use of a 5-point Likert scale analysis (5- Highly aware, 4- Aware, 3- Moderate aware, 2- Not aware, and 1- Highly not aware).

A binary logistic regression analysis model was used to determine the influence of supporting functions and the business environment in the Liwale district. The model consisted of dependent and independent variable(s). The dependents and independent variables are presented in the equation below;

$$Y = \beta Xi + \mathcal{E}i$$

where Y = dummy dependent variable (1 = Yes, 0 = otherwise)
β = constant variable,
Xi = explanatory variables that are expected to affect the medicinal plant business, and
ε = Error Term
Differences or associations between variables were considered statistically significant if the p-value was (<0.05).

Table 2.1: Measurement of Variables (Categorization and definitions of explanatory factors)

Variables	Expected outcome	Measurements
Information access	(±)	Measured on nominal
Financial services	(±)	Measured on nominal
Training	(+)	Measured on nominal

2.7 Results and Discussion

2.7.1 Respondents' Characteristics

Different characteristics of respondents were considered in this study. The characteristics included were; sex, age, education level, and experience of the respondent in medicinal plant activities.

Table 2.2: Characteristics of respondents in Liwale district (n=100)

Category	Percentage			
	1*	2*	3*	**Average**
Sex				
Male	92.8	91.2	92.0	92
Female	7.2	8.8	8.0	8
Total	100	100	100	100
Age (years)				
18 – 30	3.5	4.7	6.8	5
31 – 50	38.9	30.4	26.7	32
Above 50	57.6	64.9	66.5	63
Total	100	100	100	100
Education level				
No formal education	49.7	51.5	57.8	53
Primary education	30.5	32.1	33.4	32
Secondary education	16.8	13.4	8.8	13
Diploma education	2.0	1.0	0.0	1
Bachelor degree	1.0	2.0	0.0	1
Total	100	100	100	100
Experience (years)				
0 – 5	2.5	3.6	2.9	3
6 – 20	32.8	33.3	32.9	32
Above 20	64.7	63.1	64.2	64
Total	100	100	100	100

Village ⟶ 1=Ngongowela, 2*=Likombola, 3*=Ngunja

Results in Table 2.1 show that 92% of the male respondents are engaged in the medicinal plant business as compared to only 8% of the females, showing that it is a male-dominated business. This stark gender disparity suggests that men are more actively engaged in various aspects of the medicinal plant industry, such as cultivation, processing, trade, and possibly leadership roles within the value chain. Addressing these disparities could lead to more inclusive and equitable participation in the industry (Pauls & Franz, 2013). Of the people involved in the medicinal plants business, 63% are aged above 50 years old with very few (5%) aged below 30. This age distribution implies that the medicinal plant industry might be facing challenges related to attracting and involving younger generations. According to Wu *et al.* (2014), the lack of younger participants could potentially impact the continuity, innovation, and long-term sustainability of the industry. Findings revealed that most traditional healers (53%) did not attend any formal education and they rely largely on apprenticeship; skills they acquire through learning by doing from the elder dealers. About 32% of the respondents attended primary school education hence having the fundamental reading and writing skills. The pyramid effect continues with only 13% of the whole respondents having attended secondary education and leaving only a small group of diploma and bachelor degree level attainders which is almost 1% each. This educational distribution shows a pyramidal shape, emphasizing how few people in this category have access to higher education. A potential need for efforts that offer educational opportunities and capacity-building to improve the abilities and knowledge of traditional healers is indicated by the reliance on traditional ways of skill acquisition and the prevalence of people without formal schooling.

2.7.2 Assessment of the Medicinal Plants Business Environment

The study examined the business environment regarding rules and regulations from different responsible bodies available

through awareness and compliance. Results showed that most of the respondents were lacking awareness of the rules and regulations for both TMDA (82.4%) and TBS (69.6%). For those who were aware of the rules and regulations, the percentage of the ones complying versus non-complying was 68% versus 32% for TMDA regulations and 86% versus 14% for TBS respectively. These findings indicate that the majority of the medicinal plant dealers were not complying with various existing rules and regulations.

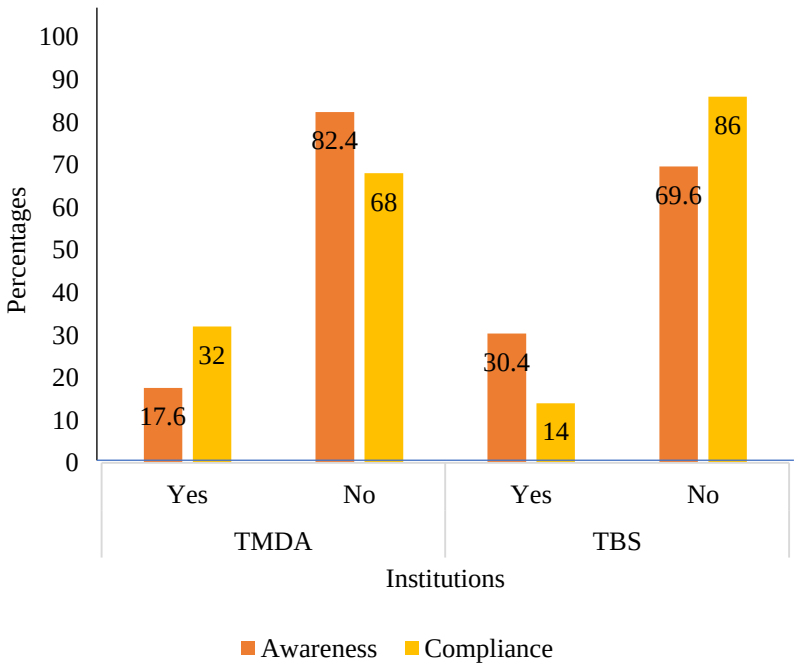

Figure 2.3: Awareness and compliance to TMDA and TBS rules and regulations by herbal clinics and other traditional healers in the study site

Referring to TMDA as a primary organization for the registration of premises, products, and issuance of licenses to businesses trading products related to drugs and medical services, its objective is to

protect the health of consumers against hazards associated with medicines, herbal drugs, and medical devices (Hellin and Meijir, 2006; Piboonrungroj *et al.,* 2017). TBS, on the other hand, has the main responsibility of formulating standards, metrology quality control, testing and calibration, and training (Tadesse and Fayera, 2018). The results revealed that most of the traditional healers use products that are not checked for quality hence no consideration of the safety of the final users (Hellin and Meijir, 2006; Piboonrungroj *et al.,* 2017). As Figure 1 revealed, most of the traditional healers are not aware of the rules and regulations from both TMDA and TBS that govern their business. This lack of awareness could be due to the reason that most of the medicinal plant dealers have offices situated in very remote areas, usually villages where it is quite difficult for the two institutions to reach them for their extension services (Box 1). Most of the awareness programs reach only the clinics and hospitals in rural areas (FAO, 2014). The respondents also claimed that normally, traditional healers are forgotten by government institutions in several programs including awareness-raising and capacity-building workshops. The results also revealed that for those who were aware, only a few of them 32% (TMDA) and 14% (TBS) complied with the available rules and regulations. The main reasons for not complying are lack of capital for the registration (registration fee), the bureaucratic process for the registration process, and the long distance from where their activities are located compared to where TMDA and TBS offices are found. The findings are consistent with those of Shakya (2016). Nwafor (2020) also reported that the bureaucratic process for the registration and other services from most government institutions was among the common reasons for the failure of most institutions.

Box 1: Reason for Low Awareness Level

"Most of the medicinal plant dealers especially the traditional healers are staying in very remote areas, this makes them inaccessible for various capacity building outreach programs"

Key Informant Interview, FORVAC official, February, 2022

The study also tried to look for awareness and compliance with the Tanzania Revenue Authority (TRA), Tanzania Forest Services Agency (TFS), and *Baraza la Tiba Asilia* (BTA), rules and regulations by herbal clinics and other traditional healers in the study site. The results in Table 2.3 show that about 78% of the respondents were aware of the rules and regulations from TFS, 35.6% were aware of the TRA rules and only 6.3 % were aware of the BTA rules. For those who were aware of the rules and regulations, the percentage of compliance was also very low with 32.3%, 16.8%, and 34.7% for TFS, TRA, and BTA respectively.

Table 1.3: Awareness and compliance

Rules and Regulations	TRA		TFS		BTA	
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
Awareness	35	65	77.8	22.2	6.3	93.7
Compliance	16.8	83.2	32.3	67.7	34.7	65.3

Other rules and regulations that guide herbal clinics and other traditional healers are enforced by the Tanzania Forest Services Agency (TFS) through the Forest Policy of 1998, the Forest Act 2002, regulations 2004, and Government Notices (GN), as well as district councils for district by-laws of a particular area and the Tanzania Revenue Authority (TRA) for tax collection and BTA for the registration of the herbal clinics. It was observed during the focus group discussion that, the majority of the respondents seemed to be aware of these rules and regulations from TFS, but among them,

very few complied with them. For the BTA and TRA most of the respondents were not aware of the available rules and regulations, and even the ones that were aware of them, the level of compliance was still very low. One of the respondents said that:

> *"The available rules and regulations are not friendly to our business. They are too costly, a lot of taxes to pay and if you cannot afford the costs, there is a lot of bureaucracy, which ends up being time consuming for us hence just decide to do without complying to the rules and regulations."*
>
> Focus Group Discussion, Ngongowela Village, February 2022

The findings are also supported by Mhede (2012) and Guadagno *et al.* (2019) who found that the reason that herbal clinics and other traditional healers in Tanzania still run their businesses illegally, is due to the reason that they face a lot of difficulties in paying the available taxes and levies. Others said:

> "*We are not aware of the reasons why they collect all those fees and taxes, so we need clarification on the use of collected taxes, fees, and levies.*"
>
> Focus Group Discussion, Ngunja Village, February 2022

This means that they still need to be engaged with awareness programs to familiarize them with the importance of the various fees, taxes, and levies they are required to pay.

2.7.3 Assessment of the supportive functions for medicinal plants business

For the assessment of the supportive function, the study tried to concentrate on training, access to financial services, and the information's reach to the herbal clinics and traditional healers which are useful for their business. Findings for the provision of training and workshops from governmental and private institutions show that 85% of the respondents lack training and only 15% of the population had a chance of attending workshops and training for capacity building.

