INVESTIGATING THE POTENTIAL OF *MORINGA OLEIFERA* FOR AGRIBUSINESS DEVELOPMENT AND RURAL YOUTHS' SELF-EMPLOYMENT IN THE LIVINGSTONE RURAL AREAS

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Declaration

I, ESTHER LOMBE CHITOSHI KWAAMBWA, hereby declare that the work contained in the thesis entitled ''INVESTIGATING THE POTENTIAL OF *MORINGA OLEIFERA* FOR AGRIBUSINESS DEVELOPMENT AND RURAL YOUTHS' SELF-EMPLOYMENT IN LIVINGSTONE RURAL AREAS'' is my own original work and that I have not previously in its entirety or in part submitted it at any university or other higher education institution for the award of a degree.

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List of Abbreviations/Acronyms

MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MO	*Moringa oleifera*
NRC	National Research Council
FAO	United Nations Food and Agriculture Organization
ZDHS	Zambia Demographic and Health Survey
STACSS	Southern Tourism Agriculture and Commercial Show Co-operative Society
CBS	Central Bureau of Statistics
Rs	Indian Rupees

Dedication

This thesis is dedicated to my husband, mother, father and family.

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First, I give glory and honour to the Lord God Almighty.

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Abstract

Title: **Investigating the Potential of *Moringa Oleifera* for Agribusiness Development and Rural Youths' Self-Employment in Livingstone Rural Areas**

Moringa oleifera is a nutritious vegetable tree with a variety of potential uses as almost every part of the tree can be used. *Moringa oleifera* is very useful as an alley crop in the agro-forestry industry. It is useful not only for human beings but also for animals and also in various industrial applications. Besides *Moringa oleifera* being processed into medicine, it contains acetone which can be prepared into herbal formulation which is an effective anti-malaria bio agent. *Moringa oleifera* has the potential to be a source of new drugs. This study was conducted in Livingstone district of the southern province of Zambia. The main objective of the study was to examine the factors that determine the use of *Moringa oleifera* for agribusiness development and rural youths' self-employment around the Livingstone rural area in Zambia. Purposive sampling was used to select the respondents that grow *Moringa oleifera* and who are youths aged 18-34 years in two villages, namely, Musokotwane and Mukuni. Descriptive analysis of the data was done where frequencies and percentages illustrated the different aspects of data. Quantitative data obtained were summarised and presented in graphs, pie charts and tables. Regression analysis using a binary Probit model was conducted to specifically identify the youths' socio-economic attributes, their perceptions, challenges, aspirations, and the opportunities of *Moringa oleifera* for agribusiness development and rural youths' self-employment around Livingstone rural areas of Zambia. Results from the study revealed that the majority of the respondents (28 percent) fell within the range of less than 18 years of age and they were single (71 percent). The results also showed that the majority of respondents were aware of the *Moringa oleifera* plant and its uses (30.3 percent) and they used it for medicine, while 0.3 percent used the plant for income generation through the sale of its products. The perception statements on the benefits of *Moringa oleifera* indicated that the respondents rated it to be favourable. The results showed that there was no statistically significant relationship between the sex of the respondents and the growing of *Moringa oleifera,* at five percent level of significance, with 45 percent males and 55 percent females in the sample. There was also no statistically significant difference in the growing of *Moringa oleifera* by family size. The study further revealed that youths were aware of the plant and could identify the plant physically and by name. The findings of the study provide information on the challenges and opportunities that the youths are facing as they venture into agribusiness in the study area. The results show that 18 percent of the youth have challenges in accessing land while 45 percent lacked finance, 24 percent mentioned high costs of agicultural machinery and 8 percent cited illiteracy

among the youths. These challenges contribute to the small numbers of youths participating in agribusiness. Therefore, if policy makers would consider polices that increase access to land, finance, agricultural machinery and address illiteracy among the youths, the production and use of *Moringa oleifera* would increase. The study findings are significant to policy makers and donors as they provide information to direct funding towards supporting and designing policies that are beneficial for youths involved in agribusiness.

Key words: Agribusiness; Livingstone rural areas; *Moringa oleifera;* Probit model; Youths

CHAPTER 1 INTRODUCTION

1.1 Background

According to the United Nations Food and Agriculture Organization (FAO, 2014), the global population is projected to reach 9 billion by 2050. The number of young people (aged 15 to 24 years) is also expected to increase to 1.3 billion by 2050, accounting for almost 14 percent of the projected global population. Most of these will be born in developing countries in Africa and Asia, where more than half of the population still lives in rural areas (Melorose, Perroy, & Careas, 2015). In Africa, 226 million youths aged between 15 and 24 years live in rural areas and by 2015 the number increased by 19 percent. By 2030, it is estimated that the number of youths will increase by 42 percent (Batu, 2016). In 2014, the Zambia Demographic and Health Survey (ZDHS) revealed that half of Zambia's 14 million people at the time was aged below 15 years.

Furthermore, Southern Tourism, Agricultural, and Commercial Show Co-operative Society (STACSS) states that youth employment is critical to development in Zambia (Chilufya, 2018). Therefore, the government has laid out strategies to address youth unemployment by urging the youths to undertake agribusiness as a way to generate income and alleviate poverty. Farming is perceived by the youths as something to do when one reaches retirement age or something people do to survive, hence, it is not seen as an income-generating activity (Kolavalli & Flaherty, 2010). The Zambian government is aware of the challenges faced by the youth as a result of unemployment and the government has been making promises to improve this situation. However, the initiatives that have been made by the government do not seem to change the high rate of youth unemployment (State, 2014). Furthermore, the Zambian government has embraced the UN 2030 Agenda on sustainable development through agriculture as the most important sector for rural development where more youths should have access to land and support services such as the provision of credit.

Agriculture plays an important role in the economy of the country through the provision of employment and income generation, and contributing to food and nutrition security. Zambian Governments have identified the agriculture sector as the number one key driver of the economy in order to supplement mining which has been the largest contributor of foreign exchange earnings and national revenue. The

country has enormous potential to expand agricultural production due to the vast resource endowment in terms of land, water, climate and labour. Zambia's total land area is 75 Million hectares (752,614 Km2), of which 58 percent (42 Million hectares) is classified as medium to high potential for agricultural production, with rainfall ranging between 800 mm to 1,400 mm annually.

Agriculture generates approximately 10 percent of the Gross Domestic Product (GDP) and provide livelihoods for more than 70 percent of the population. The sector absorbs about 67 percent of the labour force and remains the main source of income and employment for both females and males, whose population in 2015 was 7,818,236 and 7,655,669, respectively. (CSO, Census of Population and Housing 2010). Agriculture has marginally led to an increase in rural incomes and contributed marginally to poverty reduction and increased food and nutrition security. (CSO, Living Conditions Monitoring Survey, 2006 and 2010).

The rationale for the Second National Agriculture Policy is to provide a conducive environment that will stimulate sustainable agricultural development. The Policy provides a framework that will promote sustainable agricultural diversification, agricultural commercialization, private sector participation and inclusive agricultural growth. It is envisaged that this Policy will promote competitiveness, stimulate efficiency, increased productivity and profitability in the agriculture sector. This will contribute effectively to attaining food and nutrition security, employment creation, increased incomes and reduced rural poverty.

In addition, rural youths continue to face challenges that are related to unemployment, underemployment, and poverty (Steenkamp, 2015). Despite the agricultural sector's ample potential to provide income-generating opportunities for rural youths, challenges related specifically to youths' participation in this sector and more importantly, the options for overcoming them are not extensively documented. Furthermore, statistics on rural youths are often lacking as data are rarely disaggregated by important demographic factors such as age, sex, and geographical location. However, evidence has shown that the youths' engagement in agriculture is declining and this may have led to unemployment and underemployment which may undermine the efforts of governments to grow the economy in the agricultural sector (Ahaibwe & Kasirye, 2015). In developing countries, facilitating the youths' participation in agriculture has the potential to reduce widespread rural poverty reduction among youths

(Fahey, 2005). Therefore, involvement in agriculture can address the problems of unemployment among the youths.

The present study, therefore, investigated the potential of *Moringa oleifera* for agribusiness development and rural youths' self-employment in the Livingstone rural areas as a sustainable solution in addressing agribusiness problems and challenges facing the youth. The advantages of *Moringa oleifera* for agribusiness can be addressed in terms of climate change and variability resilience, health benefits and socio-economic development. These advantages and properties have a direct impact on health, nutrition, agriculture, sanitation, water, biodiversity, the environment and sustainable activities.

1.1.1 Agribusiness Development

Agribusiness development is a term used to describe the sector that encompasses all economic activities that are related to farming, chemicals, breeding, crop production or farming, farm machinery, distribution, marketing, and sale (Alston, 2009). Agribusiness refers to farming, but the term oddly is not often used in correlation with actual farms. Instead, agribusiness most commonly means an agriculturally related business that supplies farm inputs, such as machinery and seed supply. Agribusiness also is used to describe businesses that are involved in the marketing of farm products, such as warehouses, wholesalers, processors, retailers, and more (Wreford, 2010).

Agribusiness development is the business sector encompassing farming and farming-related commercial activities. The business involves all the steps required to send an agricultural good to market production, processing and distribution. Agribusiness development is a sector that supports the growth of the agricultural industry,which is pivotal to the growth of the economy. In addition, Agribusiness continues to play a crucial role in the growth of developing countries. Agribusiness can potentially improve agricultural industry,which is pivotal to the growth of the economy. In addition, Agribussiness continues to play a crucial role in the growth of developing countries. Agribusinesses can potentially improve agricultural productivity,which is why governments often offer subsidies to agricultural businesses. Agricultural activities also contribute to an improve system of food security and sustainable food production, as well as income for a majority of poor people in developing countries. However, the activites increase the pollution and contribute to global warming which is why innovation is important to the sector to address such problems (FAO, 2008).

Innovation is a continuing endeavor among agribusinesses, as the industry seeks improved and efficient methods of production and processing. Many companies now offer drone surveillance of farms, which gives the farmer insights on the health of crops and helps them to create stock projections and plan for the future. In addition, new and improved types of machinery are being engineered and manufactured on a large scale, such as robotic harvesters, automated pesticide sprayers, and driverless tractors. Ultimately, the aim of innovation in agribusiness is to improve agricultural productivity and make agricultural activities easier for farmers. It aims to lower the costs of production and increase profitability for farmers, who often endure volatile market conditions as crop prices fluctuate with changing economic conditions (Yin, 2017).

Agribusiness development is an important component of the economy in countries with arable land. Agribusiness treats the different aspects of raising agricultural products as an integrated system. Farmers raise animals and harvest fruits and vegetables with the help of sophisticated harvesting techniques, including the use of Global Positioning System (GPS) to direct harvesting operations. Manufacturers develop increasingly efficient machines that can drive themselves. Processing plants determine the best way to clean and package goods for shipping. While each subset of the industry is unlikely to interact directly with the consumer, each is focused on operating efficiently in order to keep prices reasonable. The market force have a significant impact on the agribusiness sector (Zhang, 2017). Changes in consumer taste alter what products are grown and raised agribusinesses to operate more efficiently, which can require investments in new technologies, new ways of fertilizing and watering crops and new ways of connecting to the global market. Global prices of agricultural products may change rapidly, making production planning a complicated activity. Farmers may also face a reduction in usable land as suburban and urban areas expand into their regions.

Africa's agribusiness sector is expected to reach $1 trillion by 2030, so there is certainly cause for optimism (World Bank, 2013). Consumer demand for food in Africa is growing at an unprecedented rate with a population of 1.2 billion people, Africa is currently the second most populous continent in the world, superseded only by Asia. According to United Nations projections, Africa's population could reach 2 billion by 2030 and 2.5 billion by 2050. This means that one in five consumers globally will be African. Alongside its role in stimulating economic growth, agribusiness and agro-industrial development has the potential to contribute substantially to poverty reduction and improved social outcomes and a consensus is emerging that agro-industries are a decisive component of socially-inclusive, competitive development strategies (Wilkinson & Rocha, 2008). Agribusiness directly contributes to the achievement of reducing

poverty and hunger, empowering youths and developing global partnerships for development. Strong synergies exist between agribusiness, agricultural performance and poverty reduction for Africa (World Bank, 2007). Agribusiness may stimulate agricultural growth and strong linkages between agribusiness and smallholders can reduce rural poverty. A focus on value addition in agribusiness is, therefore, central to existing strategies for economic diversification, structural transformation and technological upgrading of African economies. Such a focus can initiate faster progress towards prosperity, by affecting the bulk of the continent's economic activities and by harnessing critical linkages between the major economic sectors. On the demand side, food expenditure often represents the largest single item of household expenditure, rising to more than half of total expenditure for poor households in some countries, therefore, the efficiency of post-harvest operations is a major determinant of the prices paid by the urban and rural poor for food, and thus an important factor in household food security (Jaffee, Moffit, Caspri & Taylor, 2003).

