DRIVERS AND SOCIO-ECONOMIC DETERMINANTS OF SMALLHOLDER FARMERS' SISAL PRODUCTIVITY: A CASE OF KOROGWE DISTRICT, TANZANIA

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EXTENDED ABSTRACT

The importance of sisal to the communities, nation and globe at large has stimulated the government to introduce various efforts so as to increase both participation by smallholder farmers and their productivity. Such efforts include the government entering into partnerships with various companies to establish a sisal nucleus settlement scheme responsible for developing business plans to set up marketing and processing arrangements for sisal grown by smallholder farmers. However, it is yet to be clearly determined as to which factors determine smallholder farmers' participation in sisal production as well as socio-economic determinants of smallholder farmers for sisal productivity. The current study aimed at determining the drivers for smallholder farmers' participation in sisal production as well as socio-economic determinants of smallholder farmers' sisal productivity in Korogwe District specifically Ngombezi and Mwelya Wards. The study adopted a cross-sectional research design whereby data were collected once from Ngombezi and Mwelya Wards, Korogwe District, Tanzania. The wards (Ngombezi and Mwelya) were purposively selected due to availability of many smallholder sisal producing households. A total of 150 randomly selected households based on registers availed by estate managers in Ngombezi and Mwelya Wards participated in this study. Primary data were collected through questionnaire, key informant interviews and focus group discussions. Quantitative data were analyzed using IBM SPSS Statistics whereby descriptive and inferential statistics were determined. Qualitative data were analyzed using thematic content analysis whereby collected information were summarized based on themes and objectives of the study. Results show that the average farm size allocated to sisal within the district was 8.6 ha while the average households' sisal yields was 0.62 tons/ha. In addition, Mwelya Ward had higher average households' sisal yield (0.64 tons/ha) compared to Ngombezi Ward (0.61 tons/ha). Results further show that drivers significantly associated with household's choice to produce sisal as a first crop were transport mode ($P \leq 0.1$), labour amount ($P \leq 0.05$) and lastly, financial support ($P \leq 0.1$). In addition, the smallholder sisal farmers were faced by some challenges mainly infrastructural challenges (13%), financial constraints (11.3%) and poor farm inputs availability (9.8%). Results further show that factors significantly associated with sisal productivity were size of land allocated to sisal ($P \leq 0.001$), crops produced as first choice ($P \leq 0.1$) and finally, a household's main source of income ($P \leq 0.05$). In addition, factors determining smallholder farmers' sisal profitability were sex of the household head ($P \leq 0.1$), size of land ($P \leq 0.05$) and amount of sisal harvested ($P \leq 0.001$). Therefore, the study recommends that smallholder sisal farmers should adopt improved farming techniques and practices that will enable them to improve their productivity. In addition, agricultural and investment banks should consider financing smallholder sisal farmers so as to enable them increase their productivity and this will in turn stimulate an increase in number of smallholder farmers in sisal production.

DECLARATION

I, Azizi Hamza Beleko, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my original work done within the period of registration and that it has neither been submitted nor being concurrently submitted in any other institution for an academic award.

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(MA. Project Management and Evaluation)

The above declaration is confirmed by:

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Prof. Justin K. Urassa **Date**

(Supervisor)

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DEDICATION

This work is dedicated to my grandmother Dorcus Mang'ala, my parents, my father Hamza Beleko and my step mother Lilian Kinyemi for their constant support and inspiration during my study period and to my late mother Pendo Mwinula who always encouraged me to study hard.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS AND ACRONYMS

AMCOS Agricultural Marketing Cooperative Society

ASDS	Agricultural Sector Development Strategy
BOT	Bank of Tanzania
FAO	Food and Agricultural Organization
FGD	Focus Group Discussion
FHH	Female Headed Households
LSF	Lok Sanjh Foundation
NBS	National Bureau of Statistics
NGOs	Non-Governmental Organizations
SACCOS	Savings and Credit Cooperative Societies
SISO	Sisal Smallholders and Out growers
SPSS	Statistical Package for Social Sciences
SSA	Sub-Saharan Africa
SUA	Sokoine University of Agriculture
TIC	Tanzania Investment Center
TSB	Tanzania Sisal Board
URT	United Republic of Tanzania

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Sisal (*Agave sisalana)* is a succulent perennial crop. It is a species of the *Agave* genus with origin in southern Mexico. It is a drought resistant plant that can grow well in the arid and semi-arid regions; rainfall amount suitable for its growth is in the range 1000-1250 mm. Sisal plant grows well in hot climatic conditions with temperatures ranging from 10^0C to 30^0C. It can also endure temperatures of 40-50^{o}C (Saxena *et al.,* 2011).

The cultivation of sisal plays an important and diverse role in the economic development of many countries around the world. In Sub-Saharan Africa (SSA), sisal plays a crucial role economically, socially and environmentally through provision of employment, foreign exchange and development of other socio-economic infrastructures such as improved building plans and establishment of schools and clinics for sisal workers and other people living around the sisal estates (Dellaert, 2014).

The importance of sisal to the communities, nation and globe at large has stimulated the government to introduce various efforts so as to increase both participation by smallholder farmers and their productivity. Such efforts include the government entering into partnerships with various companies to establish a sisal nucleus settlement scheme responsible for developing business plans to set up marketing and processing arrangements for hectares of sisal grown by smallholder farmers (FAO, 2013).

As a result of the above, the Tanzanian government introduced a scheme known as Sisal Smallholders and Outgrowers scheme (SISO) where smallholder farmers are both given small farms subdivided from the agricultural lands within the estates owned by the

Tanzania Sisal Board to cultivate sisal. The scheme allows farmers to cultivate sisal from their own households' land outside the estates too. Additionally, a provisional formula has been set for sharing costs and earnings between the smallholders and the board (BOT, 2016). This approach is important as it offers the smallholder farmers not only the accessibility to farms within the estates but, also the market for selling their sisal produce to which the sisal board is hugely responsible.

Sisal in Tanzania is cultivated in a number of regions mostly with semi-arid conditions. Leading sisal growing regions in Tanzania are Tanga, Morogoro, Kilimanjaro, Coast, Lindi and Mtwara (TIC, 2016). On the other hand, Korogwe District constitutes the center of Tanzania's sisal industry. Sisal production in Korogwe District is mainly based on estates that are controlled and owned by the Tanzania Sisal Board (TSB). Currently, the board is in charge of five estates namely, Hale, Ngombezi, Mwelya, Magunga and Magoma. Nonetheless, the board still applies the SISO scheme that gives smallholder farmers access to farms within these estates and also the market for their produce to both farmers working within the estates and outgrowers. The district recorded a total number of only 1207 smallholder sisal farmers in 2018 despite being the center of the Tanzania's sisal industry (TSB, 2018).

According to URT (2017), Tanzania's sisal industry employs about 5475 people, with a total production of about 63 824 tons. Sisal productivity among smallholder farmers is also low (below a ton per hectare) (FAO, 2013). In addition, the cost for running sisal production is generally high. Therefore, the current study aimed at determining the drivers for smallholder farmers' participation in sisal production and socio-economic determinants of smallholder farmers' sisal productivity.

1.2 Problem Statement

Tanzania has for a long time been making efforts to improve production, productivity and commercialization of crop sub-sectors (sisal included) under the Agricultural Sector Development Programme Phase Two (ASDP II). Examples include financing agriculture and promoting good agricultural practices, improving extension services provided to smallholder farmers, training for updating skills and knowledge of farmers, improving agricultural mechanization and promoting contract farming (URT, 2016).

Despite the above efforts to increase smallholder producers' participation in sisal production (Salum, 2012; Kimaro *et al.*, 1994; FAO, 2013; BOT, 2016), the number of smallholder farmers involved in the sector is still low (i.e. below 10 000 people) (URT, 2017). In addition, sisal productivity among smallholder farmers is still low (below a ton per hectare) (FAO, 2013). Moreover, previous studies have not shown interest in documenting the drivers associated with smallholder sisal farmers' participation in the sisal industry as well as the socio-economic determinants associated with smallholder sisal farmers' productivity. Hence; little is known in relation to the drivers that determine smallholder sisal farmers' participation in sisal production and socio-economic determinants of smallholder farmers' productivity. The aim of the current study was to determine the drivers for smallholder farmers' participation in sisal production and the socio-economic determinants of their productivity.

1.3 Justification for the Study

Based on the background information and problem statement, it was therefore important that a study is conducted to provide empirical evidence on factors associated with smallholder sisal farmers' productivity. Moreover, based on Tanzania's banning of plastic bags as carriers, sisal products have great potential for the production of packaging materials and carriers. Again, with increased sisal productivity, sustainability of packing industries dependent on sisal as a raw material can be assured. In addition, increased smallholder sisal productivity could lead to higher households' income earnings hence, socio-economic development. Furthermore, the 2013 Agricultural Policy aims at reducing rural poverty by encouraging smallholder farmers' engagement in cash crops production, sisal farming included so as to improve their living standards through agriculture (URT, 2013). Further, findings from this study could provide empirical evidence to the government and NGOs to recognize sisal farming as an important vehicle for socio-economic improvement and poverty reduction in Korogwe district and other areas with similar conditions hence, facilitating formulation of pro-poor policies, strategies and improvement of infrastructure in order to bring more profits to the smallholder farmers.

1.4 Research Objectives

1.4.1 Overall objective

To determine the drivers and socio-economic factors associated with smallholder farmers' sisal productivity in Korogwe District.

1.4.2 Specific objectives

Specifically, the study aimed to;

(i) Identify the drivers for farmers' choice to produce sisal in the study area.

(ii) Determine factors responsible for smallholder farmers' sisal productivity.

(iii) Determine profitability of smallholder sisal farmers' productivity in Korogwe District.

(iv) Identify constraints faced by smallholder sisal producers in the study area.

1.4.3 Research Questions

i. What is the motivation for smallholder sisal farmers' involvement in sisal farming in Korogwe District?

ii. What factors are responsible for smallholders' sisal productivity?

iii. What is the level of sisal productivity in Korogwe District?

iv. How profitable is smallholder sisal farming?

v. What challenges do smallholder sisal producers face in Korogwe District?

1.5 Study's theoretical framework

The study was guided by two theories, the theory of diffusion of innovation by Rogers (1962) and the theory of production. The theory of diffusion of innovation by Rogers (1962) argues that an idea or a product gains momentum and diffuses or spreads through a specific population or social system overtime and the end result of this diffusion is that people, as part of the social system, adopt a new idea, behaviour or product (LaMorte, 2016). The theory of diffusion of innovation is relevant to this study because it emphasizes the adoption of new ideas and behaviours among people who are part of the social system through various processes. Thus, much participation in sisal production by smallholder farmers can be achieved overtime after many rural residents have become aware of the benefits and significant roles that come with cultivation of sisal and they have adopted essential sisal farming practices. On the other hand, the theory of production argues that the business firm decides how much of each commodity that it sells particularly its outputs and products it will produce, and how much of each kind of labour, raw materials and fixed capital goods that it will use (Kurz and Salvadori, 1995). The theory of production was relevant to this study because it emphasizes on creation of goods or services that are suitable for use or exchange in a market economy using suitable economic resources or factors of production. Thus, high productivity can be achieved through the availability of suitable factors of production. The link between the theory and the study is based on the key point that the availability and use of suitable economic resources can facilitate high sisal productivity among smallholder sisal farmers.

1.6 Conceptual Framework

The study's conceptual framework (Figure 1.1) shows the interaction of the independent variables and a dependent variable. The independent variables include the households' background variables and other intermediate variables which influence the dependent variable (smallholder farmers' sisal productivity) as an outcome of access to a number of crucial services required for production such as access to credit, extension services, land, inputs and transport facilities. Farmers' choice to cultivate sisal is another intermediate variable influencing the dependent variable as a result of awareness creation approaches used (multimedia and other extension methods) and available suitable drivers that will influence farmers' choice to engage in sisal production such as access to extension agents, financial support, market availability and farm inputs availability Other intermediate variables include policies and marketing conditions. Background variables include household head's age, sex, marital status, main occupation and education. Policies which fall under intermediate variable is agriculture policy, market policy and investment policy as the three have great influence to smallholders' sisal productivity.