Figure 2.4: Training availability on capacity building for medicinal plant business in the study site

These findings imply that a large number of herbal clinics and traditional healers lack proper training aimed at improving their skills for them to have a significant impact, not only on the national market but also on the international market. This training could be very important to them as it could help them improve in one or

more areas of their business, for example, the marketing and packaging of their medicine, also, expand their knowledge and even being able to cure other diseases that initially they lacked the means to. These findings are consistent with those of Chenga and Mgaza (2016), who discovered that the majority of traditional healers in Tanzania lack the necessary training to improve their business. Training and extension services are vital for improving the skills and capacity of small enterprises' workers (Guadagno *et al.,* 2019). The small group of those who get the chance to attend workshops and trainings that are aimed at raising awareness and expanding their knowledge are the ones who were found to own the herbal clinics that were found in the small towns in the study area. These trainings were provided by BTA and TMDA for the sole purpose of making them improve their business, register themselves to the responsible authorities, and run their business legally.

Findings in Figure 4 show that 79% of the herbal clinics and traditional healers have access to financial services and only 21% cannot access the service. The financial services accessed mostly were saving money (55%), money transfers (30%), grants (8%), and loans (7%).

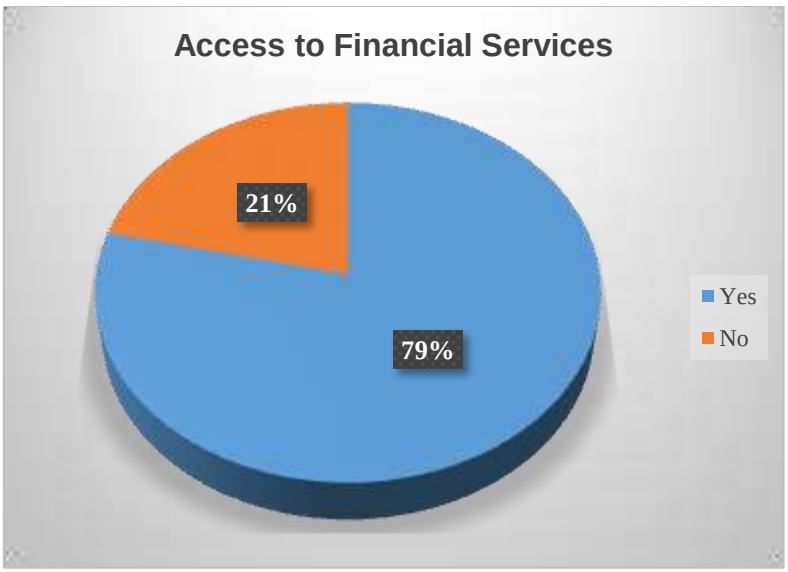

Figure 2.5: Percentages for medicinal service providers who access financial services

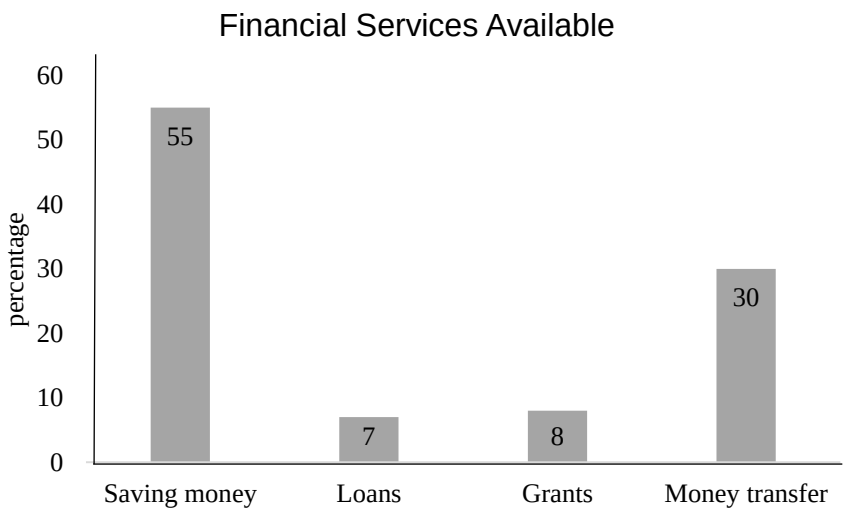

Figure 2.6: Percentage of access to financial services available in the study site

In other places, it has been reported that the industry is primarily dominated by herbal clinics and traditional healers (Guadagno *et al.,* 2019). These, however, are among the population that largely use only mobile money services such as M-PESA, Airtel Money, Tigo Pesa, and HaloPesa. They rarely have Accounted in the Banks and hence do not use such services making it difficult for them to access loans. These mobile money services however are primarily used only for saving money. Also, most of the rural areas have not been reached extensively by banks yet with few exceptions of CRDB and NMB banks in the district headquarters, hence their only option remained to use mobile money services. Mpeku and Urassa (2022), Guadagno *et al*. (2019), and Eskola, (2005) reported that many rural areas of Tanzania have not yet been reached by bank services.

The issue of loans has become challenging with a lot of bureaucracy and unattainable conditions for most people when they need to take loans hence dissatisfying them from taking loans with only a few of them being able to (Mhede, 2012). During focus group discussion, some respondents mentioned that:

> "*We lack awareness of the banking services and we would wish the bankers could rech out to us in our areas and offer us knowledge about the banking systems and services offered.*"

Findings on access to information revealed that 67% of the herbal clinics and traditional healers have hold of useful information and only 33% of them do not (Figure 2.6). The type of information accessed mostly was about customers (60%), raw materials (16%), financial support (9%), regulations (7), and training (7%).

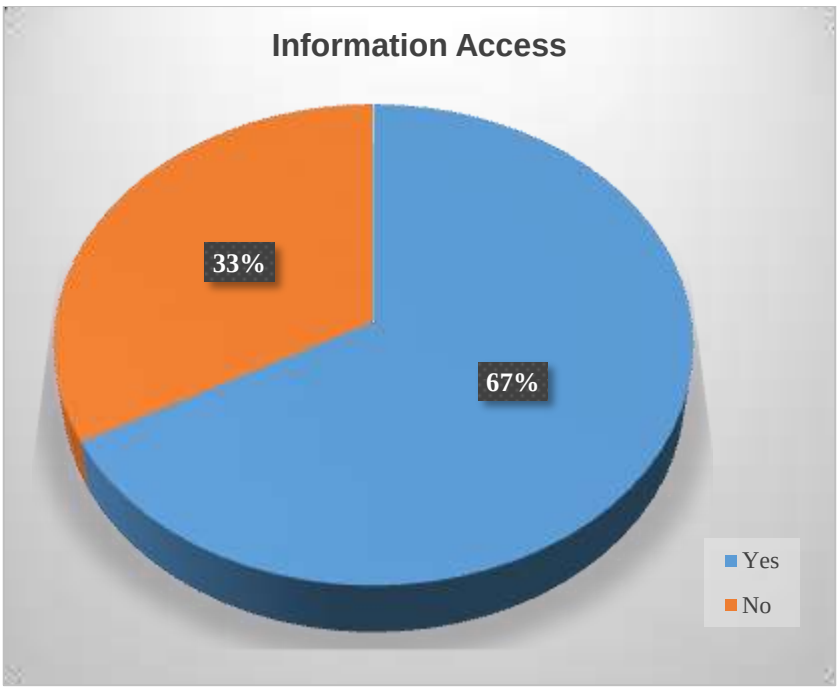

Figure 2.7: Percentages for herbal clinics and other traditional healers in the study site getting useful information for the business

Most of the herbal clinics and traditional healers therefore have access to useful information which are crucial for their business to prosperity. Further, results show that 60% of the information received by most of the herbal clinics and traditional healers is about customers, followed by 16% on raw materials and only 7% of the information on training (Figure 2.7). The more access to information regarding customers compared to other items could be because customers are key persons in any business. The respondents relied largely on word of mouth after good customer service since if one sick person attends the clinic and gets good treatment plus relief, he/she will tell another patient with a similar problem to attend to the same traditional healer.

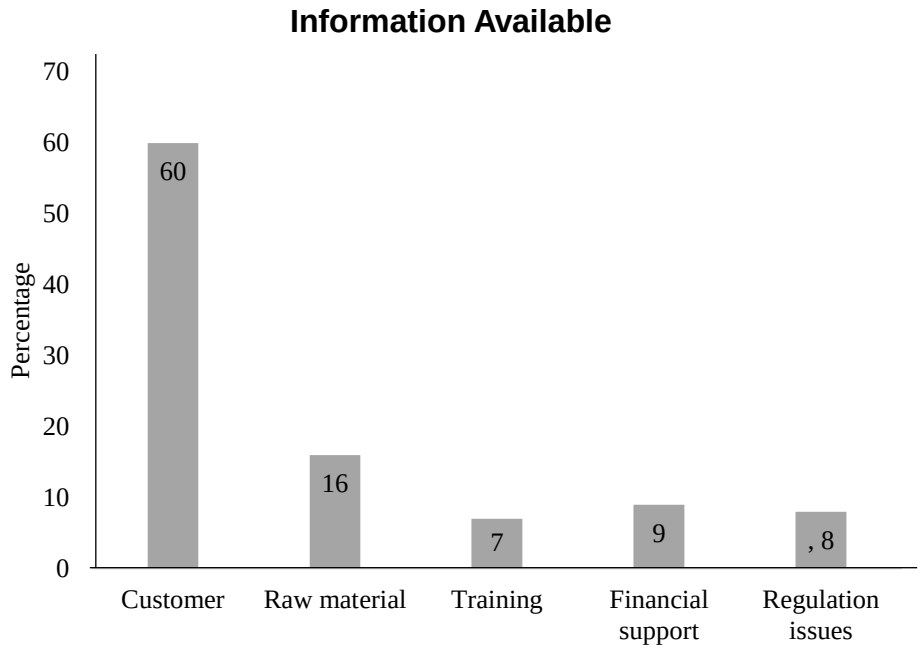

Figure 2.8: Percentage of access to types of information available in the study site

For the issue of raw materials, the results show that most of the herbal clinics and traditional healers collect their raw materials from within and outside the district and for the ingredients that cannot be found in their vicinity, even out of their home region. On the other hand, these herbal clinics and traditional healers also have constant suppliers of raw materials. Therefore, they ensure that they maintain communication with all the suppliers to have a constant supply in the clinics. These suppliers also have a network of other common customers adjacent to their area whom they keep in touch with (Chenga and Mgaza, 2016).