Agro-industrial development can contribute to improved health and food security for the poor by increasing the overall availability, variety and nutritional value of food products, and enabling food to be stored as a reserve against times of shortage, ensuring that sufficient food is available and that essential nutrients are consumed throughout the year. Agribusiness and agro-industry have the potential to contribute to a range of economic and social development processes, including increased employment generation (particularly youth employment), income generation, poverty reduction and improvements in nutrition, health and overall food security. Increasing the scale and competitiveness of Africa's agribusiness sector is critical for farmers, agro-industrial enterprises and industry-related services. The key challenge for developing agribusiness in Africa is the upgrading and improvement of manufacturing capacities and capabilities to overcome constraints related to the development of efficient industrial enterprises capable of competing in international, regional and domestic markets.

1.1.2 The Impact of Climate on Food Security and Nutrition

Climate change and variability are commonly associated with food and nutritional insecurity in many parts of the world, but the effects also include desertification, lack of safe drinking water, poverty, malnutrition, famine, and parasites (Saina, 2013). Millions of people are under the threat of famine due to the increases in the changes of the climate. This is partially true in many regions of Africa where economic fortunes are often tied to the availability of rainfall and its predictability thereof. Sub-Saharan Africa is home to some of the most nutritionally insecure and water-borne diseases that are prone to people in the world due to

poor infrastructure and limited resources, and this is compounded with other challenges such as the burden of HIV/AIDS, poor access to health services, prolonged droughts and conflict (WFP, 2017).

The relationship between climate change/variability and crop failures is not a new phenomenon, and in areas where infrastructure is limited (i.e. rural areas), poverty-stricken people are often the most vulnerable to the negative impacts of climatic changes. Moreover, the effects of climate change are making droughts more of a norm than an exception. This is a pattern that places some of the most vulnerable communities in an increasingly precarious position when it comes to meeting basic food needs. For subsistence and smallholder farmers in countries like Zambia, a failed harvest can mean months of food scarcity and hardship, thereby leading to malnutrition. In addition, "conventional" crops such as cereals are often not native and suitable to the local environmental conditions and thus they often require expensive inputs, significant irrigation, and land preparation in order to produce a successful harvest. This means that these crops are more vulnerable to droughts, thus leading to poor or unsuccessful harvests.

Trees on the other hand often survive when other crops fail. Furthermore, Africa in general, and southern Africa in particular, has a lot of plants that are both nutritional and herbal in nature. However, very little of these natural resources are exploited to their full potential in combating the problem of malnutrition, poverty and climate change. In order to identify which trees are durable to combat food shortages and that is both efficient and effective towards climate change mitigation, it is critical to look at the potential that is already available in developing countries, and in particular for the present study, Zambia. Therefore, there is need to implement climate-smart systems that can build more resilient food systems and combat climate change. The farmers will therefore need to devise mechanisms and adaptation strategies to reduce the impacts of climate change. The current study thus investigated the potential of *Moringa oleifera* for agribusiness development and rural youths' self-employment in Livingstone rural areas as a sustainable solution in relation to the above articulated climate change concerns as well as the associated socio-economic and environmental problems.

1.1.3 An Overview of the Medicinal Importance of *Moringaceae*

There are 13 known species in the plant family *Moringaceae*, and of these, the *Moringa oleifera* is the most widely studied and cultivated (Rani, 2018). Although the species is native to India, Pakistan, Bangladesh and Afghanistan, it is now cultivated widely in sub-Sahara Africa where the world's highest

rates of malnutrition are found. *Moringa oleifera* is a tropical and subtropical plant that requires very little water (well adapted to growing in adverse conditions where many plants would not be able to grow as they require at least 400 mm of rain per annum) due to its tuber-like root system, its fast growing nature (grows 6-7 m in one year), and also the fact that it is easy to grow from seed and cuttings, and demands little or no horticultural attention (Boukandoul, 2018).

The *Moringa oleifera* tree is called a multipurpose natural resource and it has medicinal, antimicrobial, nutritional, industrial, agricultural and water treatment uses as shown in Table 1 below (Foidl, Makkar, Becker, 2001). For instance, the seeds contain edible 30-40 percent oil and can be used in the manufacture of soap and cosmetics. The leaves also have antioxidants and they are nutritious such that they have been used to combat malnutrition (Dhakar, 2011). The seeds and seed cake are an effective primary coagulant in water treatment as they have the capacity to remove up to 99 percent of bacteria from water (Ali, 2009). Every part of the tree has some socio-economic and health benefits as it can be used to curb malnutrition as well as poverty and disease, especially in poor communities, since it is drought resilient (requires very little water), and produces edible, nutritious leaves all year round if irrigated (Ugwu, 2017). The *Moringa oleifera* tree is referred to as a miracle tree due to its rich source of certain macro and micronutrients of great importance to human nutrition. It is currently being used for human food fortification such as maize meal porridge, cereals, yoghurt, cheese and biscuits (Oyeyinka & Oyeyinka, 2018).

Furthermore, in these times of droughts due to climate change and variability and during dry seasons, *Moringa oleifera* is also a good option to increase the quality of ruminant feed by planting it as fodder trees and shrub forages (Nouman, Basra, Siddiqui, Yasmeen, Gull, & Alcayde, 2014). The leaves, stems and twigs contain protein and they can be used as fodder for cattle, sheep, pigs and poultry. It is scientifically established that supplementing (fortification) livestock feed with the leaves and green stems of *Moringa oleifera* increases weight gain (daily weight gain up to 32 percent), enhances milk production by 43-65 percent, boosts the immune system, and improves the digestibility of livestock feed and hence the overall health and condition of the animals. In addition, the leaves contain a substance that stimulates plant growth and increases crop production by 20-35 percent (Mahfuz, 2019).

Table 1: *Moringa oleifera* parts and their benefits

Tree part	Uses or benefits
Leaves	Nutritional value, herbal medicine, biomass, plant growth hormone, forage
Flowers	Nutritional value, herbal medicine, honey
Pods	Nutritional value, herbal medicine
Bark	Medicinal, rope making, gum for turning hides
Roots	Herbal medicine
Gum	Herbal medicine
Wood	Paper, animal feed, herbal medicine, alcohol production
Seeds	Water treatment, food, cosmetics, cooking oil, lubricant

A *Moringa oleifera* plantation can help provide a more diversified farm economy and potentially stimulate the rural economy by encouraging the development of more stable commodities (Mabapa, Ayisi, Mariga, Mohlabi, & Chuene, 2017). The current study therefore, aimed to investigate the potential of *Moringa oleifera* for agribusiness development and rural youths' self-employment in the rural areas that are situated in Musokotwane and Mukuni villages around Livingstone, Zambia. Furthermore, the purpose of the study was to examine the perceptions, challenges, aspirations, and opportunities of *Moringa oleifera* for agribusiness development and rural youths' self- employment in the study area.

1.2 Statement of the Problem

Many studies have been conducted on the potential of *Moringa oleifera* for business purposes and as a source of income (Dixit, Tripathi and Kumur, 2016; Alegbeleye, 2017; Gandji, 2018). However, in the current study area, this resource's economic potential for income generation and improving the livelihood of unemployed and underemployed youths has not been embraced. According to the 2018 Zambia statistics issued by the Central Statistical Office (CSO), youth unemployment in Livingstone district is about 41.6 percent. Yet, the *Moringa oleifera* tree, which is commonly referred to as the "miracle tree", could be one of the solutions to the problems of unemployment, underemployment and poverty among youths in Zambia, with 74 percent of its 16,405,229 total population under the age of 30 (28 percent are 15 to 34 years old). *Moringa oleifera* is a multipurpose tree with most of its parts being useful for medicinal and commercial applications in addition to its nutritional value and usage in water treatment (Wang, Chen, &

Wu, 2016). The tree is a tropical plant which grows rapidly even in marginal soils, demands little or no horticultural attention and possesses a hardiness that enables it to survive prolonged periods of drought.

The *Moringa oleifera* tree originated from northern India but it is now widely cultivated throughout the tropics and it is now found in many countries of Africa (Parrotta, 2009). In Livingstone town and the rural areas around, *Moringa oleifera* trees are commonly found in the backyards of many homesteads. However, most youths are not engaging in *Moringa oleifera* business, but rather in other forms of business such as selling curios, a business that is seasonal as it relies on tourists who come to visit the Victoria Falls. This business is however not sustainable, and poverty in this region is on the rise among the youths.

Furthermore, agriculture is only practised by old people in these rural areas as the youths have neglected the agribusiness sector and yet it has great potential for income generation and can promote self-employment if the youths can engage in the cultivation of *Moringa oleifera* for multiple purposes including trading of its products (Maroyi, 2006). However, the youths come from diverse backgrounds, with different drivers and form of experience that lead to them having different perceptions, challenges, aspirations and opportunities for agribusiness development in the study area. The current research therefore contributes to knowledge on finding out if there are any gender and other social-cultural factors (age and gender roles) that contribute to youth involvement in the *Moringa oleifera* related business. Information gathered from this study helps in drawing meaningful recommendations that can help in designing youth-centred policies and development programmes that are gender sensitive. This research also investigated the willingness of youths to engage in *Moringa oleifera* related business as a means of curbing rural youths' unemployment.

1.3 Research Objectives

1.3.1 Overall objective

The overall objective of this research was to examine the factors that determine the use of *Moringa oleifera* for agribusiness development and rural youths' self-employment around the Livingstone rural areas in Zambia.

1.3.2 Specific Objectives

The specific objectives of the study were:

- To investigate the factors that determine the use of *Moringa oleifera* as a business for youths' income generation;
- To determine challenges faced by youth in pursuit of *Moringa oleifera* cultivation for income generation;
- To develop guidelines for youth involvement in agribusiness; and
- To develop recommendations for employment creation using *Moringa oleifera*.

1.4 Hypotheses

To address the specific objectives, this study tested the following hypotheses;

- *Moringa oleifera* is available in study area and so the youths know about it;
- Youths are not aware of the agribusiness potential of *Moringa oleifera*; and
- Several factors hinder the youths' involvement in *Moringa oleifera* cultivation for income generation.

1.5 Significance of the Study

The study findings are significant to the youths not only in the specific study area but Zambia at large who wish to venture into agribusiness as it provides information on the challenges and opportunities that other youths with agribusiness ventures have faced and some of the ways to navigate these challenges. However, more insightful data and knowledge on youths in agriculture are needed to understand their relationships with farming so that it becomes possible to draw from "best practice" examples for designing youths' policies, support programmes, and interventions. Gender dimension would be observed in the study to give an equal representation of both young women and young men.

In the case of the policy makers, the study findings help to enable them to appreciate the reasons why youths are not engaging as much in agribusiness despite the importance of the sector in Zambia's economy. The study findings are therefore significant to development partners and donors as they can help them to know how to direct their support to youths in agriculture.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

This chapter introduces the reader to the literature that relates to the concept of rural entrepreneurship in agriculture. In addition, it presents literature on the concept of youth participation in agribusiness in rural areas for employment creation. This section also discusses the literature on how agribusinesses like any other entrepreneurial entity, requires start-up capital which is a crucial element without which the business cannot commence.

2.2 Concept of rural entrepreneurship

Rural entrepreneurship is one of the newest areas of research in the entrepreneurship field. It has become one of the significant supportive areas for rural economic development and agribusiness and has become a recognised area of management research.

The current state of entrepreneurship in the world of youths population is still very low and this is because of poor mobilisation strategies for the youths to get involved in agribusiness (Coward, Caicedo, Rauch, & Rodrigue, 2014). Zambia has a high rate of unemployment and underemployed youths compared to the neighbouring countries in the region (Ulandssekretariatet, 2014). Moreover, agriculture is the main source of employment in Africa and about 59 percent are youths (Adesina, 2013) but these youths do not participate in agriculture due to no credit facilities from the banking institutions or in the form of loans from government bodies to enable the youths to get involved in agriculture as it is a venture that requires a lot of capital. There is also a significant space for government interventions as a way to come up with tangible initiatives to support the youths for them to get involved in agribusiness. According to Wiggins (2009), youths are not interested in venturing into agriculture because of limited access to secure land to use for agricultural purposes and also due to the procedures that are involved when one wishes to acquire land mostly in many African countries.