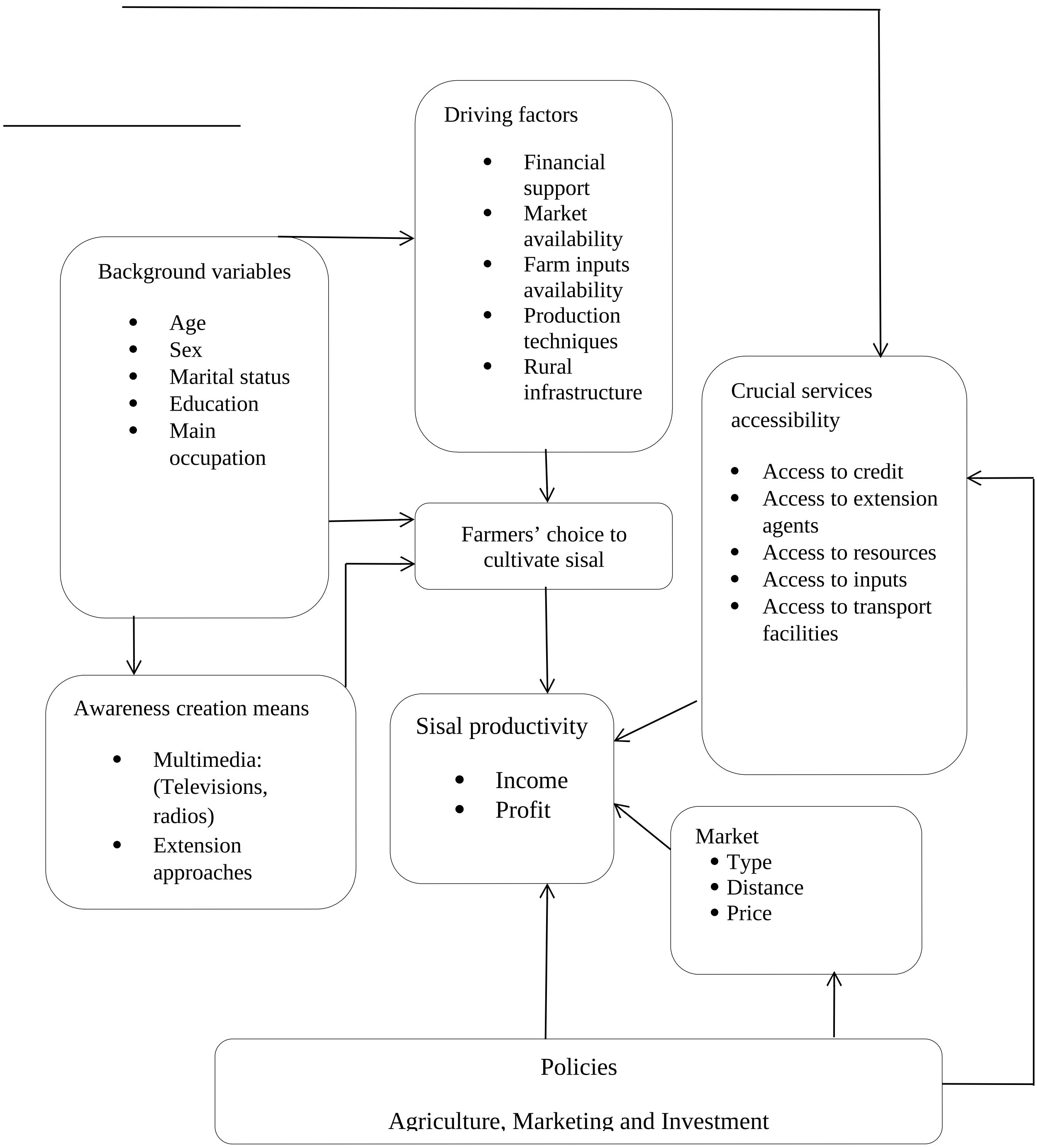

Figure 1. 1 Conceptual Framework (CF) for the drivers and the socio-economic determinants of smallholder sisal farmers' productivity.

1.7 General Methodology

1.7.1 Study Area

The study was conducted in Korogwe District, Tanga region. The district was purposively selected based on the availability of many sisal producing households. The study took place in two wards namely: Mwelya and Ngombezi. Korogwe District was selected due to having many smallholder sisal producers relative to other areas. In addition, the district constitutes the center of Tanzania's sisal industry. According to TSB (2018), the district had 1207 smallholder sisal farmers in 2018 compared to Muheza District which had 49 smallholder farmers.

1.7.2 Research design

The study adopted a cross-sectional research design whereby data were collected once (Setia, 2016). The approach allows one to collect data and determination of association between variables. In addition, it is cost effective and less time consuming while ensuring the appropriate quality of data (Kesmodel, 2018). Furthermore, the study adopted the mixed methods approach whereby both quantitative and qualitative data were collected to enable triangulation of findings.

1.7.3 Study Population, Sample size and Sampling Techniques

1.7.3.1 Study Population

The target population in this study was all the 1 207 smallholder sisal farming households in Korogwe District.

1.7.3.2 Sampling techniques and Sample size

Multistage sampling was employed to select the study's sample. The first stage involved purposive selection of Korogwe District, then two wards (Ngombezi and Mwelya) were purposively selected due to availability of many smallholder sisal producing households. Thereafter, 150 households were randomly selected to participate in the study. Random sampling was based on official sisal estate (Ngombezi and Mwelya) registers made available to the researcher by the estate leaders in the selected wards. Determination of the study's sample size took into consideration the resource limitations that the study could face. Such limitations included time available for the accomplishment of the study, analysis to be employed, availability of field helpers and available funds (Thorpe *et al.*, 2018). Due to these factors, 150 households were seen as an appropriate sample size for the study.

1.7.4 Data Collection

Primary data were collected using a structured questionnaire with open and close-ended questions from 150 selected households. The questionnaire was used to collect data on households' demographic and socio-economic data. In addition, the questionnaire gathered information on the households' sisal production and marketing. On the other hand qualitative data were collected through FGDs and key informant interviews: a total of 6 FGDs were conducted three in each ward and these involved a total of 67 participants; participants of the FGDS ranged between 8– 11 smallholders and the sessions lasted for one to two hours. The FGD participants were male and female smallholder sisal farmers from the two wards covered by the study and were purposively selected. Two key informant interviews were conducted with the managers of Mwelya and Ngombezi sisal estates. The key informants were purposively selected based on their experience in sisal production. Information collected from the FGDs and key informant interviews was mainly on general sisal production, existing opportunities and challenges faced by smallholder sisal producers.

1.7.5 Data Analysis

Qualitative data which were generated were subjected to thematic content analysis. The collected information was summarized based on themes and objectives of the study. Quantitative data collected through the questionnaire were coded and entered into IBM SPSS Statistics software (version 20) for data cleaning and analysis. The analysis included determination of descriptive statistics and inferential statistics (Chi-square test, binary logistic regression and linear regression). The detailed analysis procedure is presented under each manuscript.

1.8 Limitations of the Study

The data were collected during the rainy season and farmers were busy with farming activities; thus, it was difficult to get them. However, with help from estate managers and extension officers in the study area the researcher managed to get to them at some other pre-arranged time. In addition, some areas where farmers resided were hardly accessible due to destructed infrastructure following heavy rains. This limitation was mitigated by use of motorcycles in places where the vehicles could not access.

1.9 Organization of the Dissertation

The dissertation is based on Sokoine University of Agriculture’s dissertation format of publishable manuscripts. Therefore, the dissertation is divided into three different chapters. Chapter One presents the study’s background information, the problem statement and the study’s justification. In addition, it presents the study’s objectives, research questions and conceptual framework. Chapter Two is comprised of publishable manuscript one which covers objective i and iv and provide answers for research questions i and v (as presented in sub-section 1.4.2). Chapter Three consists of publishable manuscript two which covers objectives ii and iii and provides answers for research questions ii, iii and iv. Lastly, Chapter Four presents the study's summary of findings, general conclusions and recommendations.

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CHAPTER TWO

2.0 Drivers for Smallholder Farmers' Participation in Sisal Production in Korogwe District, Tanzania

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2.1 Abstract

In Tanzania, sisal acts as a good source of income and employment to many rural residents whose livelihoods depend on agriculture. Other significant roles of sisal in Tanzania include its cost-effectiveness as it requires minimum maintenance and withstands many Agro-ecological conditions. For many years, Tanzania has been promoting smallholder farmers' participation in the sisal industry. However, there is lack of enough information on drivers that influence smallholder farmers' choice to participate in sisal production. Therefore, the study on which the manuscript is based aimed at assessing the drivers influencing smallholder farmers' choice to cultivate sisal. The study adopted a cross-sectional research design whereby data were collected once from Ngombezi and Mwelya Wards, Korogwe District. Results show that drivers significantly associated with household's choice to produce sisal as a first crop were transport mode ($P \leq 0.1$), labour amount ($P \leq 0.05$) and finally, financial support ($P \leq 0.1$). In addition, smallholder farmers were faced by challenges mainly infrastructural challenges (13%), financial constraints (11.3%) and poor farm inputs availability (9.8%). Therefore, the study recommends that agricultural and investment banks should use existing smallholder farmer groupings such as SACCOS and AMCOS to provide them with loans.

Key words: Drivers, Farmers' choice, Constraints, Sisal production

2.2 Background Information

Sisal (*Agave sisalana)* is a succulent perennial crop. It is a species of the *Agave* genus with origin in southern Mexico. It is a drought resistant plant that can grow well in the arid and semi-arid regions and rainfall amount suitable for its growth is of 1000-1250 mm. Sisal plant grows well in hot climate of temperatures between 10^{0}C and 30^{0}C. It can also tolerate temperatures of 40-50^{o}C (Saxena *et al,* 2011).

The sisal sub-sector is the oldest commercially organized agricultural undertaking and one of the longest surviving agricultural industries in Tanzania (FAO, 2016). The cultivation of sisal in Tanzania started during the era of the German East Africa Company in the 19^{th} century. Sisal was introduced in Tanganyika back in 1893 from Mexico by Richard Hindorf. In addition, the first sisal estates were located near the sea on tidal estuaries to support easier shipment of the sisal fibres and other products.

The cultivation of sisal plays an important and diverse role in the economic development of many countries around the world. In Sub-Saharan Africa (SSA) sisal plays a crucial role economically, socially and environmentally through provision of employment, foreign exchange and development of other socio-economic infrastructures such as improved building plans and establishment of schools and clinics for sisal workers and other people living around the sisal estates (Dlamin *et al.,* 2014).

In 1961, during the time of independence, Tanzania was the leading sisal producer and exporter in the world and the sector had employed over 1 million farmers and other factory workers (Graeme, 2016). The crop became the highest source of the country's foreign exchange. In 1964, a total of 250 000 tons of sisal were produced from regions all over the country. These regions include Tanga, Morogoro, Kilimanjaro, Mwanza and

Shinyanga. Following the Arusha declaration in 1967, most sisal estates were nationalized by the government and this marked the start of its downfall (Kimaro *et al.,* 1994). Moreover, the increasing popularity of synthetic nylon fibres led to the fall in world price of sisal that in return led to the foreclosure of many sisal factories. By 1985, sisal production fell to 32 000 tons from 250 000 tons that were produced in 1964, less than a 15% of the country's peak (FAO, 2016).

Currently, Brazil tops the list of countries producing sisal, followed by Tanzania then Kenya. In 2013, over 281 000 tons of sisal were produced in the world, with Brazil producing 150 584 tons, followed by Tanzania which produced 34 875 tons (Mwaniki, 2018). Other sisal producing countries include Madagascar, China, Guinea, Central Africa Republic, Ethiopia, Malawi, Mozambique, Angola, South Africa and Morocco (FAO, 2016).