2.7.4 Influence of supporting functions on medicinal plants business

A binary logistic regression model was used to define the supporting functions that influence the medicinal plant business. Training, financial services, and information access were the variables included in the model. The model summary shows that the independent variables fit well in the regression model (R^2= 0.929). The Cox and Snell R Square and Nagelkerke R Square of 0.792 and 0.929 respectively reveal the correlation between supporting functions and the influence they have in the medicinal plant business.

The results (Table 2.3) show that some explanatory variables such as training, financial services, and information access significantly influence medicinal plant business in the Liwale district as they had a p-value less than 0.05. This is consistent with the research reported by Harbi *et al*. (2018) which highlights the growing significance of business management techniques in enhancing the business of different forest products.

Table 2.3: Influence of supporting functions on the medicinal plants business in the Liwale district

Variables	B	Std. Error	Sign.	Exp(B)
Information Access	.197	.074	.000	1.020
Financial Services	2.475	.053	.021	.144
Training	1.872	.538	0.013	6.336

Table 2.3 shows that information access has a significant impact on the expansion of the medicinal plant industry ($p < 0.05$). The findings demonstrate that, at an odds ratio of 1.02, an increase in information availability resulted in an improvement in the medicinal plant industry, including acquiring enduring clients. The results suggest

that for a value chain actor involved with medicinal plants to obtain a customer, they must be provided with information about the job. The results are consistent with a study by Gereffi and Fernandez-Stark (2016) that found that most items' businesses depend heavily on having access to information.

Additionally, Table 2.3 demonstrates that the financial services industry has an impact on the market for medicinal plants ($p < 0.05$). According to the findings, there is an odds ratio of 0.144 between an increase in financial service and an increase in knowledge of medicinal plants. This suggests that individuals who have access to financial services, such as loans and grants, have a competitive edge over those who do not in the medicinal plant industry. The study findings are consistent with the findings by Mpeku and Urassa (2022) who reported that the presence of financial services increases the economy of a business.

Trainings have a considerable impact on the medicinal plant industry as well ($p<0.05$). The findings indicate that the market for medicinal plants grows at an odd ratio of 6.336. This suggests that participants in training programs for medicinal plant actors provided by various development projects like FORVAC and MCDI in the Liwale district acquire critical skills for managing the medicinal plant business in the Liwale district. The findings support a study by Pramono and Prahiawan (2022) who found that training had a significant influence on the medicinal plant industry.

2.8 Conclusions and Recommendations

Lack of awareness of the rules and regulations for both TMDA and TBS seems a problem for most medicinal plants and traditional dealers. As a result of the lack of awareness, compliance with rules and regulations is also challenging. The majority of the herbal clinics, medicinal plants, and traditional dealers do not comply with the Tanzania Revenue Authority (TRA), Tanzania Forest Services Agency (TFS), and *Baraza la Tiba Asilia* (BTA) rules and

regulations. However, most of these actors were aware of the rules and regulations from TFS, and a few from TRA and BTA 6.3%. Despite the awareness of the rules and regulations few of them complied. A large number of herbal clinics and traditional healers lacked training for improving their business skills. Although most herbal clinics and traditional healers have access to financial services few tend to use such services. Herbal clinics, medicinal plants, and traditional dealers have a very strong tie and relationships with their customers making it difficult to lose them. Their customers are potential marketing tools to others needing similar services. Moreover, the supporting functions (training, access to financial services, and information access) have a significant influence on the medicinal plants business.

It is therefore recommended that; the government should implement policies that prioritize the products' quality by investing in capacity building in skills and innovations to make the business more lucrative. Financial institutions should also work closely with herbal clinics and medicinal plant dealers to assist them financially. Training in the medicinal plants business is recommended to assist them in lowering operational costs. Different responsible organizations and authorities should provide more education to enhance awareness of the rules and regulations to herbal clinics and other traditional healers for enhancing revenue collection and also ensuring the safety of users of the medicinal plants.

References

Amenta, E., & Ramsey, K. M. (2010). Institutional theory. *Handbook of Politics: State and Society in Global Perspective.* Springer, New York. pp.15-39.

Awotedu, B. F., Akala, A. O., Omolola, T. O., Owoeye, E. A., Olaoti-Laaro, S. O. and Ogunsiji, A. O. (2021). Some underutilized indigenous timber trees with high medicinal values: Its challenges and prospects. *World Journal of Advanced Research and Reviews* 10(02): 161–168.

Chenga, J. and Mgaza, A. (2016). *Timber Trade Dynamics: A Preliminary Review of Tanzania's Domestic Trade in Timber.* TRAFFIC, Dar es Salaam, Tanzania. 29pp.

Cummings, C. L. (2017). Cross-sectional design. In: *The SAGE Encyclopedia of Communication Research Methods.* (Edited by Allen, M.) SAGE Publications, Inc., Thousand Oaks. pp. 315 – 317.

Eskola, E. (2005). *Agricultural Marketing and Supply Chain Management in Tanzania*. Working Paper Series No. 16. University of Sussex, Department of Economics, Brighton, United Kingdom. 37pp.

FAO (2014). *Developing Sustainable Food Value Chains: Guiding Principles.* Food and Agriculture Organization of the United Nations, Rome. 11pp.

Gereffi, G. and Fernandez-Stark, K. (2016). *Global Value Chain Analysis: A Primer*. Social Science Research Institute. Duke University. 34pp.

Guadagno, F., Wangwe, S. and Delera, M. (2019). Horticulture, and wood and furniture industries in Tanzania, performance, challenges and potential policy approaches. *Journal of International Growth Centre* 40433: 1 – 50.

Harbi, J., Erbaugh, J. T., Sidiq, M., Haasler, B.and Nurrochmat, D. R. (2018). Making a bridge between livelihoods and forest conservation: Lessons from non-timber forest products'

utilization in South Sumatra, Indonesia. *Forest Policy and Economics* 94: 1-10.

Hellin, J. and Meijer, M. (2006). *Guidelines for Value Chain Analysis.* Food and Agriculture Organization, Rome Italy. 24pp.

Kaplinsky, R., & Readman, J. (2001). Integrating SMEs in global value chains: towards partnership for development. Unido. Vienna

Kilima, B. M., Rashid, S. A., Lupindu, A. M., Tarimo, J. B., & Laizer, M. K. (2020). Situational analysis of the Tanzanian food safety control system.

Mbinile, S. D., Munishi, L. K., Ngondya, I. B., & Ndakidemi, P. A. (2020). Conservation and management challenges facing a medicinal plant Zanthoxylum chalybeum in the Simanjiro area, Northern Tanzania. *Sustainability* 12(10): 41 - 40.

Mhede, E. P. (2012). *The Growth of Micro and Small, Cluster-Based Furniture Manufacturing Firms and Their Implications for Poverty Reduction in Tanzania*. Research on Poverty Alleviation, Dar es Salaam, Tanzania. 52pp.

Mlozi, S. H. (2022). The role of natural products from medicinal plants against COVID-19: traditional medicine practice in Tanzania. *Heliyon 8*(6):

Mpeku, F. N. and Urassa, J. K. (2022). Access to bank loans and smallholder farmers' paddy productivity; A Case of Mvomero District, Tanzania. *International Journal of Science and Business* 15(1): 65 – 78.

Mpelangwa, E. M., Makindara, J. R., Sorensen, O. J., Bengesi, K. M. K., & Mabiki, F. P. (2022). Effect of changes in business environments on traded medicinal plants products in Tanzania: An explorative study. *Heliyon 8*(9):

Nandi, R., Gowdru, N. V. and Boklemann, W. (2018). Value chain up-gradation through collective action: a step towards inclusive growth. *Indian Journal of Economics and Development* 6(9): 1 – 13.

Noorhosseini, S. A., Fallahi, E., Damalas, C. A. and Allahyari, M. S. (2017). Factors affecting the demand for medicinal plants:

implications for rural development in Rasht, Iran. *Land Use Policy* 68: 316 – 325.

Nwachukwu, I. (2008). Planning and evaluation of agricultural and rural development projects. *Umuahia: Lamb House Publishers*.

Nwafor, C. U (2020). Cultivation of medicinal plants by smallholder farmers in South Africa: constraints to commercialization. [10.20944/preprints202012.0761.v1] site was visited on 20/ 10/2021.

Nwafor, I., Nwafor, C., & Manduna, I. (2021). Constraints to cultivation of medicinal plants by smallholder farmers in South Africa. *Horticulturae 7*(12): 531.

Pauls, T., & Franz, M. (2013). Trading in the dark–The medicinal plants' production network in U Uttarakhand. *Singapore Journal of Tropical Geography 34*(2): 229-243.

Piboonrungroj, P., Williams, S. and Simtupang, T. (2017). The emergency of Value chain thinking. *International Journal of Value Chain Management* 10(2): 3 – 19.

Pramono, A. C. and Prahiawan, W. (2022). Effect of training on employee performance with competence and commitment as intervening. *Aptisi Transactions on Management* 6(2): 142 – 150.

Rathore R. and Mathur A. (2018). Entrepreneurship development in medicinal and aromatic plants: Prospects and challenges. *International Journal of Economic Plants* 5(1): 32 – 35.

Shakya, A. K. (2016). Medicinal Plants: Future source of new drugs. *International Journal of Herbal Medicine* 4(4): 59 – 64.

Sofowora, A., Ogunbodede, E., & Onayade, A. (2013). The role and place of medicinal plants in the strategies for disease prevention. *African Journal of Traditional Complementary And Alternative Medicines 10*(5): 210-229.

Srivastava, S. K., & Singh, N. K. (2020). General overview of medicinal and aromatic plants: A. *Journal of Medicinal Plants 8*(5): 91-93.

Tadesse, B., & Bakala, F. (2018). Value chain analysis of potato: the

case of Sheka Zone, Southwest Ethiopia. *International Journal of Horticulture and Agriculture 3*(1):1-10.

Tanzania National Forest Policy (1998). Retrieved August 11, 2023, from [http://www.fao.org/3/ca5921en/ca5921en.pdf]site visited on11/8/2023

Udemezue, J. C. and Osegbue, E. G. (2018). Theories and Models of Agricultural Development. *Annals of Re* Abihudi, S. (2022). Ethnobotanical use, threat status and optimal environmental germination conditions for conservation of aloe species in Tanzania.