According to Pelzom and Katel (2017), little effort has been made to understand the economic performance of *Moringa oleifera*. For example, a study was conducted by Daud, Omotayo, Aremu, and

Omotoso (2018) to identify the socio-economic characteristics such as food, medicine and industrial purposes of *Moringa oleifera* farmers in Oyo state, to estimate the costs and returns of *Moringa oleifera* production and to determine the factors affecting the profitability of its production. This was with the view to providing information on how the production of *Moringa oleifera* could enhance the income of farmers. *Moringa oleifera* production was found to be profitable and has improved the livelihood of the farmers.

In addition, according to Bezu and Holden (2014), the main reason why the youths mostly in rural areas are not involved in agriculture is due to lack of access to land and the lack of marketing skills to help in income generation from the produce that they grow because of the current low levels of production in the agricultural sector in Africa which is not lucrative.

Moreover, the available literature has also highlighted that some gender-related factors such as gender roles have a significant contribution to agriculture among the youths (Akter et al., 2017). Furthermore, the inclusion of young women into the land tenure at the family level and in government policies has not been adequately looked at, as well as its potential for the youth as a form of empowerment and job creation to benefit youths, both male and female due the social-cultural factors. It can thus be beneficial to identify and evaluate the challenges, perceptions, aspirations and opportunities that youths encounter by integrating both young women and men in the agriculture sector (Giuliani et al., 2017). Therefore, agribusiness in Africa should aim at creating job opportunities among the youth in rural areas by facilitating smallholder farmer diversification along the value chain as a risk management strategy in order to move the agricultural sector forward (Adesina, 2013). Yet to most of the youths, agribusiness is perceived as a venture that is pursued as a large scale commercial agricultural enterprise and requires a lot of capital and skills to operate it (Haharap & Siregar, 2018). Moreover, the economic opportunities are available to the youths, however, due to the social differences such as gender, age, class, ethnicity, education, marital status and cultural norms, the opportunities are never utilised to the highest level for the benefit of the youths to venture in agribusiness. (DeJaeghere & Baxter, 2014).

In addition, it is essential that agribusiness value chains deliver greater value to the youths that are involved in agribusiness as a way to reduce risks and increase production. There are several factors that are involved in the analysis of agribusiness value chains for youth opportunities and in this regard, the

market is the starting point before youths can embark on the entrepreneurship venture (Sukhdev, May, & Müller, 2016).

Furthermore, considerable attention has been focused on entrepreneurship agribusiness and small businesses in rural communities (White, 2012). This interest in rural entrepreneurship has been brought about by changes in the rural society. The restructuring of agriculture and the loss of manufacturing firms have caused the continuing displacement of workers and increased the need for non-farm income to support farming operations. More so, many families are unable or unwilling to leave rural communities and as such, they need to find alternative sources of income within their communities (Kamwi, Chirwa, Graz, Manda, Mosimane, & Kätscet, 2018). Moreover, rural entrepreneurship may be the means to improve the quality of life in rural areas by providing goods and services to rural communities. This interest in rural entrepreneurship has aroused considerable thought by governmental agencies.

Additionally, agribusiness like any other entrepreneurial entities, requires start-up capital which is a very crucial element without which the business cannot commence. However, most young people do not have access to capital for agricultural purposes (Abdullah & Sulaiman, 2013). Therefore, young people rank very low on the priority of credit received from the pool of finances that the financial institutions provide and hence this implies too little or no collateral for the youths as the banks view youths as a high risk group and as such, the financial institutions give less attention to the youths' financial requirements (Haharap & Siregar, 2018). However, the loans are meant to ensure that there are globally compliant agricultural inputs that represent a shift from traditional farming methods to the modern ones. In support, Olujide and Ojo (2011) reveal that access to bank credit by farmers is still a major challenge despite the relatively well-developed banking system. Furthermore, Gemma, Ahaibwe, Mbowa, and Lwanga (2013), that despite the availability of funds, rural youths do not have the knowledge on how to draft business plans and how to sell the agri-entrepreneurial ideas to the financial institutions for financial support.

According to Filmer and Fox (2014), agribusiness and rural entrepreneurial development in many developing countries and economies in transition, particularly those with large rural communities, suffer from inadequate access to food and the lack of employment. The problem is compounded by the dependence on outdated and inefficient technologies which thereby lead to poor productivity and slow economic growth (Pelzom & Katel, 2017). Moreover, agricultural-based industrial products account for

half of all exports from developing countries, yet only 30 percent of those exports involve processed goods compared to about 98 percent in the developed world.

In addition, agro-industrial activities benefit several groups, including poor and marginalised rural populations, urban agro-industries and communities facing human security challenges or requiring urgent supplies of agricultural equipment and the rehabilitation of food industries (Buruchara et al., 2013). Technical cooperation and capacity-building services are provided to agro-based and agro-related businesses and industries, inter alia, in the food, leather, textiles, wood and agricultural equipment sectors.

Furthermore, youths face distinct challenges in participating in the productive sectors of the economy. Although youths are not a homogeneous group and their circumstances vary according to age, class, education, ethnicity, location and other cultural- and socio-economic characteristics, it is widely acknowledged that the youths bear a disproportionate burden of global poverty. In a seminal work addressing youths in agriculture FAO (FAO, 2014), identified six key challenges to their advancement, namely, insufficient access to knowledge, information and education; limited access to land; inadequate access to financial services; difficulties accessing green jobs; limited access to markets; and, limited involvement in policy dialogue or decision making. Addressing these six principal challenges is vital to increasing the youths' involvement in the agricultural sector, and ultimately addressing the significantly untapped potential of this sizeable and growing demographic group.

2.3 Youth Participation in Agribusiness Development

The major constraints hindering youth participation in *Moringa oleifera* cultivation have been identified as an inadequate credit facility, access to markets, lack of agricultural infrastructure and access to land (Akpan, Patrick, James, & Agom, 2015). The problem of youth participation in agribusiness is evident in Zambia and the whole of Africa at large, especially in those countries with prolonged and sluggish economic growth. Consequently, this results in increases in poverty, unemployment, and food imports, as well as an inactive manufacturing sector and political instability among others as some of the challenges that prevail in the country (Akpan et al., 2015). This phenomenon is an indication of the inability of many young people in the country to be economically self-employed which is as a result of the volatile economic situation in the country. According to Akpan (2010), the decision of the youths to participate in agricultural

production has a lot to do with the cultural, political, environmental and economic situation of a society. The youths are vulnerable to change, either positive or negative, hence it becomes pertinent to identify these variables that can model the youths' behaviour towards agriculture.

Furthermore, youth participation is a necessity for many development interventions. Youths are innovative and as such they should be at the forefront of revitalising agriculture. Moreover, societal change, including behavioural change, is often driven by young people (Maass, Mosher, Blyth, & Bourdeau, 2009). Therefore the youths' participation in matters that affect them is important and attempts should be made to include them in planning, designing and decision making (Schäfer & Yarwood, 2008).

More so, young people bring energy, vitality, and innovation into the workforce and when their willingness to contribute is matched with an opportunity, they can have a transformative impact on economic growth and social development. Although agriculture has good employment promises, youths tend to shy away from this sector which is considered by many as dirty and demanding. However, the potential of agriculture to offer employment for the youth is recognised nationally and internationally. The available literature reveals that there is a decline of youth interest in farming even though they are the most productive and they are also in the prime of their lives both mentally and physically (Afande, Maina, & Maina, 2015).

However, the youths' access to the most crucial asset for agricultural production, land, is limited as the parents hold the ownership to land (Deininger, Savastano, & Xia, 2017). Moreover, in most instances, the youths end up with small or no piece of land, whereas for agriculture to be beneficial to them, they need a large piece of land (Sakketa & Gerber, 2017). In addition, youths perceive farming as something that is only for school dropouts and for those that are illiterate and such views promote poverty and bad business. In a study that was conducted in Nigeria's Delta State, the youths viewed farming as something that is meant for the poor people in society and also for the aged (Aphunu & Atoma, 2011).

Therefore, attitudes and perceptions by the youths towards agriculture have led to less participation in the agricultural sector (Kibirige, 2017). Furthermore, agriculture offers a lot of attractive activities and business, therefore the transformation of the agricultural sector towards a money-making entity enables the perception of the society and public towards entrepreneurship for change (Dionco-Adetayo, 2006).

Entrepreneurship education and training are important for economic development, particularly in improving the quality of life and increasing the number of future entrepreneurs (Ahaibwe & Kasirye, 2015).

2.4 *Moringa oleifera* as a business

The market is driven by the rising awareness of health benefits. In addition, the increase in the vegan demographics across the globe is also anticipated to drive the *Moringa oleifera* products' market growth during the forecast period. The popularity of *Moringa oleifera* products has been increasing considerably in recent years due to the growing awareness about their health benefits, particularly in Europe, North America, and South America. Apart from market trends and consumer demands, scientific findings highlight the health benefits of some food types that are commonly grouped as superfoods (Luhlaza, 2019). An example of such is Moringa (*Moringa oleifera*), which is native to western and northern parts of India and is currently grown in different parts around the world.

Moringa oleifera is a very fast-growing tree; it commonly reaches four meters in height within just 10 months after the seed is planted and it can bear fruits within its first year. Its pods are triangular in cross-section (30 to 50 cm long) and legume-like in appearance. These pods have oil-rich black and winged seeds which can be crushed to produce biodiesel (Hassan, 2013). *Moringa oleifera* can yield 3 tonnes of oil per hectare and this can be used for food in times of shortages. The seeds contain 30 percent to 40 percent oil that is high in oleic acid (Boukandoul, 2018). Moreover, the meal yields about 61 percent protein. Furthermore, *Moringa oleifera* are extremely nutritious, containing all the essential amino acids along with many vitamins and other nutrients (Leone, 2016). Virtually every part of the tree can be used.

Value addition means converting the fresh produce into products which can be utilised for immediate purposes or stored for future use by applying various indigenous and high techniques that are suitable for each crop. The processed products from *Moringa oleifera* include leaf powder, fruit powder, capsules, dried leaves tea, seed oil and seed powder. Furthermore, there is an increasing demand of good quality *Moringa* products in developed regions of Europe and North America. However, countries in Africa and India have not had enough output in terms of *Moringa oleifera* production to meet rising worldwide demand. As such, efforts are being made by such countries to increase production by using advanced technology in agriculture and production.

Estimates of yields, prices and costs vary greatly per region, thus making it difficult for potential growers to make informed investment decisions about growing the *Moringa oleifera*. Therefore, the lack of agronomic data about growing the crop makes it impossible to make investment decisions on *Moringa oleifera* growing with the confidence and certainty associated with a decision to grow and establish a successful plantation. Key elements in growing *Moringa oleifera* have been identified and their effects examined so as to provide accurate information about the crop for potential *Moringa oleifera* investors and growers after performing feasibility studies (Kakai, 2018).

A well-thought-out business plan can be one of the best time management tools for a *Moringa oleifera* business. Business plans can be consuming in terms of time and money, but a well-executed business plan will save the project time and money. The business plan should identify the production costs, as well as operating costs, including equipment, land, and cultivation and aftercare, labour inputs and financing, utilities, and financial projections. The business plan should be a living document that changes and grows with the project. The big picture information and the unique aspects of the project, as well as the strategies to overcome business, procurement and product marketing challenges, are the points to be considered in project development and they need to be covered in the business plan. The business plan is often underrated but it should be the key management tool for the project. By training the youths on how to draft a business plan, this can help them with the successful operations of the *Moringa oleifera* business (Yakubu, 2015).

A business plan represents the road map for successfully developing or expanding a business. A complete business plan includes short-term and intermediate goals, timelines for achieving these goals, and estimated start-up costs. It serves as a feasibility plan, a marketing plan, and an operating plan. It is also a tool for attracting potential investors and can be used to successfully negotiate start-up loans with lending institutions. Although no one likes to think about things that could go wrong with a new business, a good business plan will also include contingency plans for countering probable pitfalls.

Training youths in various business opportunities in the agricultural sector can offer income-generating initiatives (ACET, 2014). Most of the youths are unaware that agriculture is a viable business (Giuliani et al., 2017); and yet youths have immense energy to work and as such, the development of a country depends on their regimented, active and skilled performance (Olson & Carlquist, 2001). Training young people in high-quality crops and livestock production that can be sold helps them in engaging in income

generation projects and thus increasing the available employment opportunities (CSO, Census of Population and Housing, 2010). Moreover, with the right support and training, young people in rural areas will be willing to take up farming as a livelihood activity and they will stay in the countryside to produce food instead of migrating to towns and cities (Losch, 2014).