The importance of sisal to the communities, nation and globe at large has led to the introduction of various efforts by the government to increase smallholder farmers' participation. Such efforts include the government entering into partnerships with various companies to establish a sisal nucleus settlement scheme responsible for developing business plans to set up marketing and processing arrangements for the sisal grown by smallholder farmers (FAO, 2013).

As a result of the above, the Tanzanian government introduced a scheme known as Sisal Smallholders and Outgrowers Scheme (SISO) where smallholder farmers are given small farms that have been subdivided from the agricultural lands within the estates owned by the Tanzania Sisal Board where they cultivate sisal while the outgrowers cultivate sisal from their own households' land outside the estates. Additionally, a provisional formula has been set for sharing costs and earnings between the smallholders and the board (BOT, 2016). This approach is important as it offers the smallholder farmers not only the accessibility to farms within the estates but, also the market for selling their sisal produce to which the sisal board is hugely responsible.

According to FAO (2013), smallholder sisal farmers in Tanzania are defined as farmers holding usually less or sometimes above 6 hectares of sisal land but, not more than 200 hectares. They are also referred to as emerging farmers and they are often characterized by lack of market experience, lack of access to resources and technology and limited use of agro-chemicals (Oxfam, 2013). In addition, smallholder sisal farmers in Tanzania's sisal value chain involve those in estates and smallholders growing sisal as a cash crop in non-estate areas (BOT, 2016).

Sisal in Tanzania is cultivated in a number of regions mostly with semi-arid conditions. Leading sisal growing regions in Tanzania are Tanga, Morogoro, Kilimanjaro, Coast, Lindi and Mtwara (TIC, 2016). Korogwe District constitutes the center of Tanzania's sisal industry. Sisal production in Korogwe District is mainly based on estates that are controlled and owned by the Tanzania Sisal Board (TSB). Currently, the board is in charge of five estates namely, Hale, Ngombezi, Mwelya, Magunga and Magoma. Nonetheless, the board still applies the SISO scheme that gives smallholder farmers access to farms within these estates and also the market for their produce to both farmers working within the estates and outgrowers.

According to Mwaniki (2018), various socio-economic factors have a direct implication on influencing farmers' choices to cultivate sisal. Most of these factors have a huge potential of improving farmers livelihoods. However, cultivating sisal as a source of income remains the major factor stimulating farmers to cultivate sisal in many areas, though still at low levels.

Despite Tanzania's efforts to promote smallholder sisal production only a small proportion of smallholder farmers are currently participating in sisal production (TIC, 2016). For example, Korogwe District which is the center of the Tanzania's sisal industry only recorded 1207 smallholder sisal farmers in 2018; Muheza District only recorded 49 smallholder farmers (TSB, 2018). The above is happening despite the rising awareness of various benefits of cultivating sisal. Such benefits include employment opportunities, source of foreign exchange, its cost-effectiveness and lastly, its ability to withstand many agro-ecological conditions while requiring minimum maintenance (Srinivasakumar *et al.*, 2013).

Tanzania has for a long time been making efforts to improve production, productivity and commercialization of crop sub-sectors (sisal included) under the Agricultural Sector Development Programme Phase Two (ASDP II). For example, financing agriculture and promoting good agricultural practices, improving extension services provided to smallholder farmers, training for updating skills and knowledge of farmers, improving agricultural mechanization and promoting contract farming (URT, 2016). Despite the above efforts to increase smallholder producers' participation in sisal production (Salum, 2012; Kimaro *et al.*, 1994; FAO, 2013; BOT ,2016) the number of smallholder farmers involved in the sector are low (below 10 000 people) (URT, 2017). Moreover, previous studies have not shown interest in documenting the drivers associated with smallholder sisal farmers' participation in sisal industry hence, little is known about drivers that determine smallholder sisal farmers' participation in sisal production. Therefore, the study on which the manuscript is based aimed at determining drivers for smallholder farmers' participation in sisal production in Korogwe District, Tanzania.

2.3 The Study's Theoretical Framework

The study on which the manuscript is based was guided by the theory of diffusion of innovation by Rogers (1962). The theory argues that an idea or a product gains momentum and diffuses or spreads through a specific population or social system overtime and the end result of this diffusion is that people, as part of the social system, adopt a new idea, behaviour or product (LaMorte, 2016). The theory of diffusion of innovation is relevant to this study because it emphasizes the adoption of new ideas and behaviours among people who are part of the social system through various processes. Thus, much participation in sisal production by smallholder farmers can be achieved overtime after many rural residents have become aware of the benefits and significant roles that come with cultivation of sisal and they have adopted essential sisal farming practices. The link between the theory and the study is based on the key point that the spread of ideas about the benefits of cultivating sisal and adoption of good farming practices among farmers already in production can facilitate increased participation of smallholder farmers in sisal production by attracting new farmers into production while maintaining a good number of those already in production. The study assumes that consistent spread of information about the benefits associated with cultivation of sisal could lead to higher numbers of smallholder farmers into sisal industry. However, this is only possible with the support and readiness of policies (agricultural, marketing and investment policies), rules, regulations and conducive social, political and economic environments.

2.4 Conceptual Framework

The study's conceptual framework has five major components, background variables/demographic factors such as age, sex, education, marital status, occupation and household size. Generally, background variables can influence smallholder farmers' choice to participate in sisal production based on the suitable drivers that will influence farmers' choice to engage in sisal production such as access to extension agents, financial support, market availability and farm inputs availability. In addition, awareness creation approaches used (multimedia and other extension methods) can influence farmers' choice to cultivate or not cultivate sisal. Further to the above, policies such as agricultural, marketing and investment policies can determine farmers' choice to cultivate sisal. Nonetheless, the background characteristics of the households head can determine whether they adopt sisal production and associated innovations/technologies and to what extent as stipulated by the diffusion theory by Rogers (1962).

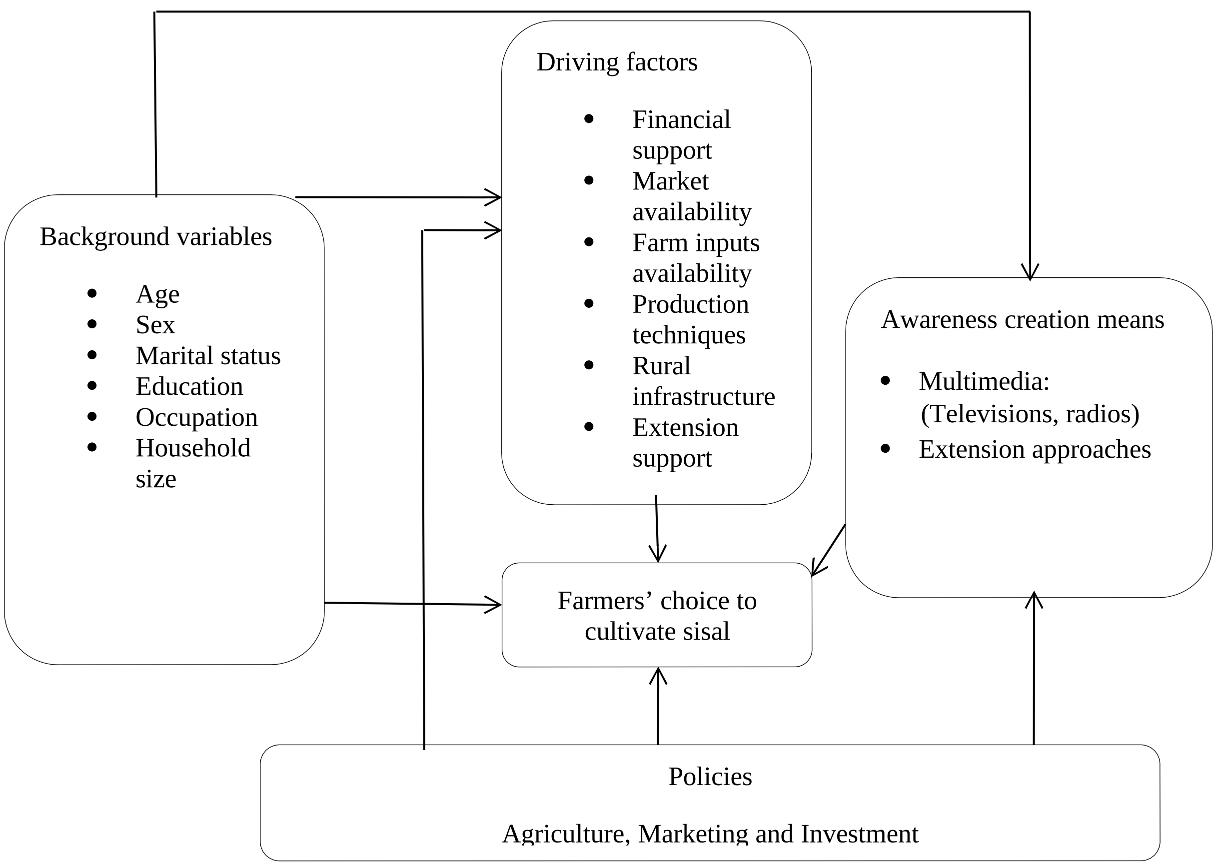

Figure 2. 1: Conceptual Framework for the drivers of farmers' engagement in sisal production

2.5 Methodology

The study was conducted in Korogwe District, Tanga region, specifically in Ngombezi and Mwelya Wards. The district lies between latitudes 4°15’ and 5°15’ South of the Equator and between longitudes 38°0’ and 38°45’ East of the Greenwich Meridian. Korogwe District borders Lushoto District to the North, Muheza District to the East, Handeni District to the South and Kilimanjaro region to the West. The district’s total area is 3756 square kilometers (URT, 2013).

Korogwe District was selected due to having many smallholder sisal producers relative to other areas. In addition, the district constitutes the center of Tanzania’s sisal industry. According to TSB (2018), the district had 1207 smallholder sisal farmers in 2018 compared to Muheza District which had 49 smallholder farmers.

The variations in topography and climate in Korogwe District provide different cropping possibilities which can be divided into three major agro-ecological zones. The three zones are the mountainous, low wetlands and semi-arid zone. An irrigational zone can also be identified along the major rivers (Agroberichtenbuitenland, 2018). Agriculture is the mainstay of the district residents, employing 90% of the households. The crops grown are millet, cassava, beans, paddy, sisal, cotton, sunflower, and cashew nuts while domestic animals kept include goats, sheep, cattle, pigs and chickens.

Korogwe District experiences different climate regimes mainly determined by the interplay of the altitudinal position, temperature and rainfall. Generally, the district experiences two major rainfall seasons, with the long rains between March and May and the short rains between October and December. However, the average annual rainfall varies from year to year and between ecological zones. In the lowland areas, rainfall ranges between 800 to 1000 mm annually, with annual average temperature ranging between 24°C to 31°C. In the mountainous areas temperature range between 21°C to 28°C with the annual rainfall ranging between 800 mm and 2000 mm (URT, 2013).

2.6 Research Design

The study adopted a cross-sectional research design whereby data were collected once (Setia, 2016). The approach allows one to collect data and determination of association between variables. In addition, it is cost effective and less time consuming while ensuring the appropriate quality of data (Kesmodel, 2018). Furthermore, the study adopted the mixed methods approach whereby both quantitative and qualitative data were collected to enable triangulation of findings.

2.7 Sampling procedures and Sample Size

Multistage sampling was employed to select the study's sample. The first stage involved purposive selection of Korogwe District, then two wards (Ngombezi and Mwelya) were purposively selected due to availability of many smallholder sisal producing households. Thereafter, 150 households were randomly selected to participate in the study. Random sampling was based on official sisal estate (Ngombezi and Mwelya) registers made available to the researcher by the estate leaders in the selected wards. Determination of the study's sample size took into consideration the resource limitations that the study could face. Such limitations included time available for the accomplishment of the study, analysis to be employed, availability of field helpers and available funds (Thorpe *et al.*, 2018). Due to these factors, 150 households were seen as an appropriate sample size for the study.