United Nations. (2015). Transforming Our World: The 2030 agenda for sustainable development. resolution adopted by the General Assembly. *Views and Research* 1(15): 134 – 137

Volenzo, T., & Odiyo, J. (2020). Integrating endemic medicinal plants into the global value chains: The ecological degradation challenges and opportunities. *Heliyon 6*(9):

Wu, G., Fanzo, J., Miller, D. D., Pingali, P., Post, M., Steiner, J. L., & Thalacker-Mercer, A. E. (2014). Production and supply of high-quality food protein for human consumption: sustainability, challenges, and innovations. *Annals of the New York Academy of Sciences* 1321(1):1-19.

CHAPTER THREE

Manuscript Two

Medicinal Plants Value Chains in Liwale District, Lindi, Tanzania. Who Is Involved and Who Benefits?

[1]Kamagenge, A.V.*, [1]Abdallah, J.M. and [1]Nyamoga G.Z.

[1]Department of Forest and Environmental Economics, Sokoine University of Agriculture,
P.O. Box 3011, Chuo Kikuu, Morogoro, Tanzania

*Corresponding author, Email: akizavictor97@gmail.com

Status: Preparation to submit

3.1 Abstract

Due to Africa's pluralistic healthcare system, which offers both conventional and alternative medicine, access to medicinal plant products is crucial. The study on which the paper is based was carried out in Liwale District, Lindi Region. Specifically, it aimed at determining the actors of the medicinal plant value chain, their income distribution, and identifying challenges facing the medicinal plant value chain actors along the chain. To address the aims, a cross-sectional research design was adopted whereby data was collected only once. Purposive sampling was used to obtain 100 respondents from the study area. Data was collected using a structured questionnaire, and focused group discussions. Collected primary data collected was analyzed using an IBM SPSS, whereby descriptive statistics such as frequencies and percentages were determined. Content analysis was used to analyze qualitative data. According to the study's findings, only three actors/collectors, middlemen (transporters and processors), herbal clinics, and traditional healers were found to exist along the value chain of medicinal plants. Additionally, it is concluded that the actors' profits differ, with herbal clinics and traditional dealers benefiting (1,500,000 Tshs per annum) more than other actors along the value chain. Finally, it can be said that the medicinal plant industry has been impacted by several factors, with the capital issue being the most frequent among the respondents, indicating that it was the main issue affecting the majority of actors in the value chain for medicinal plants. The government through the village governments should conduct more education training to increase awareness of the local people on the advantages of participating in the medicinal plants business.

Keywords: Medicinal plants, Value chains, Actors,
Profitability Analysis

3.2 Introduction

The World Health Organization (WHO) regards the use of medicinal plants as one of the primary approaches to addressing the issues of expanding access to healthcare services in the twenty-first century (WHO, 2019). Due to the lack of incentives for the development of new medications and vaccines for small markets, traditional medicine, particularly the use of medicinal plants, plays a vital role in the treatment of neglected diseases (Andrade-Cetto, 2005). One of the pillars that can lessen the mentioned health concern is making therapeutic plant products available through trade. The market for medicinal plants is believed to be worth more than $72 billion, and at least 80% of the world's population is thought to rely on them (Rathore and Mathur, 2018).

Tanzania is home to many different types of trees, the majority of which can be located and harvested in the wild. Pereus *et al*. (2019) estimate that at least 10% of Tanzania's estimated 12,000 higher plant species are utilized medicinally to treat various human health issues, offering a treatment option that is affordable, easily available, and available to Tanzania's sizable rural population. In their natural environment, medicinal plants tend to have a slow growth rate and space selection (Mbinile *et al.,* 2020). However, they are overharvested with most harvesters ignoring the conservative harvesting methods which protect the plant species and thus impose threats to natural populations and create doubts over their sustainability, especially for the frequently collected medicinal plants. Studies show that at least one potential major traditional medicine plant on Earth is lost every two years (Augustino and Gillah, 2005; Pereus *et al.,* 2019; Awotedu *et al.,* 2021).

Several studies have been done on the medicinal aspects of the plants however, few studies have been done to explore the challenges of medicinal plant commercialization among smallholder producers and their commercialization potential (Nwafor, 2020) making it very difficult for smallholder producers to enter the trade

and make a profit out of it (Ndou *et al*, 2019). Hence, this study aimed at creating an understanding of who is involved and who benefits in the medicinal plants' value chain in the Lindi region.

Findings from this study are important as they may provide knowledge and a better understanding of the actors, their linkages, profitability, and value-addition activities. This helps to enhance the value chain development of medicinal plants and to understand how medicinal plant value chains create efficiencies, increase profits, and how competitiveness is attained from the grassroots harvesters to wholesalers, hence improving the livelihood of all key players and the country at large. Furthermore, the study findings are useful to Tanzania's efforts to raise the profits of smallholder medicinal plants value chain actors to meet the second goal among the 17 Sustainable Development Goals, which is to end hunger and promote sustainable agriculture (UNDP, 2015)**.**

Understanding the value chain for medicinal plants in the Lindi region assists the government in planning conservation activities to ensure sustainable management of these plants. In addition, the study findings provide information for further research on medicinal plants in Tanzania at the same time contribute to the existing literature on medicinal plants.

3.3 Theoretical Framework

Based on the theme of the current study, the study concentrates on the "Porter Value Chain Theory". The eventual effect of this value chain is that products pass through a series of activities until they reach the consumer of the desired product (Porter, 1985). In the current study, the theory is based on value added to medicinal plants from the harvested area to the consumer and profitability of every value chain actor of medicinal plants. When a product passes through different actors, value chain interventions are done at every stage to add value to the products so that they can be sold at a more profitable value. Therefore, a firm has to perform some activities to

add value before passing to the next step (Teece, 2018). Generally, the theory postulates that the passage of the products through a series of actors from product designing, provision of raw materials, manufacturing, distribution to the final customers, and consumer support services related to the product consumption.

3.4 Conceptual Framework

The study assumed that value chain analysis for medicinal plants and products can be analyzed by looking at the three main areas, which are value chain participants involved in the medicinal plants (actors), the income distribution among the actors, and the challenges the participants face in medicinal plants value chain. The study assumed that participants can be experiencing different challenges which leads them to accrue different profits along the medicinal plants value chain.

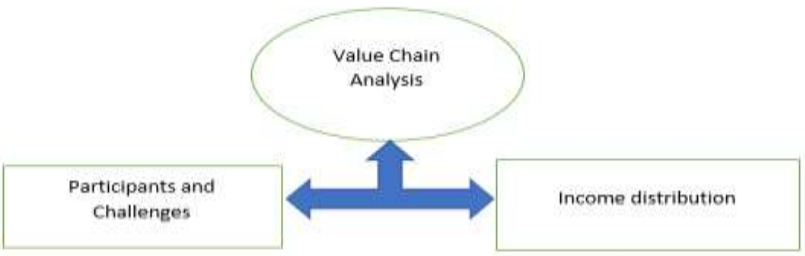

Figure 3.1: Conceptual Framework

3.5 Research Methodology

3.5.1 Description of Study Area

Lindi region was established in 1971 and comprises six districts namely Lindi Rural, Kilwa, Nachingwea, Liwale, Ruangwa, and Lindi Urban. The region has an area of about 66,000 km2 which is almost 7.56% of Tanzania Mainland's area. The district selected as the study area was Liwale due to the presence of several forests where Village Land Forest Reserves (VLFRs) are frequently conducted

including Nyera Kiperere Forest Reserve. The study area has been selected due to the presence of a large Miombo forest (Angai forest) which has plenty of important species which are not only good for timber but also used for medicine.

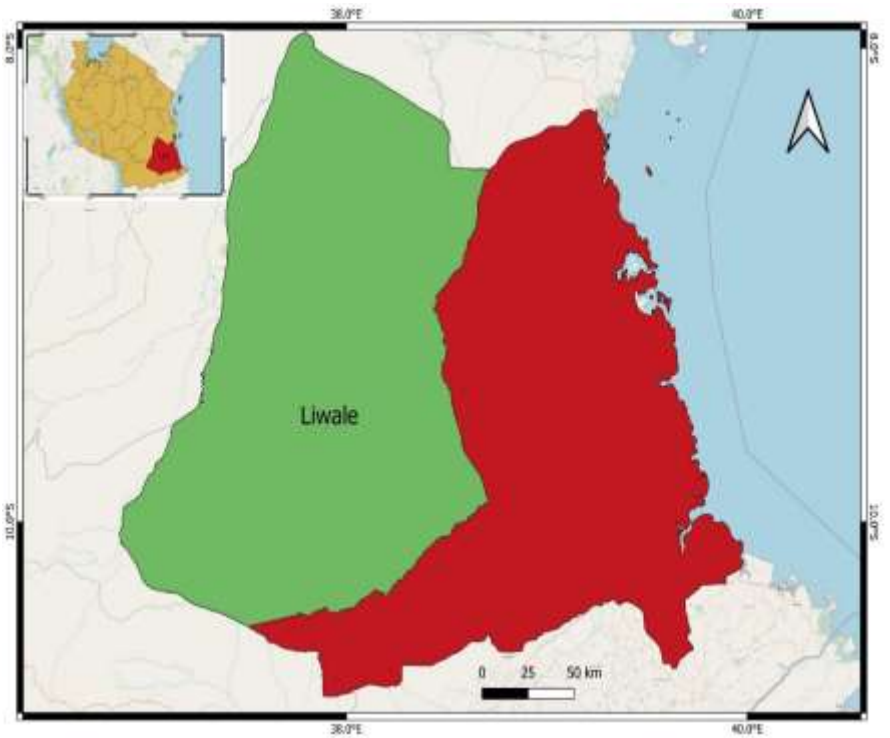

Figure 3.2: Study Area Map
Source: Own Construct (2022)

3.5.2 Research approach and design

The study employed the use of a cross-sectional research design. This design has been chosen because the cross-sectional designs are conducted at one point in time, thus, being cost-effective, and providing a “snapshot” of the population of interest.