In addition, there are important implications that have been suggested in agricultural production with regards to the efforts that are aimed at enhancing new technologies by policy makers, institutions, organisations and agricultural planners. These policies should generally focus on farm households that are not currently cultivating *Moringa oleifera* and forecast more accurately on the future of *Moringa oleifera* plant cultivation (Ajayi, Sadimenko, & Afolayan, 2016). The design of innovative food systems should ideally support poor agricultural innovations, promote the participatory engagement of smallholder farmers, recognize local and traditional knowledge systems, facilitate gender equity and be clearly linked to economic empowerment and livelihoods. This analytical framework can help policymakers and other stakeholders consider the different ways that the broader food system can be strengthened to support the application of science and technology in addressing food security challenges.

2.5 Conceptual Framework

A conceptual framework gives details of the independent, dependent and intervening variables that are examined in the study and their expected relationships (Mugenda, 2009). In the current study background variables were used to depict the characteristics of respondents, whereas independent variables were used to determine the determinants that affect youth participation in *Moringa oleifera* cultivation and the dependent variables were youth involvement in *Moringa oleifer*a business and Moringa uses. Also, the intervening variables were used in this study as illustrated in Figure 1 below (Kimaro, 2015).

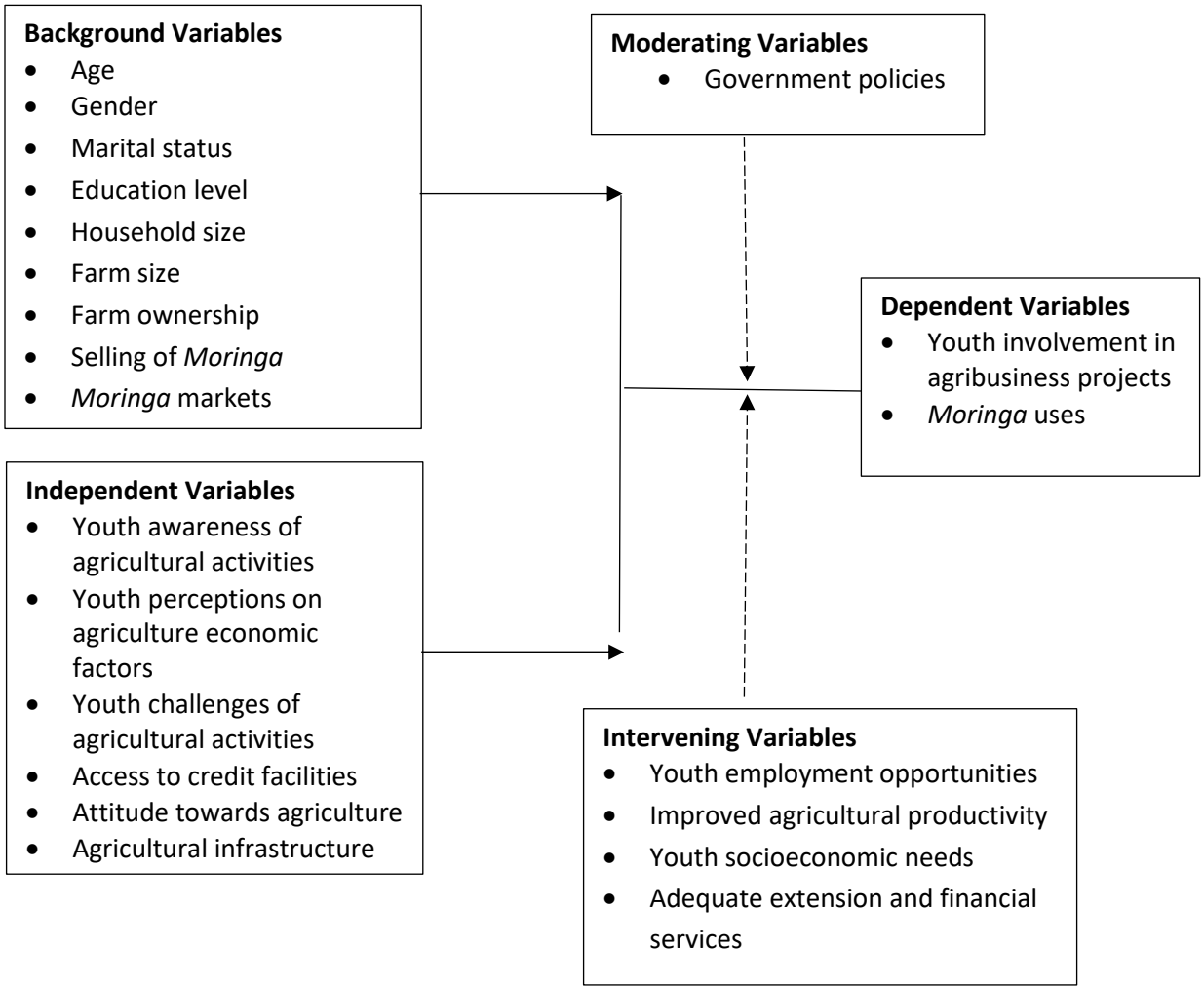

Figure 1: Conceptual Framework

Source: Modified from Kimaro, 2015

2.6 Feasibility of investment on *Moringa oleifera* cultivation

Moringa oleifera cultivation can be a feasible agribusiness venture to the youths. As a result, it can help to mitigate the high rate of unemployment and underemployment among the youths in Zambia and Africa.

According to the study by Singh, Prajapati, Mishra, Vahoniya, Lad, Zala and Savani (2017), the profitability of *Moringa oleifera* done in Vadodara district of Gujarat can be demonstrated as shown in Table 2. The feasibility of investments in *Moringa oleifera* cultivation in Vadodara district of Gujarat attracted a lot of farmers and they have taken the market by storm by processing *Moringa oleifera* leaves and pods into fine powder and marketing it to urban consumption centres. This feasibility study of investment on *Moringa oleifera* cultivation in Vadodara district of Gujarat was carried out in the year 2016-17, where a sample of 100 *Moringa oleifera* growers was drawn from four randomly selected villages of two highest producing talukas of the district. Required data was recorded on well-structured and pre-tested schedules through personal interactions with selected *Moringa oleifera* growers. Tabular analysis was used to analyse the investment pattern and maintenance cost, whereas the financial feasibility of investment was calculated using with and without finance approaches. The sensitivity analysis of investment was also carried out under different cost and return scenarios. The establishment cost for a one-hectare *Moringa oleifera* farm was calculated at Rs 2, 42,686, of which material costs constituted around 87 percent, and the rest was for maintenance costs up to the pods bearing stage. The *Moringa oleifera* bears pods in the first year and the average yield was 191 quintals per hectare, while the returns realised were Rs 537972.60 per hectare. The financial feasibility analysis revealed that the investments on the *Moringa oleifera* farm of one hectare can be recovered in around one year and six months. The Benefit Cost Ratio (BCR) was more than 10, the Net Present Worth (NPW) was more than Rs 25 lakhs, and the Internal Rate of Return (IRR) was 89 percent, with finance. BCR, NPW and IRR were around 12, Rs 26 lakhs, and 95 percent, without finance. This shows that an investment in the *Moringa oleifera* enterprise is an attractive and highly profitable proposition. Moreover sensitivity analysis revealed that even if the returns decrease by 50 percent, and the cost rises by 20 percent (the investment on year), then it is possible to wait for another growth which is fast enough as the *Moringa oleifera* flowers within 4-6 months. This is a usual cycle which was observed in the study area. A *Moringa oleifera* farm in its economic life of 10 years yielded around 1915 qtls per ha and generated gross returns of Rs 53, 79,726 per ha in ten years. It was observed as presented in table 3 that the average quantity of pods produced per ha was 32.77 qtls in the first year.

The yield was highest (326 qtls) in the fourth year. The average yield per farm per year in the bearing phase (first seven years) was about 210 quintals per ha per year, while the average yield in the mature phase (eighth, ninth and tenth year) was 149 quintals per ha per year. It was also observed that the proper management of the orchards is responsible for stable yields and this was found to be a better alternative than several other orchard enterprises, as the studies on other orchards in the study area revealed.

Table 2: Investment pattern on *Moringa oleifera* orchard of one ha in Vadodara district of Middle Gujarat (Rs/ha)

S. No	Particulars	Cost (Rs/ha)	Share in total cost (%)
A	Establishing costs		
1	Rental value of land	20000.00	8.24
2	Plant material	3720.00	1.53
3	Farm building and storehouse	91673.00	37.77
4	Farm equipment	9230.00	3.80
5	Fencing	85000.00	35.02
6	Investment in digging and planting	2536.00	1.04
	Total	212159.00	87.42
B	Operational and maintenance cost up to bearing period (up to 6 months)		
1	Land preparation	4970.00	2.05
2	Fertilizer	538.00	0.22
3	Pesticides	640.00	0.26
4	Irrigation water changes	1000.00	0.41
5	Labour changes(manual)	8522.00	3.51
6	Pesticide spray	472.00	0.19
	Total	16142.00	6.65
C	Interest on working capital	605.00	0.25
D	Interest on fixed capital	6970.00	2.87
E	Depreciation	6810.00	2.81
F	Total establishment cost (A+B+C+D+E)	242686.00	100.00

Rs = Rupees (1 US dollar = 75.98 Rupees)

Source: Singh et al., 2017

The establishment cost or the cost in the zero-time period comprise of rental value of land, cost of plant material, cost of farm building / storehouse, expenditure on farm equipment, fencing and investment on planting the stems. After incurring this initial investment for establishing the *Moringa oleifera* farm, the farmer is required to make some more investments until the trees reach the bearing stage. Such costs are known as operational and maintenance costs and they are mainly incurred for land preparation, fertilizers and pesticides application, irrigation, and the labour that is utilised in the application of each of these inputs. The analyses of the collected data from the samples revealed that the total investment on the *Moringa oleifera* until the pods appeared was around Rs 242686 per ha, of which establishment costs accounted for 87.42 percent and operational and maintenance costs accounted for 6.65 percent. Farm building and fencing constituted around 38 percent and 35 percent respectively of the total investment costs, and these were the major cost components for investment. Fencing was required to prevent crop damage by Blue bulls which were highly prevalent in the study area. The *Moringa oleifera* starts yielding returns from the first half of the year. The operational and maintenance costs for the same period (six months) were included in the establishment costs, of which labour constituted about 3.50 percent. Minimal maintenance costs (6.65 percent) also indicate that the *Moringa oleifera* farm is easy to maintain and the incurred operational and maintenance expenses were less as compared to other input-intensive horticultural crops like pomegranates, lime, amla, etc. (Gondalia & Patel, 2007; Patel, 2015; Ramanbhai, 2012;). Table 3 presents the maintenance costs of *Moringa oleifera* cultivation for its economic life, and also during the bearing phase (seven years average) and mature phase (average of 8^{th}, 9^{th}, and 10^{th} year). The average cost of cultivation of *Moringa oleifera* for an economic life of 10 years was arrived at as Rs 63033 per ha per year, of which fixed costs (including interest on fixed capital) constituted 75 percent and working capital (including interest in working capital) constituted 25 percent. Rental value of land had the largest share (31.73 percent) in fixed costs while labour had the largest share in working capital (19 percent). Human labour constituted 14 percent and mechanical labour constituted 5 percent of total labour. The expenditure made on fertilizers, plant protection chemicals, planting material and irrigation constituted around four percent of the total cost. The average yield of ten years was found to stand at 191.60 qtls per ha per year. The share of fixed costs in the bearing phase was 73 percent while the variable costs constituted 27 percent to total costs. In the mature phase, the fixed costs increased (constituting around 81 percent of total costs), while the variable costs declined considerably with a high reduction in labour costs which comprised of only 13.55 percent of total costs in the mature phase against 21.37 percent in the bearing phase.