2.8 Data Collection

Primary data were collected using a structured questionnaire with open and close-ended questions from 150 selected households. The questionnaire was used to collect data on households' demographic and socio-economic data. In addition, the questionnaire gathered information on the households' sisal production and marketing. On the other hand qualitative data were collected through FGDs and key informant interviews: a total of 6 FGDs were conducted three in each ward and these involved a total of 67 participants; participants of the FGDS ranged between 8– 11 and the sessions lasted for one to two hours. The FGD participants were male and female smallholder sisal farmers from the two wards covered by the study and were purposively selected. Two key informant interviews were conducted with the managers of Mwelya and Ngombezi sisal estates. The key informants were purposively selected based on their experience in sisal production. Information collected from the FGDs and key informant interviews was mainly on general sisal production, existing opportunities and challenges faced by smallholder sisal producers.

2.9 Data Analysis

Quantitative data collected through the questionnaire was coded and entered into the IBM SPSS Statistics software (version 20) for data cleaning and analysis. Qualitative data was analyzed using thematic content analysis whereby data was summarized based on themes and objectives of the study. The Pearson Chi square statistics test was used to compare association between households' heads socio-demographic characteristics with the choice of crops produced by households. Binary logistic regression was used to determine drivers influencing farmers to cultivate sisal as a first crop. Frequencies and percentages were determined to identify constraints faced by smallholder sisal farmers. Differences or association between variables were considered statistically significant if the p-value was ≤ 0.05 and ≤ 0.1.

The statistical model and the variables that were used are presented below.

The binary logistic regression model was specified as follows:

$$Logit\ (Pi) = \log\ (Pi/1\text{-}Pi)) = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + \ldots\ b_nx_n \ldots\ldots\ldots\ (1)$$

Where;

Logit (Pi) = in odds (event) that is natural log of the odds of an event (farmer's choice to engage in sisal production) occurring

Pi = Prob (event), that is the probability that the event will occur.

1-Pi = Prob (no-event), that is the probability that the event will not occur

b_0= Constant of the equation

$b_{1-¿b_n¿}$ = Coefficients of the independent variables

n = Number of independent variables

$X_1 - X_n$= Predictor variables entered in binary logistic regression model

X_1= Sisal transport mode (Offered by a buyer 1, 0 otherwise), X_2= Household head education level (Primary and above), X_3 = Amount of labour used (total number of people used in production by a household),, X_4= Size of land cultivated with sisal in hectares, X_5 = Financial Support (1 Yes, 0 No), X_6 = Capital source (Loans 1, 0 otherwise) X_7 = Type of inputs used (Advanced inputs 1, 0 otherwise), X_8= Household head's sex (Female 1, 0 male), X_9= Household income source (Agriculture 1, 0 otherwise).

2.10 Results and Discussion

2.10.1 Respondents socio-demographic characteristics

The households' major socio-economic characteristics are as shown in Table 2.1. More than a half (60%) of the household heads were males. The lower number of female headed households (FHHs) was caused by the fact that generally fewer women are involved in sisal cultivation. Moreover, even some of the female respondents were only representing their husbands who could not be available during the interviews and based on the study's approach of using random sampling methods, names were randomly selected from the ward estate registers. In addition, women like to cultivate crops which involve light manual work while sisal requires great labour intensity as it involves a lot of activities which are very intense. The study's finding conforms to findings by Kavita (2018) who argues that women engage themselves mostly in crops which involve light manual work unlike men who can engage in both crops cultivations even those with superior and intensive tasks requiring the use of machines such as sisal.

The age of household heads ranged from 26 to 85 years. Nevertheless, the majority (55.3%) were in the age range of 36-60 years (Middle aged household heads) followed by those above 60 years of age (42.7%). The findings generally suggest that middle aged and older household heads were actively involved in cultivation of sisal. However, the findings also suggest that youth household heads were less involved in cultivation. This is because many youth lack patience when it comes to sisal production. Unlike other crops, sisal requires much time for its cultivation and its production costs are high. The above is emphasized by the quote below:

> *''Many youth prefer to engage in production activities that pay them shortly and with less production costs too. But, sisal cultivation takes time as it requires a number of years for it to be ready for harvesting while incurring various costs of production during all these years of waiting. So, this hinders many youth to involve themselves with the production of sisal'' (FGD participant, Mwelya ward, Korogwe, 22rd February, 2020).*

A high proportion (65.3%) of household heads had primary school education level (Table 2.1). This suggests that the level of literacy in the study area was high and this could easily help farmers to adapt various farming programmes intended to raise their level of productivity and also understand instructions on inputs such as chemical fertilizers and pesticides (Lugamara, 2017).

Findings from the study further show that, almost all the household heads depend on agricultural production as their main occupation. The above is supported by Korogwe District socio-economic profile which shows that, agriculture employs over 90% of district residents (URT, 2016).

Table 2.1: Demographic and socio-economic characteristics of household heads (n=150)

Socio-economic characteristic		Frequency	Percent
Age	20-35	3	2.0
	36-60	83	55.3
	61 and above	64	42.7
Sex	Female	60	40.0
	Male	90	60.0
Education level	Primary	98	65.3
	Secondary	35	23.3
	University	17	11.3
Occupation	Agriculture	144	96.0
	Employed	5	3.3
	Business	1	.7
Marital status	Single	6	4.0
	Married	134	89.3
	Divorced	10	6.7

2.10.2 The association of households’ demographic and socio-economic characteristics and the choice of crops produced by households

Study findings (Table 2.2) show that there was a statistically significant ($P \leq 0.05$) association between the household head’s sex and the choice of crops produced by a household. Generally, fewer women (34.6%) opted to cultivate sisal over other crops unlike their male counterparts whose choice to cultivate sisal over other crops was generally high (65.4%). Sisal cultivation unlike other crops cultivation is labour intensive as it requires a lot of large workforce in relation to its production activities which is why there are so many men in sisal production unlike women. The quote below emphasizes the above:

> *"Sisal production is labour intensive as there are certain activities in its production which require great intensity. It is difficult for women to handle such activities unlike men which is why sisal is mostly seen as a crop for men" (FGD participant, Ngombezi Ward, Korogwe, 14th February, 2020).*

Study findings (Table 2.2) also show that there was no significant association between the choice of the crop produced by a household and education level. This means that a household head's education level did not have much influence on the surveyed households' choices of what crop to cultivate sisal included. The above observation is contrary to what has been reported by Urassa (2010) that education plays a key role in influencing household's livelihood strategy and that an increase in an individual's year of education is expected to increase one's range of work-related skills hence, what he/she chooses to do.

Findings from the study (Table 2.2) also show that there was no significant association between choice of the crop produced by a household and the household head's marital status. The observation simply suggests that a household head's marital status did not determine a farmer's choice to cultivate sisal simply because in most African households, household heads have the power to influence most decisions concerning a household's well-being. Therefore, choice to cultivate sisal would depend less on what a spouse wants.

This observation is in line with Annan *et al*. (2019) who reported that challenging existing social hierarchies favour men's decision-making roles and undermines women's decision-making power.

Table 2.2: The association of households' demographic and socio-economic characteristics and the choice of household crops produced (n=150)

Social-demographic characteristics		Choice of the crops Choose sisal as first choice	Other crops as first choice	χ^2	Sig
Sex	Female	37(34.6)	23(53.5)	4.570	0.033**
	Male	70(65.4)	20(46.5)		
Education level	Primary level	70(65)	28(65.1)		
	Secondary level	27(25.2)	8(18.6)	1.879	0.391
	Tertiary level	10(9.3)	7(16.3)		
Marital status	Single	4(3.7)	2(4.7)		
	Married	96(89.7)	38(88.4)	0.079	0.961
	Divorced	7(6.50	3(7)		
Age	20-35	3(2.80	0(0)		
	36-60	57(53.3)	26(60.5)	1.631	0.442
	61 and above	47(43.9)	17(339.5)		
Household occupation/income sources	Agriculture	102(95.3)	42(97.7)		
	Employed	4(33.7)	1(2.3)	0.603	0.740
	Business	1((0.9)	0(0)		

NB: Number in brackets indicate percentage

** Significant at 5% (P≤0.05) level

2.10.3 Factors influencing farmers' choices to produce sisal as a first crop

Binary logistic regression results (Table 2.3) show that there was a slightly significant (P≤0.1) association between a household's choice to produce sisal as a first crop and the mode of transport used. This means that easier availability and minimum transportation costs may play a bigger part in influencing a farmer to engage in cultivation of a particular crop because many farmers would like to opt for crops with minimum production costs. This finding is supported by BOT (2016) who noted that unlike other cash crops where the buyer supports production from farm preparation, in sisal the buyer provides extension, harvesting and transport services whose costs are borne by the farmers.

Table 2.3 further shows a significant (P≤0.05) association between a household's choice to produce sisal as its first crop and the amount of labour used. This implies that labour had a significant effect in influencing households' choice to cultivate sisal. The observation can be due to both types of labour including household's own labour were applicable and it was not necessarily for a household to hire labour if it had its own. The observation conforms to what has been reported by Dlamini *et al.* (2014) that sisal is ideal in areas where opportunity cost of labour is low which generally excludes a high wage environment.

Table 2.3 also shows a slightly significant (P≤0.1) association between choice to produce sisal as a first crop and financial support. Financial support is crucial for production of any cash crop sisal included. Financial support generally helps farmers to run a smooth production as it enables them to meet their daily operational needs which are important for the overall production. This finding conforms to what has been reported by LSF (2016) that urgent government support including financial help assists sisal growers to improve and maintain their production levels.

Table 2.3: Drivers for selecting sisal as first choice crop production

Independent variables	**B**	**S.E.**	**Wald**	**Df**	**Sig.**	**Exp(B)**
Transport mode	0.716	0.392	3.340	1	0.068*	2.047
HH head education level	0.371	0.229	2.620	1	0.106	1.450
Labor amount	-0.315	0.111	8.109	1	0.004**	0.730
Land amount	0.018	0.045	0.157	1	0.692	1.018
Financial support	0.882	0.530	2.772	1	0.096*	2.416
Capital source	-0.296	0.388	0.582	1	0.445	0.744
Types of Inputs used	0.145	0.315	0.213	1	0.645	1.157
Sex	-0.692	0.480	2.084	1	0.149	0.500
Household Income source	0.902	0.713	1.598	1	0.206	2.464
Constant	0.471	3.149	0.022	1	0.881	1.601

NB: **,* are significance levels at 5%, and 10% respectively.

2.10.4 Constraints Facing Smallholder Sisal Producers

Study findings (Table 2.4) show that 13% of the smallholder farmers faced infrastructural challenges. It was pointed out in the FGDs that rural roads were all destroyed and unreachable during the rainy seasons. The quote below emphasizes the above:

> *‘‘During rainy seasons, roads become full of mud and in complete bad conditions therefore, they become inaccessible. This affects our daily production activities which involve movements such as transporting sisal leaves from the estates to the processing areas. It also poses an increase in transportation cost’’* (FGD Participant, Ngombezi ward, Korogwe, 14th February, 2020).

The results (Table 2.4) also show that 11.3% of the household heads faced financial constraints in their sisal production activities. It was pointed out by a key informant that many farmers had limited access to loans needed to run their daily operational activities. Farmers were either offered fewer amounts of loans that did not meet their operational needs or did not have access to loans at all. This is emphasized by the quote below:

> *‘‘Loans accessibility remains a problem to smallholder sisal farmers because they certainly lack land ownership rights to the land they use for production. Therefore, they cannot use it as collateral and unexpectedly, agricultural banks show no support to these farmers. Hence, most farmers rely on cooperatives only to access loans’’* (Key Informant, Mwelya ward, 17th February, 2020).