3.5.3 Sampling frame, unit, and procedures

The study employed both probability and non-probability sampling techniques. The sample respondents for the study were household' heads in the study villages. Also, the Tanzania Forest Services Agency (TFS), Tanzania Medicines and Medical Devices Authority (TMDA), and research institutions such as NIMR were used as key informants. Purposive sampling was used to select 3 villages (Ngongowele, Ngunja, and Likombe) that are practicing VLFR from the Liwale district. An updated list of registered medicinal plant business traders in the sampled villages was requested from chairpersons and executive officers in the selected villages. Afterward, simple random sampling was employed to get the representative sample.

3.5.4 Data collection and analysis

Primary data was collected from respondents using a pre-structured questionnaire with both open and closed-ended questions. Further, 5 focus group discussions (FGDs) were conducted, the FGDs involved 10 participants comprising elders, community leaders, student representatives, women, and youth leaders. A total of 100 participants were involved in the study. Content analysis was employed in tracing the different themes and patterns that appeared and looking for relations in the data. Descriptive statistic was also used in the analysis. Descriptive statistics using SPSS and content analysis were employed for the analysis.

3.6 Findings and Discussions

3.6.1 Respondents' Characteristics

Different characteristics of respondents were considered in this study. The characteristics included were; sex, age, education level, and experience of the respondent in medicinal plant activities.

Table 3.1: Characteristics of respondents in Liwale district (n= 100)

Category	Percentage			
	1*	2*	3*	**Average**
Sex				
Male	92.8	91.2	92.0	92
Female	7.2	8.8	8.0	8
Total	100	100	100	100
Age (years)				
18 – 30	3.5	4.7	6.8	5
31 – 50	38.9	30.4	26.7	32
Above 50	57.6	64.9	66.5	63
Total	100	100	100	100
Education level				
No formal education	49.7	51.5	57.8	53
Primary education	30.5	32.1	33.4	32
Secondary education	16.8	13.4	8.8	13
Diploma education	2.0	1.0	0.0	1
Bachelor degree	1.0	2.0	0.0	1
Total	100	100	100	100
Experience (years)				
0 – 5	2.5	3.6	2.9	3
6 – 20	32.8	33.3	32.9	32
Above 20	64.7	63.1	64.2	64
Total	100	100	100	100

Village ⟶ 1=Ngongowela, 2*=Likombola, 3*=Ngunja

Results in Table 3.1 show that 92% of the male respondents are engaged in the medicinal plant business as compared to only 8% of the females, showing that it is a male-dominated business. Of the people involved in the medicinal plants business, 63% are aged above 50 years old with very few (5%) aged below 30. Findings

revealed that most traditional healers (53%) did not attend any formal education and they rely largely on apprenticeship; skills they acquire through learning by doing from the elder dealers. About 32% of the respondents attended primary school education hence having fundamental reading and writing skills. The pyramid effect continues with only 13% of the whole respondents having attended secondary education and leaving only a small group of diploma and bachelor degree level attainders which is almost 1% each.

3.6.2 Mapping actors along the medicinal plants' value chain

This study recognized three major value chain channels in the Liwale district. The first channel consists of the individual collector to the traditional healers direct to the consumer. The second was from individual collectors to informal traders and then to consumers. The last was a group of harvesters to the transporter and processors to the herbal clinics. These channels of the medicinal plants' value chain are shown in Figure 3.32.

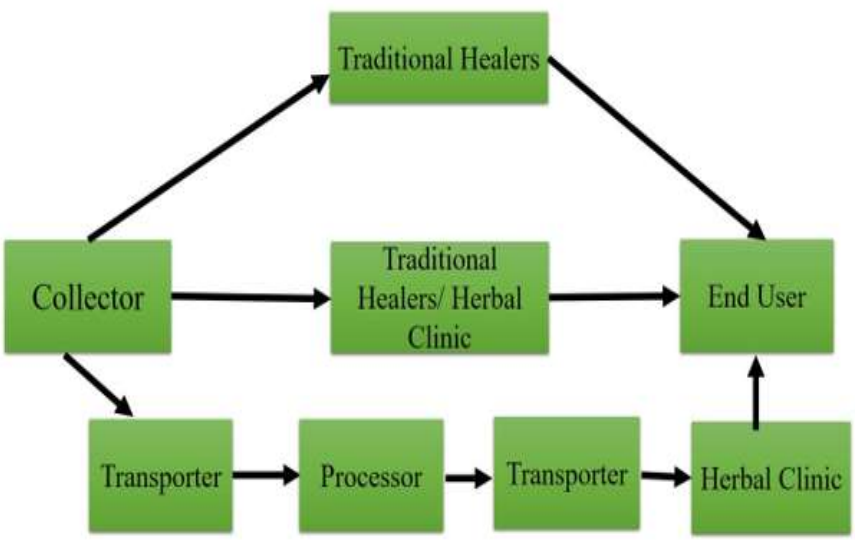

Figure 3.3: Chain of actors for medical plant value chain

The finding shows that there is more than one value chain channel for medicinal plants. The result implies that the process of producing and distributing medicinal plants involves multiple distinct pathways or channels within the value chain. This suggests that there are different routes or methods by which medicinal plants are sourced, processed, and delivered to consumers. These various value chain channels could be driven by factors such as different market segments, distribution networks, geographic regions, or variations in production and processing methods. Understanding these multiple value chain channels is important for comprehensively analyzing the dynamics of the medicinal plant industry and tailoring strategies to effectively manage and optimize each channel for maximum value creation. Mchopa *et al*. (2021) observed that a product might have one or more channels in the forest products value chain. Therefore, this confines the results of the study of these medicinal plants in the Liwale district. Most information on the participation concerns the harvesters/collectors, where men are reportedly to participate more than women in the medicinal plants business. The results mirror the study by Sunderland *et al*. (2014) which found that both men and women participate in collection and processing for trade. Differences in male and female participation in harvesting are influenced by the physical nature of the task, household responsibilities, and distance to the forests where medicinal plants are found.

3.6.3 Profitability analysis of medicinal plants

According to the study findings, several medicinal plants are of high importance in the study area. The most important medicinal plants used were Mneke (*Pteleopsis myrtifolia*), Msolo (*Pseudolachnostlis maprounaifolia*), Bwala bwaya (*Jacquemontia tamnifolia*), Kalijenge (*Psorospermum febrifugum*) and Kijoge (*Ormocarpum kirkii*). The argument above conforms to what was said by one of the key informants:

'We have several medicinal plants which are used by several people in this area. But there are few which are of most important than others and these include Mneke, Msolo, Bwala bwaya, Kalijenge, and Kijoge. The leaves, roots, and bars of different medicinal plants are usually used in the treatment of different diseases such as stomach aches, diarrhea, and rheumatism.''

Table 3.2 shows how the various players in the trade of medicinal plants split the profits from that trade. Herbal clinics/traditional healers take up the largest portion of the pie and receive the largest share of the profits from all sales of medicinal plants, while middlemen (processors, transporters) follow closely behind and receive the second-highest share of the profits from medicinal plant trade throughout the entire list of medicinal plants under consideration. The collectors in the value chain of medicinal plants are the least fortunate. The distribution of profits within the medicinal plant value chain is shaped by a complex interplay of factors. Herbal clinics and traditional healers occupy the largest portion of the profit share, likely attributed to their role in value addition through processing and their specialized knowledge of medicinal plants. Their direct interactions with consumers and cultural significance further justify their higher profit share. Middlemen, including processors and transporters, closely follow in profit share due to their pivotal role in connecting producers to broader markets, their efficient distribution networks, and their logistical expertise. The profit distribution reflects a combination of factors, including expertise, consumer trust, supply and demand dynamics, market structure, and the distinct contributions made by different stakeholders at various stages of the value chain. It has been determined that there are problems with how income is distributed, and an effort has been made to ascertain the most likely causes. Unregistered and untrained farmers may be one of these

causes. The uneven distribution of resources is caused by a lack of education, a lack of process knowledge, and a failure to recognize the market value of medicinal plants. The study findings are in line with the study by Mpelangwa *et al.* (2021) who reported that the wholesalers add value by drying, milling, and bulk packaging of individual medicinal plants and this is facilitated by the knowledge they have in recognizing the market value of medicinal plants. Also, an inadequate understanding of the production value chain has consequences on the trade in products of medicinal plants (Volenzo and Odiyo, 2020).

Table 3.2: Mean profits accrued by actors in the medicinal plants' value chain in the Liwale district

Plants	Collectors (Farmers)	Middlemen	Herbal Clinics
Pteleopsis myrtifolia	29 550	200 000	1 500 000
Pseudolachnostlis maprounaifolia	15 000	140 000	1 200 000
Jacquemontia tamnifolia	10 000	100 000	985 000
Psorospermum febrifugum	20 000	150 000	1 000 000

3.6.4 Challenges Facing Herbal Clinics and Traditional Healers in Liwale District

The first challenge that was common for the majority of the herbal clinics and traditional healers who participated in the study was the high capital for investment in the medicinal plant businesses. The results showed that 36.4% of the respondents equivalent to 36 said that capital for starting a herbal clinic was the challenge. The study's finding is in line with what has been reported in the literature by Mpeku and Urassa (2022) who reported that capital is still a major hindering factor for a startup of any business as most of the traditional healers are low-income personnel so they cannot afford money for starting up a medicinal plant business. The argument is supported by what was said by one of the key informants:

"Capital is among the major problem facing most the traditional healers. The capital for this business is too high since it needs transportation to Lindi town then Dar es Salaam. There are plenty of resources (medicinal plants) but obtaining them requires a significant amount of money to be spent."

Key Informant Interview, TFS Official, February 2022

Results in Table 3.3 show that 4.6% of the respondents equivalent to 5 respondents said trust issues among the patients. This implies that most of the patients have no trust in the medicinal plants provided by herbal clinics and traditional healers. This is highly influenced by low knowledge of the importance of traditional medicine among the community members. Echoing this, one of the FGD participants said,

"The community members in our village do not trust the traditional healers as well as the herbal clinics due to low knowledge on the importance of the medicinal plants. Some villagers get used to these traditional medicinal healers so they do not trust them as they take each other for granted."