Table 3: Maintenance costs of cultivation of *Moringa oleifera* for the economic life of ten years in Vadodara district of Middle Gujarat (Rs/ha/year)

		10 years (economic life)	7 years (bearing phase)	3 years (mature phase)			
S. No	Particulars	Average cost	Average cost	Average cost	Average cost	Average cost	Average cost
A	Fixed cost	Cost	% to total cost	% to total Cost	% to total cost	% to total cost	% to total cost
i	Rental value on land	2000	31.73	2000	30.77	2000	34.21
ii	Depreciate	13700.00	21.73	13700.00	21.08	13700.00	23.43
	Fixed costs	33700.00	53.46	33700.00	51.86	33700.00	57.64
iii	Interest on fixed costs	13759.50	21.83	13759.5	21.17	13759.5	23.53
	Total fixed costs (i +ii + iii)	4745.50	75.29	4745.50	73.03	4745.50	81.17
B	Working capital costs						
I	Labour	12100.98	19.20	13890.4	21.37	7925.47	13.55
a	Tractor charges	3020.55	4.79	3898.09	6.00	972.96	1.66
b	Human	9080.43	14.41	9992.4	15.38	6952.51	11.89
II	Planting material	372.00	0.59	531.43	0.82	0	0.00
III	Fertiliser	474.55	0.75	403.31	0.62	640.79	1.10
IV	Plant protection Chemicals	712.33	1.13	641.92	0.99	876.62	1.50
V	Irrigation	894.93	1.42	915.26	1.41	847.51	1.45
VII	Interest on working	14554.86	23.09	16382.4	25.21	10290.4	17.60
VIII	Working on capital	1018.84	1.62	1146.76	1.76	720.33	1.23
C	Total working capital (VII + VIII)	15573.64	24.71	17529.1	26.97	11010.7	18.83
D	Total costs (A+B+C)	63033.14	100.00	64988.66	100.00	58470.2	100.00

Source: Singh et al., 2017

A considerable reduction in labour costs for harvesting in the mature phase was noted as the yield declined. This is the phase when most of the farmers cut the trees from the lower part of the stem (around 10th year) and wait for another growth which is equally fast and the trees flower within 4-6 months. This

is a usual cycle which was observed in the study area. A *Moringa oleifera* farm in its economic life of 10 years yielded around 1915 qtls per ha and generated gross returns of Rs 53, 79,726 per ha in ten years. It was observed from Table 4 that the average quantity of pods produced per ha was 32.77 qtls in first year. The yield was highest (326 qtls) in fourth year. The average yield per farm per year in bearing phase (first seven years) was about 210 quintals per ha per year, while the average yield in the mature phase (eighth, ninth and tenth year) was 149 quintals per ha per year. However, the proper management of the orchards is required for stable yields.

Table 4: Yield and return structure of *Moringa oleifera* on a farm per hectare in Vadodara district of Middle Gujarat

S. No.	Economic life	Yield (qtls/ha)	Total Return (Rs/ha)
1	1st	32.77	96852.69
2	2nd	185.00	550190.00
3	3rd	219.24	634642.80
4	4th	326.00	931590.83
5	5th	276.48	736726.72
6	6th	209.69	573032.30
7	7th	219.43	611512.30
8	8th	163.00	444081.00
9	9th	153.73	437505.60
10	10th	130.64	363591.80
Total	**Total production**	**1915.80**	**537972.60**
Average yield Average Return (Rs/ha)		1915.80	537972.60

qtls = quintals (q = Cost of orchard in the t^{th} year, t = Age of *Moringa oleifera* farm (in years); I = Rate of discount (10 percent per annum); Rs = Rupees (1 US dollar = 75.98 Rupees)

Source: Singh et al., 2017

It was observed during the survey in India that farmers may take a loan in order to meet their establishment costs and operational expenses by the time the crop generates positive returns. Therefore, the average benefit cost stream of investment on *Moringa oleifera* farms was calculated using the with and without finance approach in order to understand the impact of a loan on farm income and to know

the financial feasibility of investment under two situations. The average benefit cost stream of investment on a *Moringa oleifera* farm of one ha in Vadodara district of Gujarat, when the loan was availed, that is, with finance, showed that heavy investment was required only in the first year as the tree flowers within six months of establishment, bears pods and generates returns. The incremental returns were positive from the second year itself and reached a maximum in the fourth year. While the per unit costs declined from the fourth year due to higher yields, it was observed that the costs increased again in ninth and tenth year of economic life due to increased expenses on plant protection and irrigation. Besides this, the labour charges also increased as the plant reached height. Even though the yield declined, the picking time increased during these years (due to height), thereby raising costs. Investments in orchards generally are huge and they are spread over the lifetime of the orchard (10 years in this case). A vast amount of resources is committed to raising orchards and the management of inputs plays a key role. Therefore, the costs and returns were analysed carefully to test the worthiness of the investment in the *Moringa oleifera* enterprises, hence the technique of project evaluation such as payback period, net present value, benefit cost ratio, and internal rate of return were employed for investment on one ha of *Moringa oleifera* farm in Vadodara district. In analysing the investment feasibility, the establishment costs, maintenance costs and gross returns were considered at 10 percent discount rate, thus representing the opportunity cost of capital. The establishment cost (with finance) was Rs 2, 58,546 per ha in the first year. The debt servicing cost was calculated at 10 percent and this was spread over the economic life of the tree. The average benefit cost stream of investment on the *Moringa oleifera* farm of one ha without finance showed that the cost reduced by the amount of cost of debt servicing when the loan was not taken. Therefore, the realisation of returns or incremental cash flow increased without finance.

CHAPTER 3 *METHODOLOGY*

3.1 Introduction

This chapter discusses the methodology applied, using different tools. Outlining a research methodology is a critical phase of research since it highlights the actual research process to determine the outcome of the research.

3.2 Study Area

The study was conducted in the two villages namely Musokotwane and Mukuni in Livingstone, Zambia, and Figures 2 and 3 below show the maps of these villages. Livingstone area and the surrounding villages have a population of 139,509 people according to the Zambia Census provisional 2010 report and 5,160 are youths living in the rural areas. The major occupation in the study area was farming, although some of the respondents engaged in some other minor activities like crafts. The rural populace in the study area was mostly subsistence farmers that grow crops. Currently, the method of farming is mainly traditional with farmers having smallholdings and they use traditional technology (hoe and cattle plough) for cultivation. The communities in this study area have been introduced to the *Moringa oleifera* planting project by the Chief Mukuni for youth empowerment which is going on and is funded by the United States Agency for International Development (USAID). The study areas were, therefore, ideal to examine the socio-economic benefits of *Moringa oleifera* to rural youths.

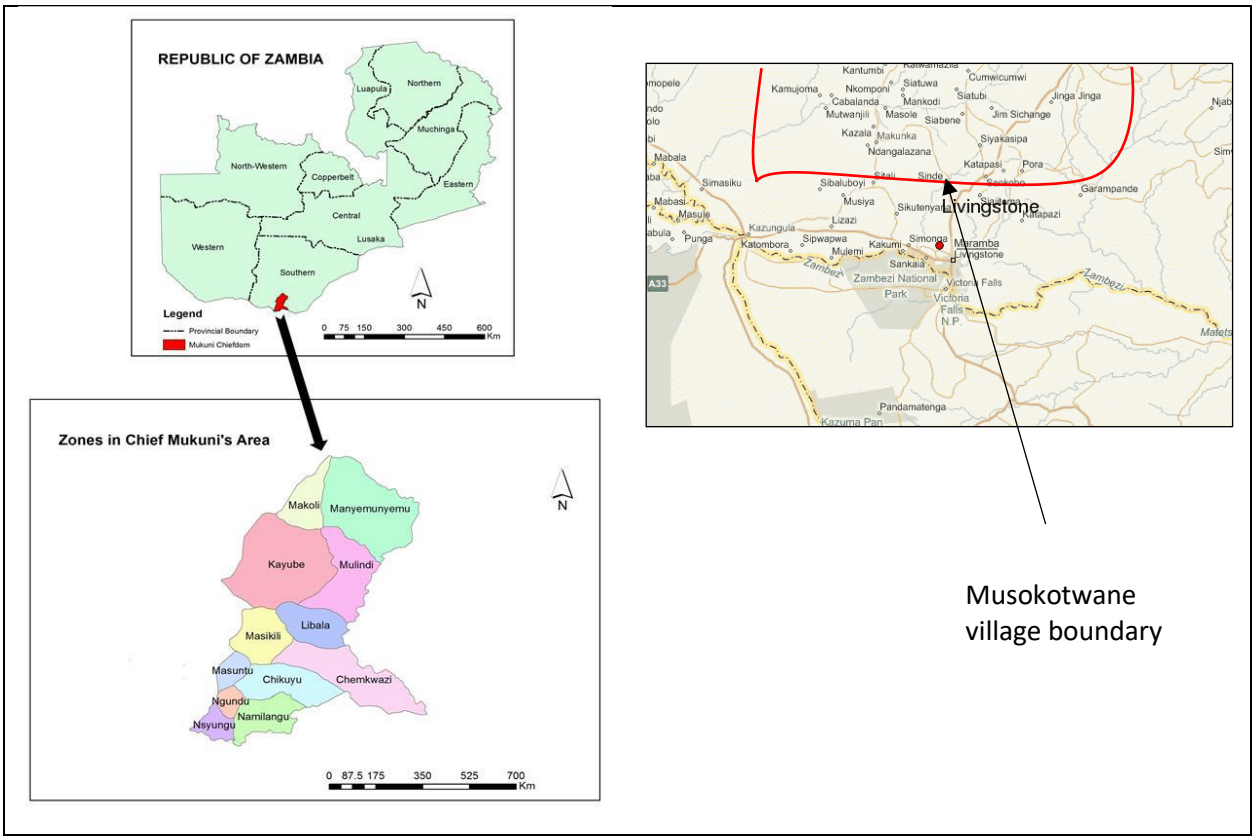

Figure 2: Map of Mukuni and Musokotwane Village

Source: Livingstone Tourism Association, 2014

3.3 Research Design

This study used a mixed method research design. Data was collected in November 2018 both qualitatively and quantitatively. The qualitative data focused on exploring themes and patterns. The quantitative data obtained was then summarised and presented using different graphics.

3.3.1 Sample Selection and Size

The required sample size, N, was calculated using the formula:

$$N = \frac{z^2 p(1-p)}{e^2} \qquad (1)$$

where *z* is the value corresponding to the level of confidence required, which is referred to as z-score, *p* is the proportion in the target population that is estimated to have characteristics being measured and *e*

the margin error. The following values were used to compute the sample size, where z = 1.65 at 90 percent confidence, p = 0.5 (50 percent) and e = 0.03 (3 percent). The sample sizes of youths randomly selected in Musokwatwane and Mukuni villages were 276 and 489, respectively, resulting in a total of 765. Only those youths involved in the growing of *Moringa oleifera* were randomly selected.

3.3.2 Data Collection

Primary data was collected using a structured questionnaire that was administered personally with the help of research assistants. The quantitative data obtained was summarised and presented using graphs, pie charts and tables. The qualitative data focused on exploring themes and patterns by using purposive sampling structured interviews and a pilot study. Data collected included gender, marital status, age, educational level, household size, family farm, farm size, selling of *Moringa oleifera* and the *Moringa oleifera* market.

3.3.3 Data Analysis

The data were analysed using SPSS computer software to transform and produce a characteristic pattern between different data variables. Descriptive statistics were used to illustrate different aspects of the data. The quantitative data obtained was summarised through graphical representation, pie charts and tables to easily understand the results.

Regression analysis was used to understand the relationship between dependent and independent variables in this research. In this study, a binary Probit model was run to determine the factors affecting the use of *Moringa oleifera* by the youths. The independent variables used in the model included gender, marital status, age, educational level, household size, family farm, farm size, selling of *Moringa oleifera* and *Moringa oleifera* market. The dependent variable, use of *Moringa oleifera,* is a dichotomous variable, which takes the value of one if youths indicated that they used *Moringa oleifera*, otherwise, zero. The aim was to investigate the factors affecting the use of *Moringa oleifera* among the youths in the rural areas.

Equation two (2) presents the Probit regression model, where Y is a dichotomous dependent variable which can assume the value of 0 or 1. X_i = n x k matrix of explanatory variables (gender, marital status, age, educational level, household size, family farm, farm size, selling of *Moringa* and *Moringa* market). β_i = k x 1 vector of parameters/coefficients to be estimated and μ is the error term (Gujarati & Porter, 2009).