Table 2.4 also shows that 9.8% of the smallholder sisal farmers faced inputs availability challenges. It was also pointed out in other FGDs that unavailability of these inputs essential for sisal production reduced human labour effectiveness and decreased farm productivity. The quote below emphasizes the above:

‘‘…the inputs that we farmers are lacking range from improved seeds, crop protection chemicals and fertilizers to machinery and this greatly affects our effectiveness in cultivation in return and it generally reduces our overall productivity’’ (FGD Participant, Ngombezi ward, Korogwe, 14th February, 2020).

The study findings further reveal that 8.3% of the household heads faced high production costs (Table 2.4). It was also pointed out in other FGDs that costs that farmers were incurring during production were high and that the expected profit after selling their produce was too low compared to the production costs they incurred. The quote below emphasizes the above:

‘‘Varying production costs which often change and mostly increase rather than decrease discourage many of us because it is to our expectations that an increase in costs should go in line with an increase in sisal price but, this is not the case. This leads to less profitability to most of us’’ (FGD Participant, Mwelya ward, Korogwe 17th February, 2020).

Generally, the challenges the sisal producers face in production can be the limiting factor for the higher productivity. The study’s finding conforms to the fact that smallholder sisal producers from other countries literally experience the same challenges that Tanzania’s smallholder sisal farmers are facing. For example, according to findings by Dellaert (2014), smallholder sisal farmers in Brazil were mostly faced by high production costs, unsafe working conditions, and poor price of sisal as a result of poor quality of fibres produced as they mostly rely on the use of small and mobile decorticators unlike other smallholder sisal producers from other countries Tanzania included. Also, Mwaniki (2018) reported that Kenya’s smallholder sisal farmers are mostly challenged by land scarcity as rapid population growth has invariably led to land use changes.

Table 2 4: Constraints facing smallholder sisal farmers in Korogwe district (n = 150)

Constraint	Responses	
	Frequency	Percent
Price Challenges	30	6.4
Inputs challenges	46	9.8
Delayed harvesting	10	2.1
Infrastructural challenge	61	13.0
Fire challenges	31	6.6
Decortication	33	7.0
Financial challenges	53	11.3
Payment challenges	20	4.3
Capital Challenges	31	6.6
Market challenges	13	2.8
Energy challenges	15	3.2
Farm management challenge	18	3.8
Climate	3	0.6
Production cost	39	8.3
Education	17	3.6
Transport cost	29	6.2
Seed challenges	5	1.1
Land challenges	15	3.2

***NB*:** The responses do not add up to 150 because of multiple responses.

2.11 Conclusions and Recommendations

2.11.1 Conclusions

The manuscript has assessed the drivers for smallholder farmers' participation in sisal production. Based on the findings it can be concluded that easier availability and minimum costs for transportation played a crucial role in influencing farmers to opt for sisal production. In addition, amount of available labour was another key factor for influencing households' choice to cultivate sisal. It is also concluded that, financial support influenced farmers to opt for sisal production as it enabled smallholder farmers to meet their daily operational needs. The manuscript also assessed constraints faced by smallholder sisal farmers and it can be concluded that smallholder sisal farmers mostly face infrastructural and financial challenges. Other challenges that hugely affect their production are poor availability of farm inputs, capital and high production costs.

2.11.2 Recommendations

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

i. Measures should be taken by the government through the Ministry of Agriculture to increase women's and youth's participation in the sisal sector. Such measures include education to raise awareness about commercial benefits of cultivating sisal, financial assistances and minimizing production costs.

ii. Agriculture and investment banks should consider financing the smallholder farmers through the use of existing smallholder farmers' groupings such as SACCOS and AMCOS to provide them with loans. Also, the government should consider expediting the process of issuing customary land titles to the farmers to be used as collateral when applying for credit/loans.

iii. The Government should consider improving road infrastructures to facilitate easier accessibility to production areas and transportation of yields throughout the year.

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CHAPTER THREE

3.0 Socio-economic Determinants of Smallholder Farmers Sisal Productivity: A Case of Korogwe District, Tanzania

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3.1 Abstract

Tanzania's sisal industry employs about 5475 people, with a total production of about 63 824 tons. This comes following Tanzania's efforts through the Sisal Board of Tanzania (TSB) to promote smallholder farmers' participation in the sisal industry. However, there is lack of enough information on factors that determine smallholder farmers' sisal productivity. Therefore, the study on which this manuscript is based aimed at determining socio-economic determinants of smallholder sisal farmers' productivity. The study adopted a cross-sectional research design whereby data were collected once from Ngombezi and Mwelya Wards in Korogwe District. Results show that factors significantly associated with sisal productivity were size of land allocated to sisal ($P \leq 0.001$), a household's main source of income ($P \leq 0.05$) and finally crops produced as first choice ($P \leq 0.1$). In addition, factors determining smallholder farmers' sisal profitability were sex of the household head ($P \leq 0.1$), size of land ($P \leq 0.05$) and amount of sisal harvested ($P \leq 0.001$). Therefore, the study recommends that agricultural and investment banks should consider financing smallholder sisal farmers so as to enable them increase their productivity.

Key words: Sisal, socio-economic determinants, small-scale sisal farmers, productivity.

3.2 Background Information

Sisal (*Agave sisalana)* is a succulent perennial crop. It is a species of the *Agave* genus with origin in southern Mexico. It is a drought resistant plant that can grow well in the arid and semi-arid regions and rainfall amount suitable for its growth is of 1000-1250 mm. Sisal plant grows well in hot climate of temperatures between 10^0C and 30^0C. It can also tolerate temperatures of 40-50^oC (Saxena *et al.,* 2011). Sisal was introduced in Tanzania by the German East Africa Company in 1893. The company was then largely focused with the development of the country thus, introduced sisal to the coastal areas as an alternative crop because the areas had hotter and drier conditions (FAO, 2013). In addition, the first sisal estates were located near the sea on tidal estuaries to support easy shipment of the sisal fibres and other products.

Generally, Tanzania used to be the world's leading sisal producer in the 1960s. Exportation of sisal contributed to more than a quarter of Tanzania's foreign income in the early 1960s however, by 1967 the production declined drastically (Kimaro *et al.*, 1994). Currently, the production is a quarter of the 1960s production level (FAO, 2016). According to Kimaro *et al.* (1994) the decline of Tanzania's sisal industry was mainly caused by shrinking of the world market and the sisal price, nationalization of sisal estates, poor marketing arrangement and lastly, shortage of labour.

Currently, Brazil tops the list of countries producing sisal, followed by Tanzania then Kenya. Over 281 000 tons of sisal was produced in the world in 2013, with Brazil producing 150 584 tons, followed by Tanzania which produced 34 875 tons (Mwaniki, 2018). Other sisal producing countries include Madagascar, China, Guinea, Central Africa Republic, Ethiopia, Malawi, Mozambique, Angola, South Africa and Morocco (FAO, 2016).

On the other hand, smallholder sisal production plays a crucial role in an overall contribution to the sisal industry globally. In Tanzania, the sisal industry employs about 5475 people, with a total production of about 63 824 tons (URT, 2017).

According to FAO (2013), smallholder sisal farmers in Tanzania are defined as farmers holding usually less or sometimes above 6 hectares of sisal land but, not more than 200 hectares. They are also referred to as emerging farmers and they are often characterized by lack of market experience, lack of access to resources and technology and limited use of agro-chemicals (Oxfam, 2013). In addition, smallholder sisal farmers in Tanzania's sisal value chain involve those in estates and smallholders growing sisal as a cash crop in non-estate areas (BOT, 2016).

Tanzania has for a long time been making efforts to improve production, productivity and commercialization of crop sub-sectors (sisal included) under the Agricultural Sector Development Programme Phase Two (ASDP II). For example, financing agriculture and promoting good agricultural practices, improving extension services provided to smallholder farmers, training for updating skills and knowledge of farmers, improving agricultural mechanization and promoting contract farming (URT, 2016). Despite the above efforts, literature (Salum, 2012; Kimaro *et al.*, 1994; and BOT, 2016) shows that sisal productivity among smallholder farmers is still low (below a ton per hectare) (FAO, 2013). Moreover, previous studies have not shown interest in documenting the socio-economic determinants associated with smallholder sisal farmers' productivity hence, little is known on the same. Therefore, the study on which the manuscript is based aimed at determining the socio-economic determinants of smallholder farmers' sisal productivity in Korogwe District, Tanzania.

Sisal in Tanzania is cultivated in a number of regions mostly with semi-arid conditions. Leading sisal growing regions in Tanzania are Tanga, Morogoro, Kilimanjaro, Coast, Lindi and Mtwara (TIC, 2016). Korogwe District constitutes the center of Tanzania's sisal industry. Sisal production in Korogwe District is mainly based on estates that are controlled and owned by the Tanzania Sisal Board (TSB). Currently, the board is in charge of five estates namely, Hale, Ngombezi, Mwelya, Magunga and Magoma. Nonetheless, the board still applies the Sisal Smallholders and Outgrowers scheme (SISO) that gives smallholder farmers access to farms within these estates and also the market for their produce to both farmers working within the estates and outgrowers.

Generally, smallholder sisal farmers' productivity is determined by a number of socio-economic determinants. According to Krugman (1994), productivity is the measure of efficiency in converting inputs into useful outputs. Sisal productivity is highly reliant on what the farm is used for and is highly determined by physical capital used for sisal production, human capital, training, experience and lastly, natural resources including land. But, for the case of this study, sisal productivity refers to the term given to the output of sisal in terms of the land input. Therefore, productivity was measured using single factor productivity i.e. tons/ha.

3.3 The Study's Theoretical Framework

The study on which the manuscript is based was guided by the theory of production. The theory argues that the business firm decides how much of each commodity that it sells particularly its outputs and products it will produce, and how much of each kind of labour, raw materials and fixed capital goods that it will use (Kurz and Salvadori, 1995). The theory of production was relevant to this study because it emphasizes on creation of goods or services that are suitable for use or exchange in a market economy using suitable economic resources or factors of production. Thus, high productivity can be achieved through the availability of suitable factors of production. The link between the theory and the study is based on the key point that the availability and use of suitable economic resources can facilitate high sisal productivity among smallholder sisal farmers. The study assumed that sufficient availability and use of suitable factors of production mainly land; labour and capital by smallholder sisal farmers could lead to higher sisal yields thus, enabling households to generate more profits from sisal production. However, this is only possible with the support and readiness of policies, rules, regulations and conducive social, political and economic environments.

3.4 Conceptual Framework

The study's conceptual framework (Figure 3.1) shows the interaction of the independent and dependent variable. The independent variables include the households' background variables and other intermediate variables which influence the dependent variable (smallholder farmers' sisal productivity) as an outcome of access to a number of crucial services required for production such as access to credit, extension services, land, inputs and transport facilities. Other intermediate variables include policies and marketing conditions. Background variables include household head's age, sex, marital status, main occupation and education. Policies which fall under intermediate variable is agriculture policy, market policy and investment policy as the three have great influence to smallholders' sisal productivity.