Focus Group Dscussion, Likombola Village, February 2022

The study's finding is in line with what has been reported in the literature by Hampshire *et al.* (2017) and Asare *et al.* (2021) that Patients are faced with the problem of whom and what to trust. Trust usually implies vulnerability, since the truster has to depend on, but can never be certain about, another's motives, intentions, and future actions.

the low income of customers has been the main challenge facing traditional healers and herbal clinic dealers. The results show that 12% of the respondents equivalent to 12 respondents said that low income is among the challenges (Table 3.3). This implies that most of the people in the study area have low income. The findings are in line with the findings reported by Hughes *et al*. (2022) who reported that most of the people who live in rural areas have very low incomes which makes them not to be able to afford hospital bills. Furthermore, Oyebode *et al*. (2016) found out that individuals are more willing to pay for the treatment using herbal medicine although they have low incomes.

Moreover, the result in Table 3.3 shows that 24.5% of the respondents said that there is an unfriendly process in the registration of herbal clinics and traditional healers. This implies that the medicinal plants sector is not taken into high consideration by most organizations. This is highly influenced by the rise of education levels in most of the rural areas, which makes most people abandon medicinal plants. The argument is supported by what was said in one FGD;

> *"Most of traditional healers are not registered by the government, this is because of many bureaucratic procedures which makes most of them to lose patience"*

The observed results are in line with the study by Asare *et al*. (2021) and Kala *et al*. (2006) who reported that medicinal plant dealers have a poor market which is enhanced by technological advancement in most African countries.

Another challenge was the high taxes imposed on the medicinal plants business. Results in Table 3.3 show that 23.5% of the respondents said that too high taxes are the major challenge in the business of medicinal plants. The study's finding is in line with what has been reported in the literature (Mpeku and Urassa, 2022; Onwunali 2018), the argument is supported by what was said by one of the key informants,

> *"High taxes are a major problem facing traditional healers and herbal clinics. The taxes are too high for actors. They literally gain very little or no profit. This kind of situation happens time to time. Few benefits and it's a tragedy for many."*
> Key Informant Interview, FORVAC Official, February 2022

Table 3.3: Challenges facing herbal clinics and traditional healers in Liwale district

Challenges	Frequency	Percentage
Capital	36	36.4
Trust issues among patients (People not being sick but visiting the clinic to challenge the expertise of medicinal plant provision)	5	4.6
Customers do not have money, or little money compared to what is needed for treatment	12	12
Unfriend process for registration of the business	24	23.5
Too much taxes and levies for running the business	23	23.5

3.7 Conclusions and Recommendations

3.7.1 Conclusions

The study aimed to identify the actors along the medicinal plant value chain, determine the profit gained by each actor along the medicinal plant value chain, and identify the challenges facing the medicinal plant actors along the chain. The study concluded that only three actors were identified along the medicinal plant value

chain which includes collectors, middlemen (transporters, and processors), and herbal clinics/traditional healers. It is further concluded that profits gained among the actors vary as herbal clinics/traditional dealers benefit more than other actors along the value chain. Lastly, it is concluded that the medicinal plant business was affected by several factors, such as the capital factor being the most mentioned by the majority of the respondents, showing that it was the major problem that affected most of the medicinal plant value chain actors.

3.7.2 Recommendations

Based on the study findings and the conclusions, the following are recommended:

i. The government through the village governments should conduct more education training to increase awareness of the local people on the advantages of participating in the medicinal plants business. This will encourage villagers to invest more in forest activities due to insurance of returns
ii. The government should provide a conducive environment for the business of medicinal plants such as deducing policy which will lower the taxes of the medicinal plant businesses.

References

Abihudi, S. (2022). Ethnobotanical use, threat status and optimal environmental germination conditions for conservation of aloe species in Tanzania.

Amenta, E., & Ramsey, K. M. (2010). Institutional theory. *Handbook of Politics: State and Society in Global Perspective.* Springer, New York. pp.15-39.

Andrade-Cetto, A. (2005). Neglected diseases in Africa: a challenge for medicinal plants research. *African Journal of Traditional, Complementary and Alternative Medicine* 2(3): 213 – 214.

Asare, C., Aziato, L. & Boamah, D. (2021). Facilitators and barriers to the clinical administration of herbal medicine in Ghana: a qualitative study. *BioMed Central Complementary Medicine and Therapies* 21(1): 1 – 13.

Augustino, S. and Gillah, P. R. (2005). Medicinal plants in urban districts of Tanzania: plants, gender roles, and sustainable use. *International Forestry Review* 7: 44 – 58.

Awotedu, B. F., Akala, A. O., Omolola, T. O., Owoeye, E. A., Olaoti-Laaro, S. O. & Ogunsiji, A. O. (2021). Some underutilized indigenous timber trees with high medicinal values: Its challenges and prospects. *World Journal of Advanced Research and Reviews* 10(02): 161–168.

Hampshire, K., Hamill, H., Mariwah, S., Mwanga, J. & Amoako-Sakyi, D. (2017). The application of signaling theory to health-related trust problems: the example of herbal clinics in Ghana and Tanzania. *Social Science and Medicine* 188: 109 – 118.

Hughes, G. D., Aboyade, O. M., Okonji, O. C., Clark, B., Bawa, W. A., Xavier, C. & Rasu, R. S. (2022). Cost of traditional herbal medicines for noncommunicable diseases in rural and urban communities in South Africa. *Value in Health Regional Issues* 29: 66 – 75.

Kala, C. P. (2006). Problems and prospects in the conservation and development of the Himalayan medicinal plants

sector. *International Journal of Sustainable Development* 9(4): 370 – 389.

Kaplinsky, R., & Readman, J. (2001). *Integrating SMEs in Global Value Chains: Towards Partnership for Development.* Unido. Vienna

Kilima, B. M., Rashid, S. A., Lupindu, A. M., Tarimo, J. B., & Laizer, M. K. (2020). Situational analysis of the Tanzanian food safety control system.

Mbinile, S. D., Munishi, L. K., Ngondya, I. B. & Ndakidemi, P. A. (2020). Conservation and management challenges facing a medicinal plant Zanthoxylum chalybeum in Simanjiro Area, Northern Tanzania. *Sustainability* 12(10): 1 – 12.

Mchopa, A. D., Jeckoniah, J. N. & Mgema, J. M. (2021). Smallholder Agriculture and Livelihood Sustainability Potentials among Rural Households: A Case of Sunflower Value Chain in Tanzania. *Journal of Social Sciences, Business, and Technology* 2(2): 1 – 10.

Mlozi, S. H. (2022). The role of natural products from medicinal plants against COVID-19: traditional medicine practice in Tanzania. *Heliyon 8*(6):

Mpeku, F. N. & Urassa, J. K. (2022). Access to Bank Loans and Smallholder Farmers' Paddy Productivity; A Case of Mvomero District, Tanzania. *International Journal of Science and Business* 15(1): 65 – 78.

Mpelangwa, E. M., Makindara, J. R., Sørensen, O. J. & Bengesi, K. M. K. (2022). The value chain of traded products of medicinal plants in Tanzania: the emerging role of formulators. *African Journal of Economic and Management Studies* 13(1): 1 – 14.

Ndou, V., Mele, G. & Del Vecchio, P. (2019). Entrepreneurship education in tourism: An investigation among European Universities. *Journal of Hospitality, Leisure, Sport and Tourism Education* 25: 100 - 175.

Nwafor, C. U (2020). Cultivation of medicinal plants by smallholder farmers in South Africa: constraints to commercialization. [10.20944/preprints202012.0761.v1] site was visited on 20/

10/2022.

Nwafor, I., Nwafor, C., & Manduna, I. (2021). Constraints to cultivation of medicinal plants by smallholder farmers in South Africa. *Horticulturae 7*(12): 531.

Onwunali, C. (2018). *Assessment of the Financial Products and Services Extended to Smallholder Farmers: A Case Study of the MIVARF Programme in Iringa Region, Tanzania.* International Fund for Agricultural Development, Rome, Italy. 65pp.

Oyebode, O., Kandala, N. B., Chilton, P. J. & Lilford, R. J. (2016). Use of traditional medicine in middle-income countries: A WHO-SAGE study. *Health Policy and Planning* 31(8): 984 – 991.

Pauls, T., & Franz, M. (2013). Trading in the dark–The medicinal plants' production network in U Uttarakhand. *Singapore Journal of Tropical Geography 34*(2): 229-243.

Pereus, D., Hilonga, S., Otieno, J. N., Ghorbani, A., Kocyan A. & de Boer, H. (2019). Trade of wild-harvested medicinal plant species in local markets of Tanzania and its implications for conservation. *South African Journal of Botany* 122: 214 – 224.

Porter, M. E. (1985). *Competitive Advantage. Creating and Sustaining Superior Performance*. Free Press, New York. 557pp.

Rathore R. & Mathur A. (2018). Entrepreneurship development in medicinal and aromatic plants: Prospects and challenges. *International Journal of Economic Plants* 5(1): 32 – 35.

Sofowora, A., Ogunbodede, E., & Onayade, A. (2013). The role and place of medicinal plants in the strategies for disease prevention. *African Journal of Traditional, Complementary and Alternative Medicines 10*(5): 210-229.

Sunderland, T., Achwiadan, R., Angelsen, A., Babigumira, R., Ickowitz, A., Paumgarten, F., Reyes-Garci, V. & Shively, G. (2014). Challenging perception about men, women, and

forest product use: A global comparative study. *World Development* 64: 56 – 66.

Tadesse, B., & Bakala, F. (2018). Value chain analysis of potato: the case of Sheka Zone, Southwest Ethiopia. *International Journal of Horticulture and Agriculture 3*(1): 1-10.

Tanga M., Lewu F. B., Oyedeji O. A. and Oyedeji O. O. (2018). Cultivation of medicinal plants in South Africa: a solution to quality assurance and consistent availability of medicinal plant materials for commercialization. *Academia Journal of Medicinal Plants* 6(7): 168 – 177.

Tanzania National Forest Policy. (1998). Retrieved August 11, 2023, from http://www.fao.org/3/ca5921en/ca5921en.pdf

Teece, D. (2018). Business Models and Dynamic Capabilities. *Long Range Planning* 51(1): 40 – 49.

UNDP (2015). *Sustainable Development Goals.* United Nations, New York, USA. 68pp.

United Nations (2015). Transforming Our World: The 2030 agenda for sustainable development. resolution adopted by the general assembly. [https://doi.org/101007/ s13398-014-0173-7.2] site visited on 25/09/2022.

Volenzo, T. & Odiyo, J. (2020). Integrating endemic medicinal plants into the global value chains: The ecological degradation challenges and opportunities. *Heliyon* 6(9): 1 – 11.