$Y = \beta_0+\beta_1X_1+\beta_2X_2+\cdots+\beta_kX_k+u$…… (2)

With

$P(Y=1|X_1,X_2,\ldots,X_k)=\Phi(\beta_0+\beta_1X_1+ \beta_1 \beta_1X_2+\cdots+\beta_kX_k)P(Y=1|X_1,X_2,\ldots,X_k)=\Phi(\beta_0+\beta_1X_1+\beta_2X_2+\cdots+\beta_kX_k)$…… (3)

as the Probit model with multiple regressors $X_1,X_2,\ldots,X_kX_1,X_2,\ldots,X_k$ and $\Phi(\cdot)$ is the cumulative standard normal distribution function (Deegan & White, 1976), where:

Y_i = binary dependent variable (use of *Moringa*, 1 = Yes; 0 = No)

β_0 = intercept parameter (constant)

β_1, β_k = slope parameter

X_1, X_k = explanatory variables

U_1 = error term

Table 5: Independent variables and their expected relationship with the dependent variable

Variables and their expected relationship with the dependent variable		
Variable	**Expected relationship with the dependent variable**	**Rationale**
Dependent Variable		
Uses of *Moringa oleifera*		
Independent Variables		
Gender	+	These variables capture the use of *Moringa oleifera*, however, gender, age, education level, household, marital status and employment would influence the use of *Moringa oleifera* either positively or negatively. The variables capture the characteristics which are important to understand Livelihood strategies
Age	+	
Education level	+	
Household size	-/+	
Marital status	+	
Employment	+	
Farm size	+	These variables capture the use of *Moringa oleifera* and are expected to influence the youths' participation in the cultivation of the *Moringa oleifera* Positively. Assets owned are expected to have a positive effect on the use of *Moringa oleifera*.
Farm ownership	+	

3.4 Reliability and Validity of the Data

Reliability and validity are indications that are used to evaluate the quality of research. They indicate how well a method, technique or test measure something. Reliability is about the consistency of a measure, and validity is about the accuracy of a measure. There are various threats to the reliability and validity of the data, and these could be fiction constructs, item order and personal information such as income, marital status, age, gender. To ensure the collection of reliable and valid data, a total of 765 respondents were interviewed for the study. A validated and pre-tested interview schedule was used to solicit for information that could cause inaccurate responses (Adair, 2012).

3.5 Ethical Considerations

In this research, ethical issues were considered to ensure that the study had no potential of being unethical to people. Respondents were given all the relevant information that was necessary to make an informed decision as to whether they would like to take part in the study or not. In other words, informed consent was obtained from all participants before interviewing them, that is, no one was forced to participate in the study. Confidentiality was considered to make sure that the participants' names and addresses were not required. No personal details were required from participants such as their names to ensure and maintain anonymity and strict confidentiality. The respondents were assured that the information collected was to be used for academic research purposes only and could opt out at any time.

3.6 Limitations of the Study

Many of the respondents showed interest in getting involved in the *Moringa oleifera* business so as to generate income, however, this research was only meant to get information for academic purposes and not to help with soliciting funds for the respondents to start the *Moringa oleifera* business. The respondents' expectations for funding may have influenced the data provided for business related variables. However, the intention of the study was clearly explained to the respondents.

CHAPTER 4 RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents results from the data analysis process including variables such as gender, marital status, age, educational level, household size, farm size, family ownership, selling of *Moringa oleifera*, *Moringa oleifera* markets and the uses of *Moringa oleifera*. The results are presented in tables and figures. A discussion of the results is also presented in this chapter.

4.2 Results

The demographic profile of respondents has been interpreted as while as the Chi-square tests in this chapter.

4.2.1 Gender

The distribution of respondents by sex is shown in Table 6. Fifty-five percent of the respondents were female while 45 percent were male. These results concur with the Zambia 2010 population and housing Census provisional report (CSO, 2012), which showed that the female population was slightly higher (51 percent) than the male population (49 percent). The same trend was observed among youths who grew *Moringa oleifera.* This trend is reflective of which gender is more interested in growing *Moringa oleifera*. These results address the objective which sought to investigate if sex could affect youth involvement in *Moringa oleifera* business.

A Chi-Square Test of gender and use of *Moringa oleifera* revealed that there was no statistically significant difference *(p* = 0.602) in the use of *Moringa oleifera* by sex of respondents at 5 percent level of significance. This shows that every respondent use *Moringa oleifera* despite their sex.

4.2.2 Age

The age range of respondents in the study area as presented in Table 6 was arranged in the order of less than 18, between 19 and 22, between 23 and 26, between 27 and 30, and between 31 and 34. The highest

number of respondents were aged less than 18 years old (28 percent) followed by 19 -22 (25 percent), 23 - 26 (21 percent), 27 - 30 (15 percent) and finally 31 - 34 (1 percent).

To examine the uses of *Moringa oleifera* based on age range, a Chi-Square test was conducted which showed no statistically significant difference *(p* = 0.263) in the use of *Moringa oleifera* by age of respondents at 5 percent level of significance. This can be attributed to the consistent use of *Moringa oleifera* by every age range of respondents.

4.2.3 Educational Level

The educational levels of respondents are presented in Table 6. Most of the respondents had Secondary education with 70 percent and Primary education had 16 percent. Technical/vocational level was 7 percent. Respondents with Tertiary level were 5 percent, while the Others category of those that have written the examinations and are waiting to be admitted either to tertiary or secondary level were 3 percent. Lastly, the no formal education category of respondents accounted for 2 percent.

A Chi-Square test of educational level and use of *Moringa oleifera* was carried out to find out if there were statistically significant differences in the use of *Moringa oleifera* among respondents based on their educational level. However, the result indicated that there were no statistically significant differences (*p* = 0.944) in the use of *Moringa oleifera* by educational level of respondents at 5 percent level of significance. This clearly reveals that all respondents used *Moringa oleifera* for different purposes equally despite their educational level.

4.2.4 Household Size

The household sizes in the study area are shown in Table 6. Since every youth is a member of a household, therefore, the determination of the household size was crucial. The results show that 64.8 percent of the households had less than 5 members, 33.1 percent had between 5 and 10 members, and 2.1 percent had more than 10 members.

A Chi-Square test of household size and use of *Moringa oleifera* revealed that there was no statistically significant difference *(p* = 0.969) in the use of *Moringa oleifera* by household size at 5 percent level of significance. This shows that every respondent used *Moringa oleifera* despite their household size.

4.2.5 Marital Status

The marital status of respondents in the study area is shown in Table 6. More than 70 percent (71.1 percent) of the respondents were single, 28.4 percent were married, 0.4 percent were separated, and 0.1 percent were widows/widowers. As commonly found in many societies, single people are the majority compared to the married, widows/widowers and divorced, hence the current study's result confirm those by EOSOC and Statistical Commission (2015).

A Chi-Square Test of marital status and use of *Moringa oleifera* revealed that there was no statistically significant *(p* = 0.930) score in the use of *Moringa oleifera* by marital status of respondents at 5 percent level of significance. This shows that every respondent used *Moringa oleifera* despite their marital status.

4.2.6 Employment

The employment status of respondents in the study is shown in Table 6. The results show that the youths in the informal employment constituted 4 percent of the sample, self-employed youths were 12 percent, while unemployed youths were 84 percent. This means that there is a high unemployment rate among youths, although self-employment was second highest followed by formal employment.

A Chi-Square Test of employment status and use of *Moringa oleifera* was carried out to find out if there were statistically significant differences in the use of *Moringa oleifera* among respondents based on their employment status. However, the result indicated that there were no statistically significant differences *(p* = 0.002) in the use of *Moringa oleifera* by employment status of respondents at 5 percent level of significance. This clearly reveals that all respondents equally used *Moringa oleifera* for different purposes despite their employment status.

4.2.7 Farm Size

The farm size of the respondents in the study area is shown in Table 6. The farm size of the respondents with 45 percent had less than 1.0 acres, followed by 21 percent who had 1.0 acre of farm size, 19 percent had 2.0 acres, 8 percent had 5.0 acres followed by 4 percent who had 3.0 acres of farm size and 3 percent

who had 4.0 acres. An insignificant number of respondents had 6.0 – 8.0 acres. This is an indication that as communal farmers, many of them have more acres of farm size to cultivate for their livelihoods.

4.2.8 Farm Ownership

Farm ownership data is shown in Table 6. The majority of the respondents (88 percent) were farming on a family farm while 12 percent of the respondents were farming on land that was not a family farm, even though it was not directly related to *Moringa oleifera* farming. Out of the respondents who did not use family farms, 12 percent owned the farm and 88 percent did not own the farms they were using. This can be attributed to the fact that farming is their source of livelihood as the highest proportion of respondents had family farms and fewer had their own land.

Table 6: Demographic Profile of Respondents

Variable		Frequency	Percent
Gender	Female	424	55
	Male	341	45
Age (years)	Less than 18	210	28
	Between 19-22	186	24
	Between 23-26	155	20
	Between 27-30	114	15
	Between 31-34	87	11
Education level	No formal education	12	1.6
	Primary school level	121	15.8
	Secondary school level	533	69.7
	Technical/Vocational level	57	7.5
	Tertiary level	38	5.0
	Adult education	2	0.3
	Other	2	0.3
Household size	Less than 5 people	496	65
	Between 5 and 10 people	253	33
	More than 10 people	16	2
Marital status	Single	544	71.1
	Married	217	28.4
	Separated	3	0.4
	Widow/Widower	1	0.1
Employment	Formal employment	31	4.1
	Unemployed	646	84.4
	Self-employed	88	11.5
Farm size	Less than 1.0 acre	345	45.1
	1.0 acres	164	21.4
	2.0 acres	142	18.6
	3.0 acres	34	4.4
	4.0 acres	19	2.5
	5.0 acres	57	7.5
	6.0 acres	1	0.1
	More than 8.0 acres	3	0.4
Farm ownership	No	670	88
	Yes	95	12
	Total	765	100.0

4.2.9 Selling of *Moringa oleifera*

Figure 3 shows that 89 percent of respondents did not sell *Moringa oleifera,* whereas 11 percent did. The selling of *Moringa oleifera* by respondents was mainly to generate income for their livelihood. Those who did not sell *Moringa oleifera* products but produced it for consumption were the majority.

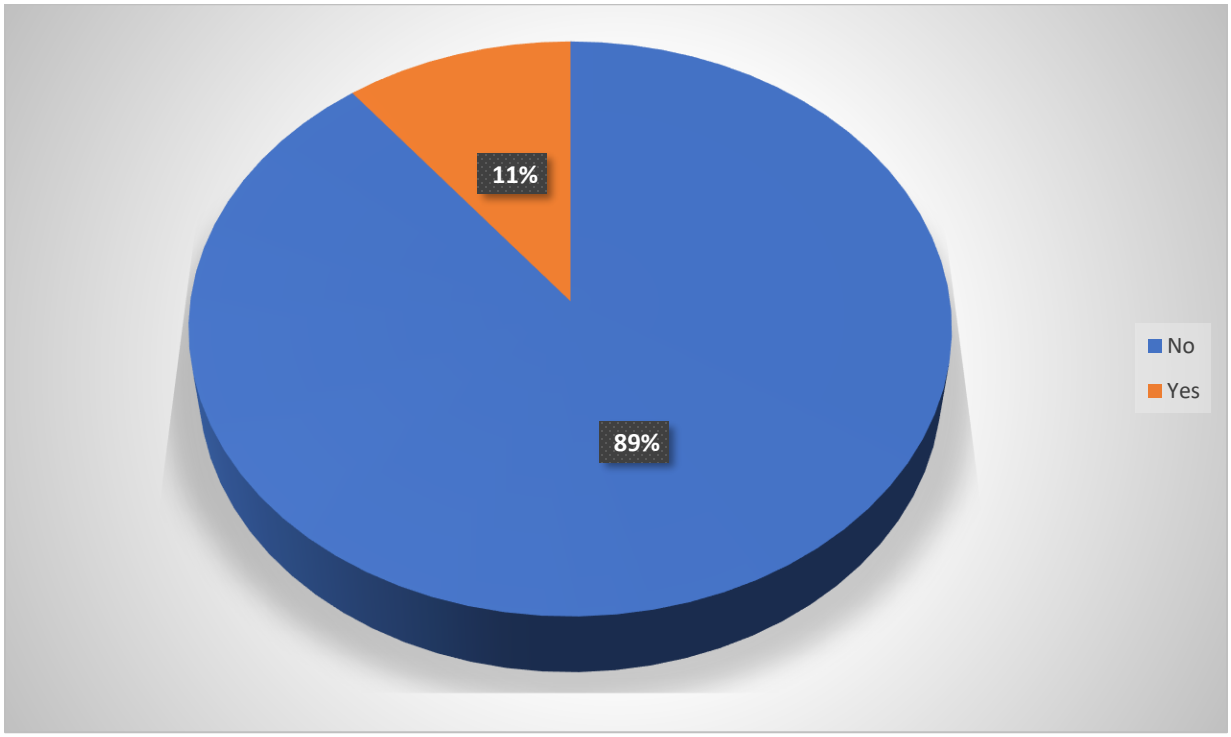

Figure 3: Selling of *Moringa oleifera* by respondents in Livingstone rural area, Zambia (N = 765)

4.2.10 *Moringa oleifera* Markets

Figure 4 shows the market for *Moringa oleifera* which reveals that 72 percent of the respondents sell their *Moringa* products within Zambia, whereas 28 percent sell to the international market.