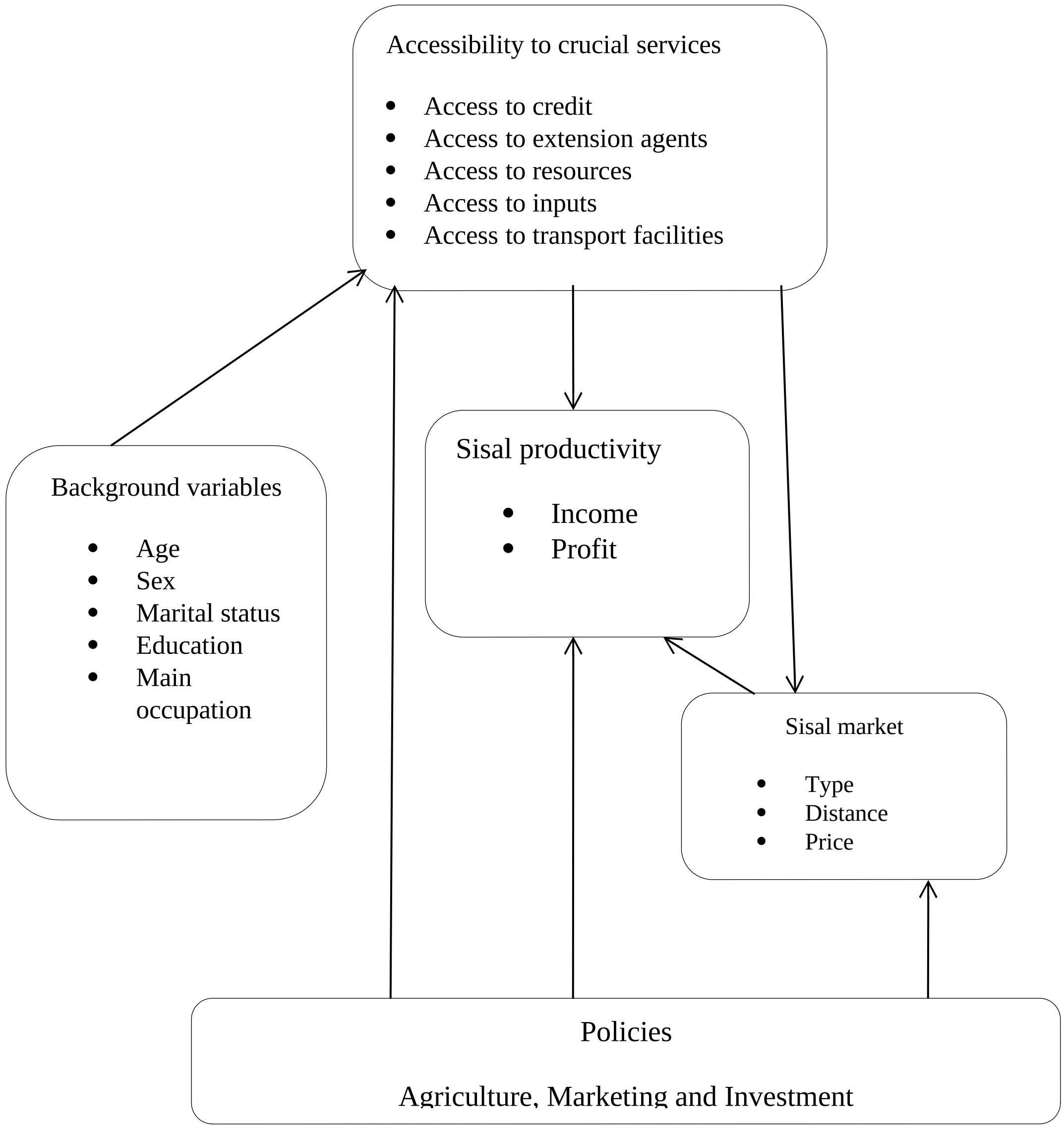

Figure 3. 1: Conceptual Framework (CF) for socio-economic determinants of smallholder sisal farmers' productivity.

3.5 Methodology

The study was conducted in Korogwe District, Tanga region, specifically in Ngombezi and Mwelya Wards. The district lies between latitudes 4°15' and 5°15' South of the Equator and between longitudes 38°0' and 38°45' East of the Greenwich Meridian. Korogwe District borders Lushoto District to the North, Muheza District to the East, Handeni District to the South and Kilimanjaro region to the West. The district's total area is 3756 square kilometers (URT, 2013).

Korogwe District was selected due to having many smallholder sisal producers relative to other areas. In addition, the district constitutes the center of Tanzania's sisal industry. According to TSB (2018), the district had 1207 smallholder sisal farmers in 2018 compared to Muheza District which had 49 smallholder farmers.

The variations in topography and climate in Korogwe District provide different cropping possibilities which can be divided into three major agro-ecological zones. The three zones are the mountainous, low wetlands and semi-arid zone. An irrigational zone can also be identified along the major rivers (Agroberichtenbuitenland, 2018). Agriculture is the mainstay of the district's residents, employing 90% of the households. The crops grown are millet, cassava, beans, paddy, sisal, cotton, sunflower, and cashew nuts while domestic animals kept include goats, sheep, cattle, pigs and chickens.

Korogwe District experiences different climate regimes mainly determined by the interplay of the altitudinal position, temperature and rainfall. Generally, the district experiences two major rainfall seasons, with the long rains falling between March and May and the short rains between October and December. However, the average annual rainfall varies from year to year and between ecological zones. In the lowland areas, rainfall ranges between 800 to 1000 mm annually, with annual average temperature ranging between 24°C to 31°C. In the mountainous areas temperature range between 21°C to 28°C with the annual rainfall ranging between 800 mm and 2000 mm (URT, 2013).

3.6 Research Design

The study adopted a cross-sectional research design whereby data were collected once (Setia, 2016). The approach allows one to collect data and determination of association between variables. In addition, it is cost effective and less time consuming while ensuring the appropriate quality of data (Kesmodel, 2018). Furthermore, the study adopted the mixed methods approach whereby both quantitative and qualitative data were collected to enable triangulation of findings.

3.7 Data Collection

Primary data were collected using a structured questionnaire with open and close-ended questions from 150 selected households. The questionnaire was used to collect data on households' demographic and socio-economic data. In addition, the questionnaire gathered information on the households' sisal production and marketing. On the other hand qualitative data were collected through FGDs and key informant interviews: a total of 6 FGDs were conducted three in each ward and these involved a total of 67 participants; participants of the FGDS ranged between 8– 11 and the sessions lasted for one to two hours. The FGD participants were male and female smallholder sisal farmers from the two wards covered by the study and were purposively selected. Two key informant interviews were conducted with the managers of Mwelya and Ngombezi sisal estates. The key informants were purposively selected based on their experience in sisal production. Information collected from the FGDs and key informant interviews was mainly on general sisal production, existing opportunities and challenges faced by smallholder sisal producers.

3.8 Sampling procedures and Sample Size

Multistage sampling was employed to select the study's sample. The first stage involved purposive selection of Korogwe District, then two wards (Ngombezi and Mwelya) were purposively selected due to availability of many smallholder sisal producing households. Thereafter, 150 households were randomly selected to participate in the study. Random sampling was based on official sisal estate (Ngombezi and Mwelya) registers made available to the researcher by the estate leaders in the selected wards. Determination of the study's sample size took into consideration the resource limitations that the study could face. Such limitations included time available for the accomplishment of the study, analysis to be employed, availability of field helpers and available funds (Thorpe *et al.*, 2018). Due to these factors, 150 households were seen as an appropriate sample size for the study.

3.9 Data Analysis

Quantitative data collected through the questionnaire was coded and entered into the IBM SPSS software Statistics (version 20) for data cleaning and analysis. Qualitative data was analyzed using thematic content analysis whereby data was summarized based on themes and objectives of the study. Linear regression was used to determine determinants for smallholder farmers' sisal productivity and profitability. Sisal productivity (tons/ha) was determined by calculating an average of households' sisal yields where the district's average sisal production (tons) was divided by district's average farm size (ha) under sisal production. Likewise, Sisal profitability was determined by calculating the difference between revenues obtained by smallholder farmers in sisal production and costs incurred by smallholder farmers during sisal production (i.e. Profit= Revenue – Costs). Differences or association between variables were considered statistically significant if the p-value was ≤ 0.001, ≤ 0.05 and ≤ 0.1.

The statistical model and the variables that were used are presented below.

The linear regression model for factors determining smallholders' sisal productivity was specified as:

$Y = b_0 + b_1X_1 + b_2X_2 + \dots b_nX_n + \varepsilon_i$

Y = The expected or predicted sisal productivity (tonnes/ha)

b_0 = the value of Y when all of the independent variables (X_1 through X_n) are equal to zero.

b_1 - b_n = estimated regression coefficients

X_1 - X_n = predictor variables entered in the linear regression model.

X_1 = Years of experience in sisal production, X_2 = Education of the household head (Primary and above 1, 0 otherwise) X_3 = Size of land cultivated with sisal in hectares, X_4 = Amount of labour used (total number of people used in production by a household), X_5 = Crops produced as first choices (Sisal 1, 0 otherwise), X_6 = Household main source of income (Agriculture 1, 0 otherwise), X_7 = Sex of the household head (Female 1, 0 Male), X_8 = Type of inputs used (Advanced inputs 1, 0 otherwise), X_9 = Number of support given

Likewise, the linear regression model for factors determining smallholders' sisal profitability was specified as:

$Y = b_0 + b_1X_1 + b_2X_2 + …. b_nX_n + \varepsilon_i$

Y = The expected or predicted profitability

b_0 = the value of Y when all of the independent variables (X_1 through X_n) are equal to zero.

b_1 - b_n = estimated regression coefficients

X_1 - X_n = predictor variables entered in the linear regression model.

X_1 = Household head's age measured in years, X_2 = Household head's sex (Female 1, 0 male), X_3 = Amount of sisal harvested (tons), X_4 = Years of experience in sisal production, X_5 = Household head's marital status (Married 1, 0 otherwise), X_6 = Size of land cultivated with sisal in hectares, X_7 = Household head's main occupation (Agriculture 1, 0 otherwise), X_8 = Type of sisal products sold (Processed fibres 1, 0 otherwise), X_9 = Household head's education level (Primary and above 1, 0 otherwise)

3.10 Results and Discussion

3.10.1 Respondents socio-demographic characteristics

The households' major socio-economic characteristics are as shown in Table 3.1. More than a half (60%) of the household heads were males. The lower number of female headed households (FHHs) was probably caused by the fact that generally fewer women are involved in sisal cultivation. Moreover, even some of the female respondents were only representing their husbands who could not be available during the interviews and based on the study's approach of using random sampling methods, names were randomly selected from the ward estate registers. In addition, women mostly cultivate crops which involve light manual work while sisal requires great labour intensity as it involves a lot of activities which are very intense. The study finding conforms to findings by Kavita (2018) who argue that women mostly cultivate crops which involve light manual work unlike men who can cultivate all crops even those involving superior and intensive tasks requiring the use of machines such as sisal.

The age of the household heads ranged from 26 to 85 years. Nevertheless, the majority (55.3%) were in the age range of 36-60 years (Middle aged household heads) followed by those above 60 years of age (42.7%). The findings (Table 3.1) generally suggest that middle aged and older household heads were actively involved in cultivation of sisal. However, the findings also suggest that youth household heads were less involved in cultivation. This is because many youth lack patience when it comes to sisal production; unlike other crops, sisal requires much time for its cultivation and its production costs are high. The above is emphasized by a quote below:

> ''*Many youth prefer to engage in production activities that pay them shortly and with less production costs too but, sisal cultivation takes time as it requires a number of years for it to be ready for harvesting while incurring various costs of production during all these years of waiting. So, this hinders many youth to involve themselves with the production of sisal*'' (FGD Participant, Mwelya ward, Korogwe, 22rd February, 2020).

A high proportion (65.3%) of household heads had primary school education level (Table 3.1). This suggests that the level of literacy in the study area was high and this could easily help farmers to adapt various farming programmes intended to raise their level of productivity and also understand instructions on inputs such as chemical fertilizers and pesticides (Lugamara, 2017).

Findings from the study (Table 3.1) further show that, almost all the surveyed household heads depend on agricultural production as their main occupation. The above is supported by Korogwe District socio-economic profile which shows that, agriculture employs over 90% of district residents (URT, 2016).