WHO (2019). *Global Report on Traditional and Complementary Medicine.* World Health Organization, Geneva. 226pp.

Wu, G., Fanzo, J., Miller, D. D., Pingali, P., Post, M., Steiner, J. L., & Thalacker-Mercer, A. E. (2014). Production and supply of high-quality food protein for human consumption: sustainability, challenges, and innovations. *Annals of the New York Academy of Sciences 1321*(1): 1-19.

CHAPTER FOUR

4.1 Summary of Major Findings

The study's main conclusions are listed below in chronological order according to the manuscripts that were submitted.

4.1.1 To assess the medicinal plants business environment in Liwale district

Objective one of the research study aimed at assessing the medicinal plants business environment. The study findings show that more than three-quarters of the medicinal plant dealers were not aware of the business environment and did not comply with them.

4.1.2 To assess the supportive functions of the medicinal plants in the Liwale district

Objective two aimed to assess the extent to which the supporting functions influence the medicinal plant business. The supporting functions were less done in the study area. Generally, the results from the binary logistic regression show that variables of training, financial services, and information access were statistically significantly associated with the medicinal plant business.

4.1.3 To map the medicinal plant value chain actors

Objective three was to map the medicinal plant value chain actors in the Liwale district. The study concluded that only three actors were identified along the medicinal plant value chain which includes collectors, middlemen (transporters, and processors), and herbal clinics/traditional healers.

4.1.4 To determine the profitability of medicinal plants

Objective four was to determine the profitability gained by medicinal plant dealers in the Liwale district. It is concluded that profits gained among the actors vary as herbal clinics/traditional dealers benefit more than other actors along the value chain.

4.1.5 To identify the challenges facing herbal clinics and traditional dealers in Liwale district

The medicinal plant business was affected by several factors, such as the capital factor being the most mentioned by the majority of the respondents, showing that it was the major problem that affected most of the medicinal plants' value chain actors.

CHAPTER FIVE

5.0 Conclusion and Recommendations

5.1 Conclusion

This study aimed to assess the medicinal plant value chain in Liwale district, Tanzania. According to the report, there is a lack of compliance (83.2%) and awareness (82.4%) in the business environment and as a result of the lack of awareness, compliance with rules and regulations is also challenging. A significant portion of herbal clinics and conventional healers (85%) lacked training for enhancing their commercial skills, according to the survey. It was also noted that herbal clinics, medicinal plants, and traditional dealers have a very strong tie and relationships with their customers making it difficult to lose them. Their customers are potential marketing tools to others needing similar services. Despite having access to financial services, particularly mobile money, the majority of herbal clinics and traditional healers rarely use them (79%). It was also noted that the supporting functions (training, access to financial services, and information access) have a significant influence on the medicinal plants business.

The survey also discovered that there were only three actors throughout the value chain of medicinal plants, including collectors, middlemen (transporters and processors), herbal clinics, and traditional healers. The researchers also found that the players' profits varied, with herbal clinics and traditional sellers making more money (1,500,000 Tshs) than the other actors.

5.2 Recommendations

Based on the study findings and the conclusions, the following are recommended:

i. The government through the village governments should conduct more education training to increase awareness of the local people on the advantages of participating in the medicinal plants business. This will encourage villagers to invest more in forest activities due to insurance of returns.

ii. The government should provide a conducive environment for the business of medicinal plants such as deducing policy which will lower the taxes of the medicinal plant businesses.

iii. Different governmental and non-governmental organizations should work hand-in-hand to provide training on the medicinal plants business so that the people participating in it will be well aware of the best practices to run the business which will aid in lowering the operational costs and massively improve the profitability for the participants of the business.

iv. The study faced some shortcomings, especially from it being a bird's eye view, and thus, there a room for further research to be done on this very lucrative NTFP, especially from the product perspective on further understanding why different products sell differently on the market and how to improve these to fully harness the full potential of the business.

References

Andrade-Cetto, A. (2005). Neglected diseases in Africa: a challenge for medicinal plants research. *African Journal of Traditional, Complementary and Alternative Medicine* 2(3): 213 – 214.

Asare, C., Aziato, L. & Boamah, D. (2021). Facilitators and barriers to the clinical administration of herbal medicine in Ghana: a qualitative study. *BioMed Central Complementary Medicine and Therapies* 21(1): 1 – 13.

Augustino, S. and Gillah, P. R. (2005). Medicinal plants in urban districts of Tanzania: Plants, Gender Roles And Sustainable Use. *International Forestry Review* 7: 44 – 58.

Awotedu, B. F., Akala, A. O., Omolola, T. O., Owoeye, E. A., Olaoti-Laaro, S. O. & Ogunsiji, A. O. (2021). Some underutilized indigenous timber trees with high medicinal values: Its challenges and prospects. *World Journal of Advanced Research and Reviews* 10(02): 161–168.

BBC Swahili (30th January 2021). Waziri Jafo: Tunaanza kampeni ya kupiga nyungu juma zima. [https://www.bbc.com/swahili/habari-55870231]_site visited on 7/8/ 2021.

Chenga, J. & Mgaza, A. (2016). *Timber Trade Dynamics: A Preliminary Review of Tanzania's Domestic Trade in Timber.* TRAFFIC, Dar es Salaam, Tanzania. 29pp.

Cummings, C. L. (2017). Cross-sectional design in *The SAGE Encyclopedia of Communication Research Methods*. (Edited by Allen, M.) SAGE Publications, Inc., Thousand Oaks. pp. 315 – 317.

El Tahir, B. A. & Vishwanath, A. (2015): Market and value chain analyses of marketable natural products from agroforestry systems in Eastern Sudan. *Journal of Geoscience and Environment Protection* 3: 57 – 73.

Eskola, E. (2005). *Agricultural Marketing and Supply Chain Management in Tanzania*. Working Paper Series No. 16.

University of Sussex, Department of Economics, Brighton, United Kingdom. 37pp.

FAO (2014). *Developing Sustainable Food Value Chains: Guiding Principles.* Food and Agriculture Organization of the United Nations, Rome. 11pp.

Gereffi, G. and Fernandez-Stark, K. (2016). *Global Value Chain Analysis: A Primer*. Social Science Research Institute. Duke University. 34pp.

Guadagno, F., Wangwe, S. and Delera, M. (2019). Horticulture, and wood and furniture industries in Tanzania, performance, challenges and potential policy approaches. *Journal of International Growth Centre* 40433: 1 – 50.

Hampshire, K., Hamill, H., Mariwah, S., Mwanga, J. & Amoako-Sakyi, D. (2017). The application of signaling theory to health-related trust problems: the example of herbal clinics in Ghana and Tanzania. *Social Science and Medicine* 188: 109 – 118.

Harbi, J., Erbaugh, J. T., Sidiq, M., Haasler, B. & Nurrochmat, D. R. (2018). Making a bridge between livelihoods and forest conservation: Lessons from non-timber forest products' utilization in South Sumatra, Indonesia. *Forest Policy and Economics* 94: 1-10.

Hellin, J. & Meijer, M. (2006). *Guidelines for Value Chain Analysis.* Food and Agriculture Organization, Rome Italy. 24pp.

Hishe, M., Giday, M. & Asfaw, Z. (2016). Value chain analysis of medicinal plants and the associated challenges. *Journal of Medicinal Plants Studies* 4(3): 45–55.

Hughes, G. D., Aboyade, O. M., Okonji, O. C., Clark, B., Bawa, W. A., Xavier, C. & Rasu, R. S. (2022). Cost of traditional herbal medicines for noncommunicable diseases in rural and urban communities in South Africa. *Value in Health Regional Issues* 29: 66 – 75.

Joshi, B. C. & Joshi, R. K. (2014). The Role of Medicinal Plants in Livelihood Improvement in Uttarakhand. *International Journal of Herbal Medicine* 55(16): 55–58.

Kala, C. P. (2006). Problems and prospects in the conservation and development of the Himalayan medicinal plants sector. *International Journal of Sustainable Development* 9(4): 370 – 389.

Kimaro, V. (2020). Dawa kutoka NIMR yaonesha mafanikio. [https://habarileo.co.tz/ habari/2020-05-085eb4f7f85771c.aspx] site visited on 7/8/ 2021.

Materu, B. (2021). Tanzanians urged to use traditional medicine for Covid-19 - The East African. [https://www.theeastafrican.co.ke/tea/news/east-africa/tanzania-traditi onal-medicine-covid-19-3276402] site visited on 7/8/ 2021.

Mbinile, S. D., Munishi, L. K., Ngondya, I. B. & Ndakidemi, P. A. (2020). Conservation and management challenges facing a medicinal plant Zanthoxylum chalybeum in Simanjiro Area, Northern Tanzania. *Sustainability* 12(10): 1 – 12.

Mchopa, A. D., Jeckoniah, J. N. & Mgema, J. M. (2021). Smallholder Agriculture and Livelihood Sustainability Potentials among Rural Households: A Case of Sunflower Value Chain in Tanzania. *Journal of Social Sciences, Business, and Technology* 2(2): 1 – 10.

Mhede, E. P. (2012). *The Growth of Micro and Small, Cluster-Based Furniture Manufacturing Firms and Their Implications for Poverty Reduction in Tanzania*. Research on Poverty Alleviation, Dar es Salaam, Tanzania. 52pp.

Mpeku, F. N. & Urassa, J. K. (2022). Access to Bank Loans and Smallholder Farmers' Paddy Productivity; A Case of Mvomero District, Tanzania. *International Journal of Science and Business* 15(1): 65 – 78.

Mpelangwa, E. M., Makindara, J. R., Sørensen, O. J. & Bengesi, K. M. K. (2022). The value chain of traded products of medicinal plants in Tanzania: the emerging role of formulators. *African Journal of Economic and Management Studies* 13(1): 1 – 14.

Mtakasimba, S. (2021). Muhimbili yafunga mashine za kutoa tiba mvuke, wtaalam kuzifanyia utafiti. [http://www.mnh.or.tz/muhimbiliblog/story/muhimbili-yafunga-mashine-za-kutoa-tiba-mvuke-watalaam-kuzifanyia-utafiti] site visited on 7/8/ 2021.

Nandi, R., Gowdru, N. V. & Boklemann, W. (2018). Value chain up-gradation through collective action: a step towards inclusive growth. *Indian Journal of Economics and Development* 6(9): 1 – 13.