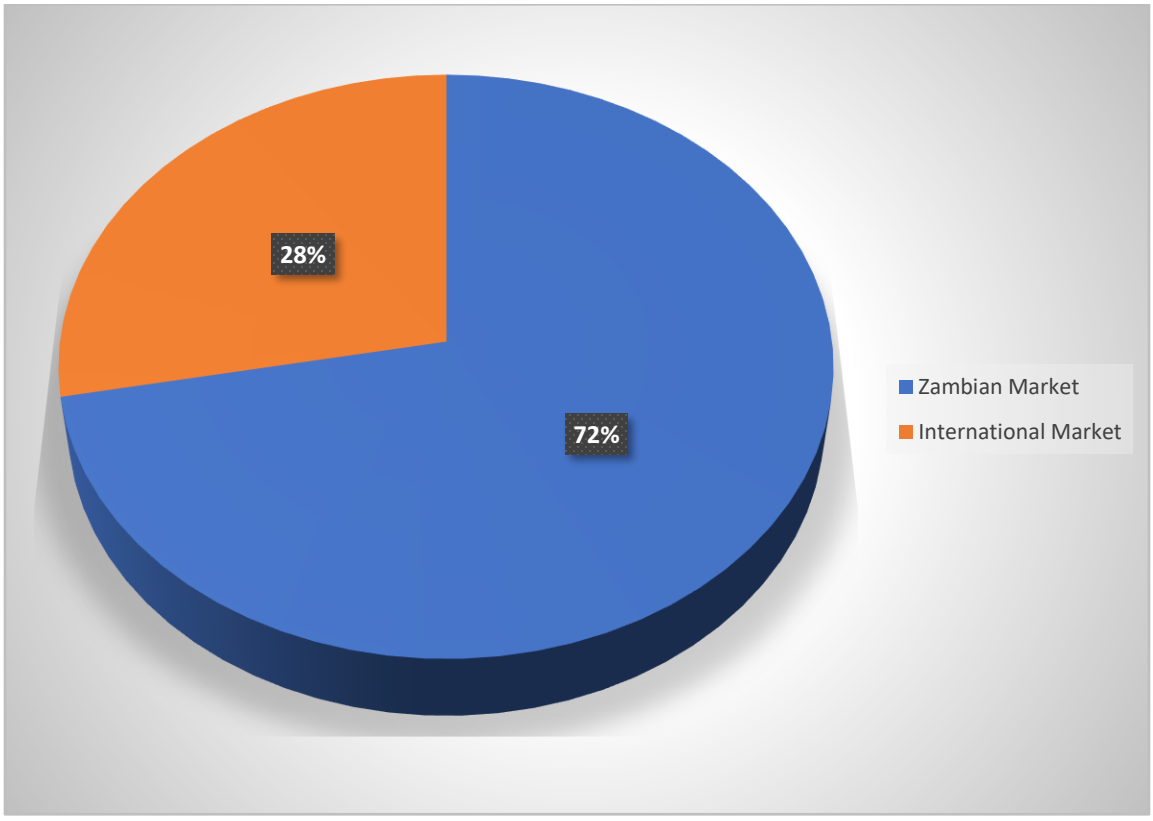

Figure 4: *Moringa oleifera* Markets for respondents in Livingstone rural area, Zambia (N = 765)

4.2.11 Uses of *Moringa oleifera*

The uses of *Moringa oleifera* by youths in the study area are shown in Figure 5. The identified uses of *Moringa oleifera* include animal fodder, construction (poles and fibre), food supplements, vegetables, source of oil, tea, ornamental, fuelwood, medicinal, intercropping and source of income. The highest usage is for medicine with 30.3 percent, followed by tea with 28.7 percent, vegetable with 26.5 percent and food supplement with 9.2 percent while the other uses are below 4 percent.

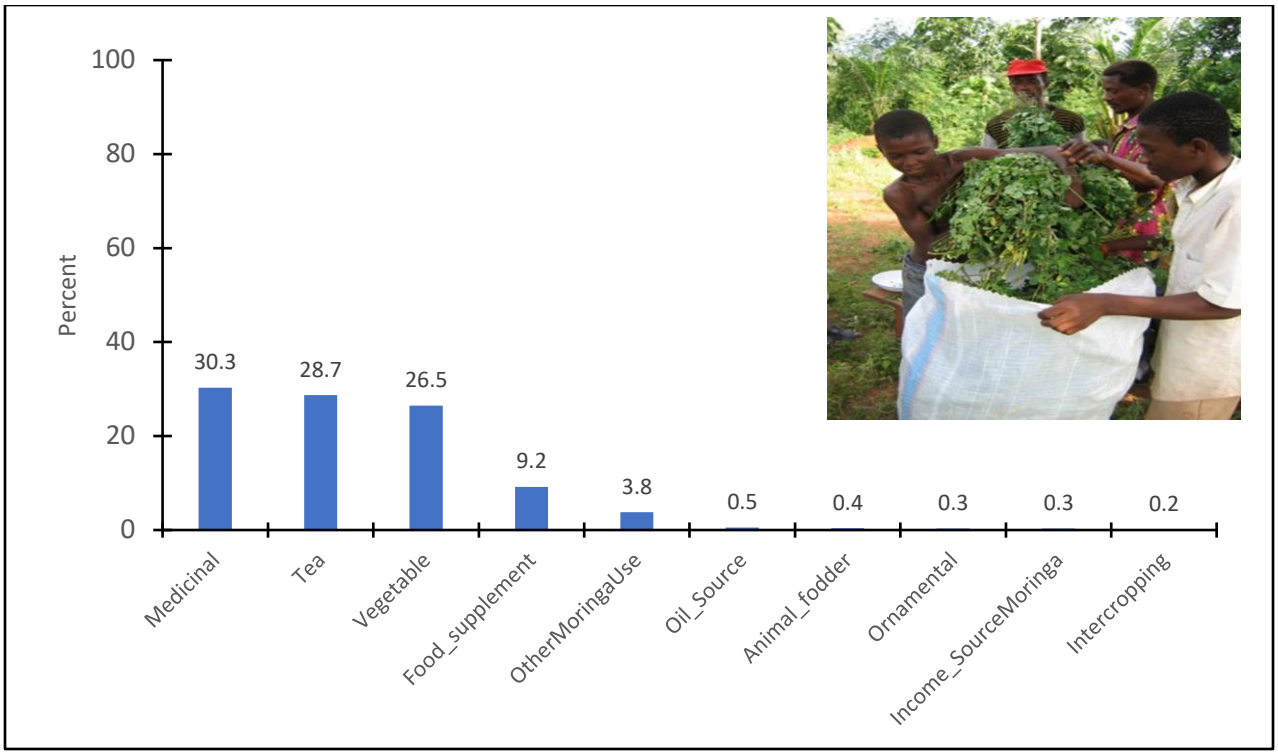

Figure 5: *Moringa oleifera* uses by respondents (N = 765) in Livingstone rural area, Zambia (Insert shows youth in Livingstone rural area, Zambia, harvesting *Moringa oleifera*)

Table 7: *Moringa oleifera* uses by gender

	Animal fodder	**Medicine**	**Food supplement**	**Oil source**	**Income source**	**Vegetable**	**Other uses**
Female	4	274	64	5	2	176	23
Male	1	154	47	1	1	145	23
p-value for Chi square test*	0.392	0.494	0.242	0.501	0.223	0.861	0.352

* 95% Confidence level

In order to establish the relationship between the use of *Moringa oleifera* and gender, Table 7 is hereby used. Gender was categorised as female and male. Only 5 respondents used *Moringa oleifera* for animal fodder of which 4 are females and 1 is male. The number of respondents who used *Moringa oleifera* as medicine were 274 (64.0 percent) females and 154 (36.0 percent) males from a total of 428 respondents who selected this use. As a food supplement, the females had the highest number at 64 (57.7 percent),

may be because they are the ones who prepare food and they are more health conscious than males who were 47 (42.3 percent). The respondents who used *Moringa oleifera* seeds as a source of oil were 5 females and only 1 male. Income generation had few respondents who used *Moringa oleifera* as a business as only 2 females indicated that they sold *Moringa oleifera* products and only 1 male. The same trend was observed in the use of *Moringa oleifera* as a vegetable in that there were more females (176 or 54.8 percent) than males (145 or 45.2 percent). Other(firewood,ornament) uses *of Moringa oleifera* by both female and male were found to be equal with each having 23 respondents.

The Chi-square tests showed no statistically significant differences ($p > 0.05$) in the use of *Moringa oleifera* by gender as animal fodder ($p = 0.392$), for medicine ($p = 0.494$), as a food supplement ($p = 0.242$), as an oil source ($p = 0.501$), as an income generation source ($p = 0.223$), as a vegetable ($p = 0.861$) and for other uses ($p = 0.352$).

Moringa oleifera uses categoried by age are shown in Table 8. Less than 18 years who used animal fodder had only 1 while between 19-22 years were 2 and between 23-26 ,27-30 and 31-34 years had 1 respondent each. However, to establish the relationship between the use of *Moringa oleifera* as medicine by age less than 18 years respondents were 112. Between 19-22 had 86 respondents,78 respondents aged between 23-26 years, while respondents that were between 27-30 had 55. The least age that used *Moringa oleifera* had 20 respondents.

Table 8: *Moringa oleifera* uses by age

	Animal fodder	**Medicine**	**Food supplement**	**Oil source**	**Income source**	**Vegetable**	**Other uses**
Less than 18	1	112	18	0	0	87	9
Between 19-22	2	86	26	1	1	74	19
Between 23-26	1	78	19	1	1	69	5
Between 27-30	1	55	20	1	1	28	11
Between 31-34	1	20	20	1	0	42	11
p-value for Chi square test*	0.265	1.000	0.938	0.285	0.199	0.962	0.245

* 95% Confidence level

This shows that majority of the respondents used *Moringa oleifera* as medicine were the respondents who had less than 18 years and the overall uses of *Moringa oleifera* by age ,showed that the use of *Moringa oleifera* as medicine was the highest by the respondents followed by vegetable ,food supplement ,other uses, animal fodder,oil and income was the least. Therefore, a conclusion can be drawn that the respondents do not use *Moringa oleifera* for income generation.

The Chi-square tests showed no statistically significant differences ($p > 0.05$) in the use of *Moringa oleifera* by age as animal fodder ($p = 0.265$), for medicine ($p = 1.000$), as a food supplement ($p = 0.938$), as an oil source ($p = 0.285$), as an income generation source ($p = 0.199$), as a vegetable ($p = 0.962$) and for other uses ($p = 0.245$).

Table 9: *Moringa oleifera* use by educational level

	Animal fodder	**Medicine**	**Food supplement**	**Oil source**	**Income source**	**Vegetable**	**Other uses**
No formal	0	11	1	0	0	5	0
Primary school	1	63	0	0	0	48	5
Secondary school	3	249	3	3	3	228	0
Technical/vocational	0	33	2	2	0	19	37
Tertiary school	1	12	1	1	0	19	3
Adult education	0	0	0	0	0	1	0
Others	0	0	0	0	0	1	0
p-value for chi square test	0.504	0.731	0.999	0.830	0.000***	0.914	0.998

Note: * 95% Confidence level

*** p<0.01, ** p<0.05, * p<0.1

Table 9 establishes the relationship between the uses of *Moringa oleifera* by educational level categories as no formal education, primary school, secondary school, technical/vocational, tertiary school, adult education and others. The others category represents those respondents that were not in tertiary or vocational yet but waiting for their results and admission to enter into tertiary education. Animal fodder usage had 1 respondent with primary school level, 3 with secondary school and 1 with tertiary education. The rest of the respondents had no formal education, adult education or others. The 368 respondents

that used *Moringa oleifera* as medicine were 11 (3.0 percent) with no formal education, 63 (17.1 percent) with primary school education, 249 (67.7 percent) with secondary school education, 33 (8.9 percent) with technical/vocational education and 12 (3.3 percent) with tertiary level education. There were no respondents with adult education and others category. For *Moringa oleifera* usage as a food supplement, 1 respondent had no formal education, 3 had secondary school level education, 2 had technical/vocational education and 1 only had tertiary school level education. Moreover, for *Moringa oleifera* usage as a source of oil, this category had 3 with secondary school level education, 2 with technical/vocational level education and 1 with tertiary school education. Income generation had only 3 respondents who had secondary school level education and the rest of the categories had no respondents. This shows that the majority of the respondents were not selling *Moringa oleifera* products as a source of income and this could be because they were not aware of the financial benefits of *Moringa oleifera*, or the lack of access to markets or infrastructure for them to be able to venture in the *Moringa oleifera* business. Of the 321 respondents who use *Moringa oleifera* as a vegetable, 5 (1.6 percent) had no formal education, 48 (15.0 percent) had primary level education, and 228 (71.0 percent) had secondary school level education, whereas the technical/vocational and tertiary education level had 19 (5.9 percent) respondents each and adult education and others had 1 (0.3 percent) respondents each. This is a clear indication that all the categories of respondents that used the *Moringa oleifera* were aware of the tree in the study area. As for the other uses, the technical/vocational level education had the highest number of respondents with 37 and primary school education level with 5, whereas tertiary level education had 3 respondents, while the other categories had no respondents.