Table 3. 1: Demographic and socio-economic characteristics of household heads (n=150)

Socio-economic characteristic		**Frequency**	**Percent**
Age	20-35	3	2.0
	36-60	83	55.3
	61 and above	64	42.7
Sex	Female	60	40.0
	Male	90	60.0
Education level	Primary	98	65.3
	Secondary	35	23.3
	University	17	11.3
Occupation	Agriculture	144	96.0
	Employed	5	3.3
	Business	1	.7
Marital status	Single	6	4.0
	Married	134	89.3
	Divorced	10	6.7

3.10.2 Level of Sisal Production in Korogwe District

Sisal as a crop was very important to many sisal cultivating households in Korogwe District and this was clearly identified during the household survey and focus group discussions whereby 99.3% of household heads ranked it as the most important crop to the household (Table 3.2). Both the FGDs and the interviewed farmers referred it as great source of households' income. Most of the household heads who ranked sisal as the number one crop based their arguments on its importance both as their main source of income earnings, its minimum maintenance requirements, ability to withstand many agro-ecological conditions and lastly, its ability to produce continuous fibres for many years. The above is emphasized by the quote below:

> ''…*sisal has fewer complications when compared to some other crops because it sustains many climatic conditions unlike other crops and its production and maintenance activities become less as years pass by and this gives us ample time to focus on other household's income earning activities*'' (FGD Participant, Mwelya ward, Korogwe, 21st February, 2020).

The greater importance of sisal crop to the farmers was based on the quantitative estimates of sisal output and the area cultivated with sisal. Table 3.3 shows that the average of 0.64 tonnes/ha sisal yield observed for households in Mwelya Ward were relatively higher than the averages observed for Ngombezi Ward. The findings further show that average farm size allocated to sisal by all households was 8.6 ha. However, households in Ngombezi Ward allocated more land to sisal i.e. 9.97 ha. The observation that yields are highest in Mwelya, where average farm size is slightly smaller than Ngombezi suggests that larger farms are not as productive as smaller farms. However, other factors might be involved on the sisal yield differences noted. The study's observation conforms to Wickramaarachchi and Jeevika (2018) who found that smaller farms in Sri Lanka were more productive as their operators apply more inputs, particularly labour hence, resulting into higher output.

Table 3. 2: Ranking of sisal crop based on its importance to the household

	Frequency	Percent
First	149	99.3
Second	1	0.7
Total	150	100.0

Table 3. 3: Surveyed households' sisal production for the 2018/2019 season (n=150)

Characteristic		n = 150	Ngombezi	Mwelya
			n_N = 75	n_M = 75
Average households' sisal production (tons) 2018/19		5.04	5.54	4.55
Average households' sisal yield (tons/ha) 2018/19		0.625	0.61	0.64
Average farm size under sisal production		8.6	9.77	7.42
Is crop farm a single plot of land	Yes	28 (18.7)	5 (6.7)	23 (30.7)
	No	122 (81.3)	70 (93.3)	52 (69.3)

n_N and n_M refers to number of households from Ngombezi and Mwelya respectively.

3.10.3 Costs of Sisal Production

The costs incurred by small-scale sisal farmers during sisal production were divided into two phases. The first phase involved the costs that farmers incurred during the early stages of production and which were paid directly by the farmers themselves. These costs included farm preparation, seed preparation, planting and weeding costs. The second phase involved harvesting, transportation and lastly, processing and decortication costs. Unlike the former, the latter were at first paid by the buyer and then farmers would be obliged to wait until fibres have been processed and purchased by a buyer, then and only then the second phase's costs would be cut directly from the farmers' money during payments by cooperatives. The quote below emphasizes the above:

> *''Unlike other cash crops where buyers support farmers from farm preparation to harvesting, in sisal a farmer incurs all necessary costs all by himself. However, during harvesting season a buyer provides harvesting and transport services whose costs are borne by a farmer but, in this way a buyer earns control over the sisal fibre quality''* (FGD Participant, Mwelya ward, Korogwe, 21st February, 2020).

3.10.4 Market Situation of Sisal in Korogwe District

Table 3.4 shows that all farmers (100%) sold their sisal produce to a tenderer who happens to win a tender for the particular sisal selling season, a process ran by cooperatives under the sisal board. The observation that all farmers relied upon one buyer per selling season suggests that there is a limited market for sisal produce and that prices offered could be low due to lack of competition. The observation conforms to BOT (2016) who reported that presence of few buying companies impairs competition, leading to low prices. Table 3.4 also shows that type of sisal product sold mostly by small-scale farmers of sisal was processed sisal fibres (97.3%). This also suggests that there is a limit in range of type of products sold by small-scale sisal farmers hence, lower profitability to small-scale farmers. The quote below emphasizes the above:

> *‘‘There is a good number of sisal products that farmers could offer to the market and some of them are handy made including ropes and, in this way they could have expanded their profitability rate. However, many farmers are obsessed with selling of sisal fibres only hence, sisal production remains less profitable to them’’* (Key Informant, Mwelya ward, Korogwe, 18th February, 2020).

Table 3. 4: Sisal marketing by surveyed households (n=150)

		n=150
Buyer	Tenderer	150(100)
Type of product sold	Raw leaves	4 (2.7)
	Processed sisal fibres	146(97.3)

3.10.5 Factors Determining Sisal Productivity of Smallholder Sisal Farmers.

Linear regression analysis results (Table 3.5) show that there was a significant ($P \leq 0.001$) association between sisal productivity and amount of land (ha) allocated to sisal. This implies that amount of land allocated to sisal production plays a bigger part in influencing and determining its productivity. The quote below emphasizes the above:

> *‘‘…amount of land determines productivity however, in traditional agriculture, smaller farms have been associated with greater productivity because it is often perceived that less land allows farmers to use more inputs such as fertilizer, use*

> *the land more intensely and adopt more technology unlike in larger farms. Also, farmers with smaller farms usually employ family members, only hiring the more expensive low-hour workers when family labour potential is exhausted unlike farmers with larger farms who have to employ expensive non-family labour''* (Key Informant, Ngombezi ward, Korogwe, 20th February, 2020).

Table 3.5 further shows there was a slightly significant (P≤0.1) association between sisal productivity and sisal being produced as a first choice crop. This means that expectation that sisal is a great source of household income than other crops gives it an advantage of being highly prioritized by a household. Therefore, much attention and higher priority including the use of more inputs and better technologies will be directed towards it thus, eventually leading to higher output. The study results conform to those of Mwaniki (2018) that, cultivating sisal as a source of income is a major factor encouraging uptake of the crop's cultivation by rural households.

Further to the above, Table 3.5 shows existence of a significant association between sisal productivity (P≤0.05) and households' source of income. This means that household's source of income can influence a household's sisal productivity whereby households with sufficient income sources are more likely to obtain higher productivity because they can afford adopting better technologies and purchasing the same on time. The finding conforms to Ruiz (2014) who reported that improved access to finance can increase farmers' investment choices and provide them with more effective tools hence, improved productivity. The study findings also conform to the theory of production by Kurz and Salvadori (1995) that suitable economic resources or factors of production capital included determine profitability.

Table 3. 5: Factors determining sisal productivity of smallholder sisal farmers

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	0.880	0.105		8.386	0.000***		
Year of producing sisal	-0.003	0.004	-0.063	-0.803	0.423	0.932	1.073
Household head education	0.048	0.058	0.068	0.840	0.403	0.869	1.150
Land allocated to sisal (ha)	-0.012	0.003	-0.384	-3.721	0.000***	0.533	1.875
Amount of labour used	-0.046	0.103	-0.045	-0.444	0.658	0.548	1.823
Sisal produced as first choice	-0.076	0.040	-0.152	-1.883	0.062*	0.871	1.148
Household's main source of income	-0.057	0.029	-0.154	-1.985	0.049**	0.949	1.053
Household head's sex	-0.003	0.037	-0.007	-0.088	0.930	0.898	1.113
Type of equipment used	0.008	0.024	0.031	0.354	0.724	0.755	1.325
Number of support given	0.008	0.022	0.029	0.376	0.708	0.934	1.070

NB: ***, **,* are significance levels at 1%, 5%, and 10% respectively.

3.10.6 Factors Influencing Smallholder Sisal Farmers Profitability

Linear regression results (Table 3.6) show a significant association between a household head's sex and sisal profitability. This implies that male headed households cultivating sisal get higher profit relative to female headed households. The observation suggests that the intensity nature of sisal cultivation forces women to use more of a hired labour to help them perform the intense cultivation tasks that could not be performed by them. Thus, incurring more production costs unlike men who can perform all the intense activities by themselves hence, saving the money they could have paid to hired labourers. The above is emphasized by the quote below:

> *''Women participating in sisal cultivation are forced to use more hired labour because sisal cultivation is characterized with very intense activities some of which are not easily performed by women thus, hiring of labourers. In turn, this adds to the other costs that women incur in production thus, profiting less compared to men''* (FGD Participant, Mwelya ward, Korogwe, 18th February, 2020).

Table 3.6 further shows a significant (P≤0.05) negative association between amount of land allocated to sisal production and its profitability. This means that the more land a household allocates to sisal production the less profit it gets. Therefore, suggesting that small farms are more profitable compared to bigger farms. The observation is in line with Yu *et al.* (2015) who found that subsidizing farmers to rent land without helping them to become better-equipped could result in resource misallocation towards larger farms using less-efficient labour technologies.

Table 3.6 further shows there was a significant association (P≤0.05) between amount of sisal harvested and the profitability. This implies that the more sisal yields that a smallholder farmer harvests the more profit and vice versa. Also, based on economies of scale, smallholder farmers with more produce are more profitable as their production costs become lowered through spread of costs over a large number of their harvests. This observation conforms to what has been reported by Kenton (2020) that individuals and companies can achieve economies of scale by increasing production and lowering costs because this enables costs to be spread over a large number of goods. The above is supported by the quote below:

> ‘‘*Even with all the charges that are cut by the cooperatives after payments, farmers with more produce (i.e. higher production) are likely to obtain more profits because they have an assurance of selling many tons of fibres to the buyer unlike farmers with less harvest*’’ (FGD Participant, Ngombezi ward, Korogwe, 21th February, 2020).

Table 3. 6: Factors determining profitability of smallholder sisal farmers

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF

(Constant)	14.649	0.781		18.753	0.000***		
Sex of the household head	-0.204	0.107	-0.118	-1.911	0.058*	0.791	1.264
Occupation	0.157	0.202	0.045	0.779	0.437	0.909	1.100
Household head's marital status	0.186	0.149	0.072	1.250	0.213	0.915	1.093
Year of producing sisal	-0.011	0.011	-0.059	-1.045	0.298	0.953	1.049
Amount of labour used	0.021	0.015	0.112	1.418	0.159	0.489	2.043
Land allocated to sisal (ha)	-0.030	0.012	-0.246	-2.427	0.016**	0.295	3.388
Household's main source of income	0.194	0.124	0.090	1.570	0.119	0.915	1.093
Sisal products sold	-0.347	0.311	-0.066	-1.115	0.267	0.853	1.173
Tone of sisal harvested	2.591	0.281	0.916	9.220	0.000***	0.307	3.256

NB: ***,**,* are significance levels at 1%, 5%, and 10% respectively.

3.11 Conclusions and Recommendations

3.11.1 Conclusions

The manuscript has assessed the socio-economic determinants for smallholder farmers' sisal productivity and also, the factors that determine smallholder sisal producers' profitability. Based on the findings it can be concluded that size of land planted with sisal owned by the smallholder sisal producers plays a crucial role in influencing sisal productivity. However, smaller farms are more productive than larger farms as the former allows farmers to use more inputs and intensely thus, utilizing the land unlike larger farms. Also, the choice to produce sisal as a first crop is associated with the crop's higher productivity. Lastly, it is concluded that a household's main source of income determines its sisal productivity. On the other hand, the manuscript assessed the factors that determine household's sisal profitability. It is hereby concluded that a household head's sex determines profitability with those headed by men profiting more than those of women; the intensity nature of sisal cultivation forces women to use more of a hired labour unlike men who can perform all the tasks. Also, size of land allocated to sisal is highly associated with profitability. Lastly, it is concluded that amount of sisal harvested (tonnes) determines sisal profitability of the sisal cultivating households.