Ndou, V., Mele, G. 7 Del Vecchio, P. (2019). Entrepreneurship education in tourism: An investigation among European Universities. *Journal of Hospitality, Leisure, Sport and Tourism Education* 25: 100175.

Njogopa, G. (2021). Hospitali ya taifa Tanzania yazindua huduma ya kujifukiza|Matukio ya Afrika|DW|04.03.2021. [https://www.dw.com/sw/hospitali-ya-taifa-tanzania-yazindua-huduma-ya-kujifukiza/a-56775980] site visited on 10/8/ 2021.

Nkuba, L. & Mohammed, N. (2017). Heavy metals and essential elements in selected medicinal plants are commonly used for medicine in Tanzania. *Chemical Science International Journal* 19(2): 1–11.

Noorhosseini, S. A., Fallahi, E., Damalas, C. A. & Allahyari, M. S. (2017). Factors affecting the demand for medicinal plants: implications for rural development in Rasht, Iran. *Land Use Policy* 68: 316 – 325.

Nwachukwu, I. (2008). Planning and evaluation of agricultural and rural development projects. *Umuahia: Lamb House Publishers*.

Nwafor, C. U (2020). Cultivation of Medicinal Plants by Smallholder Farmers in South Africa: *Constraints to Commercialization* 1: 1 – 17.

Onwunali, C. (2018). *Assessment of the Financial Products and Services Extended to Smallholder Farmers: A Case Study of the MIVARF Programme in Iringa Region, Tanzania.*

International Fund for Agricultural Development, Rome, Italy. 65pp.

Oyebode, O., Kandala, N. B., Chilton, P. J. & Lilford, R. J. (2016). Use of traditional medicine in middle-income countries: A WHO-SAGE study. *Health Policy and Planning* 31(8): 984 – 991.

Pereus, D., Hilonga, S., Otieno, J. N., Ghorbani, A., Kocyan A. & de Boer, H. (2019). Trade of wild-harvested medicinal plant species in local markets of Tanzania and its implications for conservation. *South African Journal of Botany*122: 214 – 224.

Piboonrungroj, P., Williams, S. & Simtupang, T. (2017). The emergency of Value chain thinking. *International Journal of Value Chain Management* 10(2): 3 – 19.

Porter, M. E. (1985). *Competitive Advantage. Creating and Sustaining Superior Performance*. Free Press, New York. 557pp.

Pramono, A. C. & Prahiawan, W. (2022). Effect of training on employee performance with competence and commitment as intervening. *Aptisi Transactions on Management* 6(2): 142 – 150.

Rathore, R. & Mathur, A. (2018). Entrepreneurship development in medicinal and aromatic plants: Prospects and challenges. *International Journal of Economic Plants* 5(1): 32 – 35.

Sánchez, M., González-Burgos, E., Iglesias, I., Lozano, R. & Gómez-Serranillos, M. P. (2020). Current uses and knowledge of medicinal plants in the Autonomous Community of Madrid (Spain): A descriptive cross-sectional study. *British Medical Centre Complementary Medicine and Therapies* 20(1): 1–13.

Shakya, A. K. (2016). Medicinal Plants: Future source of new drugs. *International Journal of Herbal Medicine* 4(4): 59 – 64.

Shanley, P.& Luz, L. (2003). The impacts of forest degradation on medicinal plant use and implications for health care in eastern Amazonia. *BioScience* 53(6): 573–584.

Simtowe, A. (2021). Kujifukiza Muhimbili, Mloganzila Sh5000 tu - Mwananchi. [https://www.mwananchi.co.tz/mw/habari/kitaifa/kujifukiza-muhimbili-mloganzila-sh5000-tu-3311872] site visited on 7/8/ 2021.

Sofowora, A., Ogunbodede, E. & Onayade, A. (2013). The role and place of medicinal plants in the strategies for disease prevention. *African Journal of Traditional, Complementary, and Alternative Medicines* 10(5): 210–229.

Stein, C. & Barron, J. (2017). *Mapping Actors Along Value Chains: Integrating Visual Network Research and Participatory Statistics into Value Chain Analysis*. International Water Management Institute, Colombo, Sri Lanka. 24pp.

Sunderland, T., Achwiadan, R., Angelsen, A., Babigumira, R., Ickowitz, A., Paumgarten, F., Reyes-Garci, V. & Shively, G. (2014). Challenging perception about men, women, and forest product use: A global comparative study. *World Development* 64: 56 – 66.

Tadesse B. & Fayera B. (2018). Value chain analysis of potato: The Case of Sheka Zone, Southwest Ethiopia. *International Journal of Horticulture and Agriculture* 3(1): 1 – 10.

Tanga M., Lewu F. B., Oyedeji O. A. & Oyedeji O. O. (2018). Cultivation of medicinal plants in South Africa: A solution to quality assurance and consistent availability of medicinal plant materials for commercialization. *Academia Journal of Medicinal Plants* 6(7): 168 – 177.

Teece, D. (2018). Business Models and Dynamic Capabilities. *Long Range Planning* 51(1): 40 – 49.

Udemezue, J. C. & Osegbue, E. G. (2018). Theories and Models of Agricultural Development. *Annals of Reviews and Research,* 1(15): 134 - 137

UNDP (2015). *Sustainable Development Goals.* United Nations, New York, USA. 68pp.

URT (2002). *Forest Act, 2002. The Gazette*. Government Printers, Dar es Salaam, Tanzania. pp. 51 – 66.

URT (2007). *Land Use Planning Act 2007*. Government Printers, Dar es Salaam, Tanzania. 48pp.

Volenzo, T. & Odiyo, J. (2020). Integrating endemic medicinal plants into the global value chains: The ecological degradation challenges and opportunities. *Heliyon* 6(9): 1 – 11.

WHO (2019). *Global Report on Traditional and Complementary Medicine.* World Health Organization, Geneva. 226pp.

APPENDICES

Appendix 1: Questionnaire

The interviews will take between 30-45 minutes of your time. I would like to assure you that the information in this questionnaire will be used only for the intended research purposes. No names of residents/respondents are required in this questionnaire. I greatly appreciate your participation in this study.

A. General Information

Identification number	
a. Time of the interview starts	
b. Name of the interviewer	
c. Date of interview	
d. Questionnaire number	
e. Interviewee; a) Household head b) Spouse c) Others (specify)	
f. GPS Reading	
g. Village name	
h. Ward	
i. Division	
j. District	
k. Region	

Mapping actors along the value chain and profitability

1. Who are the actors involved in medicinal plants from collection to the end user?
2. What are the roles of each mentioned actor above?
3. From the mentioned actors, what type of actor are you?
4. What is your experience in extracting the medicinal plants?
   a. 0 – 5 years

   b. 6 – 20 years
   c. More than 20 years
5. How many employees (including you) do you have?
   a. 1 – 4
   b. 5 – 49
   c. 50 – 99
   d. 100 and above
6. What raw materials are required for your work to be accomplished?
7. Where do you get materials for your work?
8. What types of tree species are used for medicinal plants?
9. What is the measuring unit (e.g. Kg or liter) used for the raw material and/or your products?
10. What amount of raw materials are you demanding per month?
11. What are your products or varieties of services being offered and their cost?
12. What types of customers do you have? rank in order (institution, home use, etc)
13. How many (products/services) mentioned (11) are offered per month?
14. What do you think could be the reason for people to prefer conventional medicine to traditional medicine?
15. What is your current business investment?
    a. Up to 5 mil.
    b. Above 5 mil to 200 mil.
    c. Above 200 mil to 800 mil
    d. Above 800 mil

Assess the medicinal plants business environment in the Lindi region

1. Are there any of these, (i) policy (ii) standards (iii) informal rules and norms
   (iv) regulations (v) by-laws available, guiding your work?
   a. Yes

b. No

2. If yes, what are they among those?
3. Are you able to comply with any of those mentioned legal frameworks?
    a. Yes
    b. No

4. If no, why?
5. Is the available legal framework helpful?
    a. Yes - go to 6
    b. No - go to 7

6. If yes, how do they help?
7. If no, why?
8. Do you think there are (i) policy (ii) standards (iii) informal rules and norms (iv) regulations (v) by-laws available that conflict with your work? If yes, what are they?
9. What are the incentives and disincentives for legal working with these medicinal plants?

Assess the supportive functions for the trade of medicinal plant products in the Lindi region.

1. Are the infrastructure (roads) available friendly to support your work?
    b) Yes
    c) No
    d) I don't know

1. Is there any training/exhibition provided to build your skills or capacities for your work?
2. If yes from whom?
3. How many training/exhibitions do you attend per year?
    a. 1 – 5
    b. 6 – 20

c. 21 and above

4. Is there any information about the business you are receiving?
    a. Yes
    b. No
5. What type of information are you receiving?
    a. Tender
    b. Financial issues
    c. About raw materials (medicinal plants)
    d. Training/Exhibition
    e. Others(Specify)

6. From whom?
7. Is there any financial service you can access?
    a. Yes
    b. No

8. If yes, which services do you get?
9. Are these supportive functions (in general) helpful for industrial growth?
    a. Yes
    b. No

Appendix 2: Focus group discussion

1. Who are the actors in the medicinal plants' value chain in the area?
2. What are the roles of each actor in the chain?
3. Is there any legal framework available guiding medicinal plant activities in your area?
4. Who is responsible for the supervision of those legal frameworks?
5. Are these legal frameworks helping the industry to grow?
6. What challenges do you face when complying with those legal frameworks?
7. Is there any seminar/training/exhibition provided to make you familiar with those legal frameworks?
8. What are your suggestions for the available legal framework?

Appendix 3: Key Informants Interview

1. Are there any activities that involve medicinal plants business in your area? Mention them.
2. Who are the actors in the medicinal plant's value chain in your area? What are their roles?
3. Are there any activities done to support the medicinal plants trade in your area? If yes, mention them and describe how they are done.
4. Is there any rules and regulations available guiding medicinal plant activities in your area? Highlight them
5. Who is responsible for the supervision of those rules and regulations?
6. What are the challenges faced during the implementation of the rules and regulations guiding the medicinal plants trade?
7. Are there any rules and regulations that hinder the growth of the medicinal plants business in the area? If yes, mention them
8. What are your suggestions toward available rules and regulations?