3.11.2 Recommendations

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

i. Smallholder sisal farmers should adapt better farming practices that will enable them raise their productivity and in turn lead to higher profit. Such practices include the use of modern farm equipment including tractors and agro-chemicals.

ii. Furthermore, the farmers need to be more creative and increase the range of types of sisal products they offer to the market instead of relying on selling of fibres only. The government also should find ways through which the market for these products will be assured. By doing these, the profitability among sisal smallholder farmers will increase. .

iii. The government through the Ministry of Agriculture, Cooperatives and Food Security should consider allowing more buyers of sisal so as to allow competition that will eventually lead to higher sisal prices. This will enable farmers to benefit more from their produce by selling sisal at reasonable prices.

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CHAPTER FOUR

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Summary and Findings

Below is a summary of the study's major findings in a chronological order as per presented manuscripts.

4.1.1 Drivers for smallholder farmers' participation in sisal production

Objective one aimed at determining the drivers that influence farmers' choice to engage in sisal production. And objective two aimed at assessing the constraints faced by smallholder sisal farmers. Generally, the study results show that drivers that were significantly associated with household's choice to produce sisal as a first crop were transport mode ($P \leq 0.1$), labour amount ($P \leq 0.05$), and lastly, financial support ($P \leq 0.1$).

The study results also show that, the constraints that were mostly faced by smallholder sisal farmers were infrastructural challenges (13%), financial constraints (11.3%) and poor farm inputs availability (9.8%).

4.1.2 Socio-economic Determinants of Smallholder Farmers' Sisal Productivity

Objective three of the study aimed at determining smallholder sisal farmers' productivity. And objective four involved determination of smallholder sisal farmers' profitability. The results of the study show that average households' sisal yield (tons/ha) was 0.62 tons/ha. The average farm size allocated to sisal by all households was 8.6 ha. Households in Ngombezi ward allocated more land to sisal i.e. 9.97 ha. However, yields were highest in Mwelya ward (0.64 tons/ha) where the average farm size was smaller. Study results further show that the factors significantly associated with sisal productivity were size of land allocated to sisal ($P \leq 0.001$), a household's main source of income ($P \leq 0.05$) and finally crops produced as first choice ($P \leq 0.1$).

The study results further show that, the factors that were significantly associated with smallholder farmers' sisal profitability were sex of the household head ($P \leq 0.1$), size of land ($P \leq 0.05$) and amount of sisal harvested ($P \leq 0.001$).

4.2 Conclusions

Generally, it can be concluded that many farmers are motivated by easier availability and minimum costs for transportation to participate in sisal production. Also, amount of labour required for sisal production is another key factor influencing households' choice to engage in sisal cultivation. This is because farmers have options not to hire labour if they have their own household's labour thus, saving unnecessary costs. It is also concluded that, financial support influences farmers to opt for sisal production as it enables small-scale farmers to meet their daily operational needs. It is further concluded that smallholder sisal farmers are generally faced by infrastructural and financial challenges. Other challenges that hugely affect their production are poor availability of farm inputs, poor capital and high production costs.

Based on the study findings it is further concluded that size of land planted with sisal is associated with a household's sisal productivity whereby smaller farms are more productive than larger farms. This is due to the fact that smaller farms allow farmers to use more inputs and intensely utilize the land unlike larger farms. Also, the choice to produce sisal as a first crop is associated with the crop's higher productivity. It is also concluded that a household's main source of income determines its sisal productivity. It is further concluded that sex determines profitability with men profiting more than women. This is due to the intensity nature of sisal production that forces women to use more of a hired labour unlike men who can sustain all the hard tasks. Also, size of land allocated to sisal is highly associated with profitability. Lastly, it is concluded that amount of sisal harvested (tons) determines sisal profitability of the sisal cultivating households.

4.3 Recommendations

Therefore, based on the study findings and conclusions it is recommended that;

i. Agriculture and investment banks should consider financing the smallholder sisal farmers through the use of existing smallholder farmer groupings such as SACCOS and AMCOS to provide them with loans. Also, the government should consider expediting the process of issuing customary land titles to the farmers to be used as collateral so as to make it even easier for farmers to get loans.

ii. The government should consider improving road infrastructures to facilitate easier accessibility to production areas and transportation of yields throughout the year. By doing this, not only transportation of yields will be easier but also costs for transportation of yields will be reduced.

iii. The government through the Ministry of Agriculture, Cooperatives and Food Security should consider allowing more buyers of sisal so as to allow competition that will eventually lead to higher sisal prices. This will enable farmers to benefit more from their produce by selling sisal at reasonable prices.

4.4 Areas for Further Study

Generally, the study has observed that determinants that encourage smallholder farmers to engage in sisal production are few and they are faced by many challenges in their production activities. Moreover, following the ongoing reforms being made to the sisal sector, they might trigger an increase in the number of smallholder farmers in sisal production in the near future and help them raise productivity too. Therefore, there is a need to conduct a similar research to see if there will be any changes brought about by the reforms compared to the current situation.

APPENDICES

Appendix 1: Respondents questionnaire

TITLE: Drivers for Smallholder Farmers’ Participation in Sisal Production and Socio-economic Determinants of Smallholder Farmers for Sisal productivity: A Case of Korogwe District, Tanzania.

A Master Student research questionnaire for: BELEKO, A.H. P.O. BOX 3035, SUA, MOROGORO.

General objectives

To determine the socio-economic factors associated with small-scale farmers’ sisal productivity in Korogwe district.

Specific objectives

Specifically, the study aimed to;

i. Identify drivers for farmers’ choice to produce sisal in the study area.

ii. Determine smallholder farmers’ sisal productivity.

iii. Determine profitability of small-scale sisal farmers’ productivity in Korogwe district.

iv. Identify constraints faced by small-scale sisal producers in the study area.

General Instructions to Enumerators

Introduce yourself briefly to each respondent before starting to ask them questions. Make an introduction about yourself to the respondents by greeting them locally and allow them to introduce themselves to you; let them know the institution you are working for and make the purpose and objective of this study clear (build rapport). Please fill the questionnaire according to the respondents responses (avoid recording your own words/feeling). Please ask each question clearly and patiently and make clarifications whenever necessary until respondents understand clearly what you are seeking. Avoid the use of technical terms while discussing with the respondents to make communication even better and easier. Lastly, explain to the respondents that the information collected shall be kept private, confidential and only used for the purpose and benefit of the study.

SECTION A: Respondent's Background Information

- ✓ Tick the appropriate answer or fill in the space provided.

1. Household head's age……………….
2. Household head's sex:
   (i) Male ( )
   (ii) Female ( )
3. Household head's education level
   (i) Primary
   (ii) Secondary
   (iii) University
4. Actual years of schooling ………………….
5. Household head's main occupation………………….
6. Household head's marital status
   (i) Married ( )
   (ii) Single ( )
   (iii) Divorced ( )
7. Household size…………………………

SECTION B: Socio-economic Information

8. What is the amount of land (ha) owned by a household? …………………. (ha)
9. Is the household's farm a single plot? Yes ( ) No ( )
10. If no how many plots does the household have? ……………………….
11. Amount of land allocated to each crop produced by a household

S/NO	Type of crop	Land allocated/ set aside in ha
1.		
2.		
3.		

12. Household's main source of income………………….
13. Other sources of household's income (Specify).
    (i) ………………………….
    (ii) ………………………….
    (iii) ………………………….

14. What farming activities is the household involved in?
    (i) Crop production ( )
    (ii) Livestock production ( )
    (iii) Both crop and livestock production ( )
    (iv) Aquaculture, crop production and livestock production
    (v) Others (specify) ……………………

15. Ranking of crops produced by farmers in terms of importance

S/NO	**Crop**	**Household's ranking of the crop**
1		
2		
3		
4		

16. Year when household started to be involved in sisal production? ………………
17. What is the type of labour used by household in its sisal production?
    (i) Own labour
    (ii) Hired labour
    (iii) Both hired and own labour
    (iv) Others (specify) ……………………
18. What is the amount of labour used by a household in its production activities?
    ……………………………………………………………………………….
19. Which farm inputs are used mostly by household in its farming activities?
    ……………………………………………………………………………….
20. Household's cost of sisal production

S/NO	Activity	Cost (Tshs)
1.	Farm preparation	
2.	Seed preparation	
3.	Planting	
4.	Weeding	
5.	Harvesting	
6.	Processing and decortication	
7.	Transportation	
8.	Marketing	

21. What is the source of capital invested in sisal production?
    (i) ……………………………….
    (ii) ……………………………….
    (iii) ……………………………….
    (iv) ……………………………….

22. What was the total amount of sisal harvested in the year 2018/2019?
……………………………………………………………………………………

23. What form of sisal products do you market?
    (i) Raw leaves ( )
    (ii) Processed sisal fibres ( )
    (iii) Others (specify) ………………

24. What mode of transport is used by household in transporting its sisal products to a market area?
    (i) ……………………………….
    (ii) ……………………………….
    (iii) ……………………………....
    (iv) ………………………………..

25. Amount of money earned by a household from selling of sisal in the year 2018/2019……………

26. To whom do you sell your sisal products?
    (i) ………………………………
    (ii) ………………………………..

SECTION C: Support Provided to Small-scale Sisal Producers

27. From whom do you get support when it comes to your sisal cultivation?
    (i) …………………………………
    (ii) ………………………………..
    (iii) ………………………………..
    (iv) ………………………………..
28. What kind of support do you normally get?
    (i) ………………………………
    (ii) ………………………………..
    (iii) ………………………………..
    (iv) ………………………………..
29. Is the support provided adequate and sufficient to your needs?
    (i) Yes ( )
    (ii) No ( )
30. If no why?
……………………………………………………………………………………

SECTION D: Challenges Facing Small-scale Sisal Producers

31. What challenges do you face in your sisal production?
    (i) …………………………………..
    (ii) ………………………………..
    (iii) ………………………………..
    (iv) ………………………………..

32. In your opinion what needs to be done to address the above-mentioned challenges?
    (i) ………………………………
    (ii) ………………………………..
    (iii) ………………………………..
    (iv) ………………………………..

33. In your opinion what needs to be done so as to attract many small-scale farmers into sisal production?
    (i) ……………………………….
    (ii) ………………………………..
    (iii) ………………………………..
    (iv) ………………………………..

THANK YOU FOR YOUR COOPERATION

Appendix 2: A Checklist for Key Informant Interviews

The aim of this study is to determine socio-economic determinants of small-scale farmers' sisal productivity within this area. If you will accept to be part of this study, I will do an interview with you asking to know about personal socio-economic details including your age, marital status, employment or other activities you do for a living, level of education and income and we would like to record the interview. Also, your participation in this study is voluntary as you may choose to participate or otherwise and also skip or deny answering questions you might find you are incapable or unwilling to tackle and lastly you have all the rights to stop at any time. Your responses will be kept highly confidential and used for the purpose of this study only.

1. What are the motivating drivers for small-scale farmers' engagement in sisal production?
2. What are the factors that influence farmers' sisal productivity in the district?
3. Is sisal production profitable to the district's households?
4. What is the marketing situation of sisal in this area?
5. What challenges do small-scale farmers face in marketing of sisal?
6. What support do small-scale sisal producers get from government and other sisal stakeholders?
7. What needs to be done to attract more small-scale producers of sisal participation in sisal cultivation?

THANK YOU FOR YOUR COOPERATION

Appendix 3: Focus Group Discussion

The aim of this study is to determine socio-economic determinants of small-scale farmers' sisal productivity within this area. This exercise is crucial for the accomplishment of my studies. Your household was randomly selected from a number of households to participate in this study. Your participation in this study is voluntary as you may choose to participate or otherwise and you have all the rights to stop at any time. Your responses will be kept highly confidential and used for the purpose of this study only.

1. What are the drivers that motivate small-scale farmers engagement into sisal production?
2. What are the factors that influence farmers' sisal productivity in the district?
3. Is sisal production profitable to the district's households?
4. What is the marketing situation of sisal products in this area?
5. What challenges do small-scale farmers face during production of sisal?
6. What support do small-scale sisal producers get from government and other sisal stakeholders?
7. What needs to be done to attract more small-scale producers of sisal participation in sisal cultivation?

THANK YOU FOR YOUR COOPERATION