The Chi-square test showed no statistically significant differences ($p > 0.05$) in the usage of *Moringa oleifera* by education level as animal fodder ($p = 0.504$), medicine ($p = 0.731$), food supplement ($p = 0.999$), oil source ($p = 0.830$), vegetable ($p = 0.914$), food supplement ($p = 0.999$) and others uses ($p = 0.998$). However, there were statistically significant differences ($p < 0.05$) in *Moringa oleifera* usage by education level for income generation ($p = 0.000$ to 3 decimal places).

Table 10: *Moringa oleifera* uses by marital status

	Animal fodder	**Medicine**	**Food supplement**	**Oil source**	**Income source**	**Vegetable**	**Other uses**
Single	1	274	70	3	2	218	27
Married	4	93	40	3	1	101	19
Separated	0	0	1	0	0	2	0
Divorced	0	0	0	0	0	0	0
Widow/widower	0	1	0	0	0	0	0
p-value for Chi square test*	0.082	0.997	0.270	0.368	0.223	0.952	0.345

* 95% Confidence level

Moringa oleifera uses by marital status were shown through categories such as single, married, separated, divorced and widow/widower. Table 10 was used to establish the relationship between marital status and the use of *Moringa oleifera*. For animal fodder use, there were only 5 respondents of which 4 were married and 1 was single. In other words, there were no respondents that were separated, divorced and widows/widowers. In the case of *Moringa oleifera* usage for medicine, a total of 368 responded of which 274 (74.4 percent) were single and 93 (25.3 percent) were married, while 1 (0.3 percent) was a widow/widower and none was divorced or separated. With regards to its usage as a food supplement, there were 70 single respondents, 40 married and only 1 separated, that is, none were divorced or widows/widowers. Single and married had 3 respondents each who used it as a source of oil, whereas the other categories had none. As a source of income, there were 2 single and 1 married respondents, while the rest had no respondent. For the 321 respondents that used *Moringa oleifera* as a vegetable, 218 (67.9 percent) were single, 101 (31.5 percent) were married, and 2 (0.6 percent) were divorced, whereas there were none that were divorced and widows/widowers. In the case of other uses, 27 respondents were single and 19 were respondents and none were separated, divorced and widows/widowers. It is important to bear in mind that the respondents were youths and therefore the majority of them were single and only a small percentage were married. The separated, divorced and widow/widower categories had generally the lowest number of respondents (0.5 percent) according to Table 10.

The Chi-square tests showed no statistically significant differences ($p > 0.05$) in the use of *Moringa oleifera* by gender as an oil source ($p = 0.368$), income source ($p = 0.223$), food supplement ($p = 0.270$), animal fodder ($p = 0.082$, medicine ($p = 0.997$) and vegetable ($p = 0.952$) and other uses ($p = 0.345$).

Table 11. *Moringa oleifera* uses by household size

	Animal fodder	**Medicine**	**Food supplement**	**Oil source**	**Income source**	**Vegetable**	**Other uses**
Less than 5	0	22	10	1	1	2	1
Between 5 and 10 people	2	368	111	6	3	111	46
More than 10 people	2	55	60	278	3	3	424
p-value for Chi square test*	0.277	0.038**	0.995	0.827	0.223	0.277	0.999

* 95% Confidence level

*** p<0.01, ** p<0.05, * p<0.1

Household size of the respondents was determined by the number of people living in the homestead and relationship with the *Moringa oleifera* uses in Table 11. Animal fodder was used by 2 respondents each from the household size of between 5 and 10 people and more than 10 people. Between 5 and 10 people use *Moringa oleifera* were 368 respondents, while more than 10 people were 55 and less than 5 were 22. As food supplement uses 111 respondents were between 5 and 10 people. 60 respondents were more than 10 people and 10 respondents were less than 5 people. Oil source as *Moringa oleifera* use had 278 responents more than 10 people in the homestead, while between 5 and 10 people were 6 respondents and 1 respondent from less than 5 people category. *Moringa oleifera* as income generation had 3 respondents each from the category of between 5 and 10 and more than 10 people with 1 respondent from the less than 5 people group. Between 5 and 10 people use *Moringa oleifera* as a vegetable had 111 respondents. More than 10 people only 3 respondents and 2 respondents were less than 5 people. 424 respondents use *Moringa oleifera* for other uses(tea,fuel,ornament) were more than 10 people in the homestead,while 46 responndents were between 5 and 10 people category and only 1 respondent from the less than 5 people.

The Chi-square tests showed no statistically significant differences ($p > 0.05$) in the use of *Moringa oleifera* by household size as an oil source ($p = 0.827$), income source ($p = 0.223$), food supplement ($p = 0.995$), animal fodder ($p = 0.277$), and vegetable ($p = 0.277$) and other uses ($p = 0.999$). There were no statistically significant differences ($p > 0.05$) in *Moringa oleifera* use by household size as medicine ($p = 0.038$**).

Table 12: *Moringa oleifera* uses by employment status

	Animal fodder	**Medicine**	**Food supplement**	**Oil source**	**Income source**	**Vegetable**	**Other uses**
Formal employment	0	31	1	0	0	0	16
Unemployed	7	646	102	6	3	9	276
Self-employment	0	88	8	0	0	0	29
p-value for Chi square test*	0.629	0.001***	0.047**	0.573	0.756	0.672	0.118*

* 95% Confidence level

*** p<0.01, ** p<0.05, * p<0.1

To determine whether there is any relationship between employment status and use of *Moringa oleifera* in Table 12, the employment status was categorised as formal employment, self-employment and unemployed. None of the respondents in the formal and self-employment sectors use *Moringa oleifera* as animal fodder whereas only 7 unemployed respondents do. This is contrary to what is expected since one would expect the respondents in the formal and self-employment sector to have a better understanding of the social-economic benefits of *Moringa oleifera*. The number of respondents who use *Moringa oleifera* for medicine in formal employment, self-employment and unemployed were 31 (4.1 percent), 646 (84.4 percent) and 88 (11.5 percent), respectively. A total of 111 respondents who use it as a food supplement, only 1 (0.9 percent) use it from the formal employment sector, whereas 102 (91.9 percent) who used as food supplement are unemployed while 8 (7.2 percent) respondents used food supplement are self-employment, respectively. It is again interesting that more unemployed respondents use it as a food supplement. Moreover, its usage as a source of oil and vegetable was respectively indicated by 6 and 9 unemployed respondents that use it, whereas the ones in formal and self-

employment do not use it at all. For other(firewood,ornament) uses of *Moringa oleifera*, a total of 321 selected this category and 16 (5.0 percent) were in formal employment, 276 were unemployed (86.0 percent) and 29 (9.0 percent) were self-employed.

The Chi-square tests showed statistically significant differences ($p < 0.05$) in the use of *Moringa oleifera* by employment status as medicine ($p = 0.001$), food supplement ($p = 0.047$) and other uses ($p = 0.118$). There were no statistically significant differences ($p > 0.05$) in *Moringa oleifera* use by employment status as animal fodder ($p = 0.629$), oil source ($p = 0.573$), income source ($p = 0.756$) and vegetable ($p = 0.672$).

4.2.12 Factors Influencing the Use of *Moringa oleifera*

Results presented in Table 13 show how age, household size, employment, farm size, farm ownership and *Moringa oleifera* markets influence the use of *Moringa oleifera* from the Probit model. Specifically, the coefficient of age is positive and significant at 95 percent confidence level. This finding implies that age increases the probability of using *Moringa oleifera*. This could be explained by the fact that older farmers are experienced and are likely to use it to sustain their daily activities. This result is in line with the findings of Gandji (2018). Similarly, the coefficient of household size is positive and significant at 5 percent level of probability. This finding implies that household size increases the probability of *Moringa oleifera* usage and as such, a plausible explanation might be that the larger the number of family members, the more *Moringa oleifera* is demanded within the household as source of food supplement and for medicine. The result is in line with the findings of Sekhar (2018).

In addition, the Probit coefficient for employment is positive and significant at 95 percent confidence level. This can be attributed to the fact that employment increases the probability of using *Moringa oleifera*. Employment is a source of income for individuals and therefore the respondents within this category may likely have the means to use *Moringa oleifera*. This result is in line with the findings of Animashaun (2013) who also found that employing non-users on the claimed Nutraceutical benefits of *Moringa* products led to 85 percent prospective adoption. However, given knowledge, the major determinant of reticence to its adoption was safety concerns, which is statistically significant ($p<0.01$) Hence, it is recommended that an awareness of the claimed Nutraceutical benefits of *Moringa* products should be increased since it could increase the adoption with a consequent increase in market share and job creation. Also, the coefficient of farm size is positive and significant at 1 percent level of probability. This result implies that farm size increases the probability to use *Moringa oleifera*. A possible explanation

is that land is among key factors of production and it is likely to enhance *Moringa oleifera* business and production. This result is in line with the findings of Chandare (2018).

Table 13: Factors influencing the use of *Moringa oleifera*

Variables	Probit coefficient	Marginal effects
Gender	0.256 (0.247)	0.0235 (0.0227)
Age	0.0481** (0.0232)	0.00442 (0.00209)
Educational level	-0.0122 (0.0134)	-0.00112 (0.00123)
Household size	0.00608** (0.00267)	0.000558 (0.000243)
Marital status 1 = Yes, 0 = No	0.374 (0.304)	0.0343 (0.0279)
Employment 1 = Yes,0 = No	1.094** (0.434)	0.101 (0.0391)
Farm size 1 = Yes,0 = No	1.327** (0.286)	0.122 (0.0364)
Farm ownership 1 = Yes, 0 = No	1.197*** (0.286)	0.110 (0.0259)
Moringa oleifera markets	-0.722** (0.337)	-0.0664 (0.0304)
Constant	-5.482 (0.965)	
Observations	765	765

Note: Robust standard errors are in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Moringa oleifera is mainly grown by a limited number of farmers in the backyards and spaces around the homesteads. This hinders *Moringa oleifera* growers to engage in mass production and management of the tree as well as its commercial production potential. Similarly, the coefficient of farm ownership is positive and significant at 1 percent level of probability. This result implies that farm ownership increases the probability to use *Moringa oleifera*. This could be attributable to the fact that a landowner may decide to cultivate cash crops without any fear to alternate with any other crop in their land. This result is contrary to the findings of Animashaum (2016) that revealed negative influences on *Moringa oleifera* business due to the land tenure system practiced ($p < 0.05$). The findings imply, inter alia, that small-scale farmers may avoid diversification into these crops if they have limited access to cultivated land. Therefore, the present author advocates for equitable access to farmland through a structural and legislative land tenure reform policy.

In addition to growing the normal arable and conventional crops, the cultivation of these crops requires additional farm plots, the absence of which may negatively influence their cultivation by farmers. In contrast, the coefficient of *Moringa oleifera* markets is negative and significant at 5 percent. This result

implies that *Moringa oleifera* markets decrease the probability to use *Moringa oleifera*. This could be because there is a greater tendency that farmers are likely to get tempted to sell *Moringa oleifera* which in turn will increase their farm income. This result is in line with the findings of Oyekele (2015) who revealed that most farmers are willing to expand their *Moringa* production, however, the major challenge of effective market access needs to be addressed. This is critical if the crop is to be incorporated in the smallholder farming system for income generation and food security.

4.2.13 Challenges Faced by Youth Wishing to Venture into the *Moringa oleifera* Agribusiness

Results presented in Figure 6 show the challenges that the youth that wish to venture into *Moringa oleifera* agribusiness face. The lack of finances was the highest impediment with 45 percent, followed in decreasing order by high cost of agricultural implements (24 percent), land problem (which includes land degradation and access to of land) (18 percent), illiteracy (8 percent) and lack of innovation capacity (5 percent). Specifically, lack of finances could be due to the high interest rates and lack of collateral security which could jeopardise the accessibility of finances by the youth.

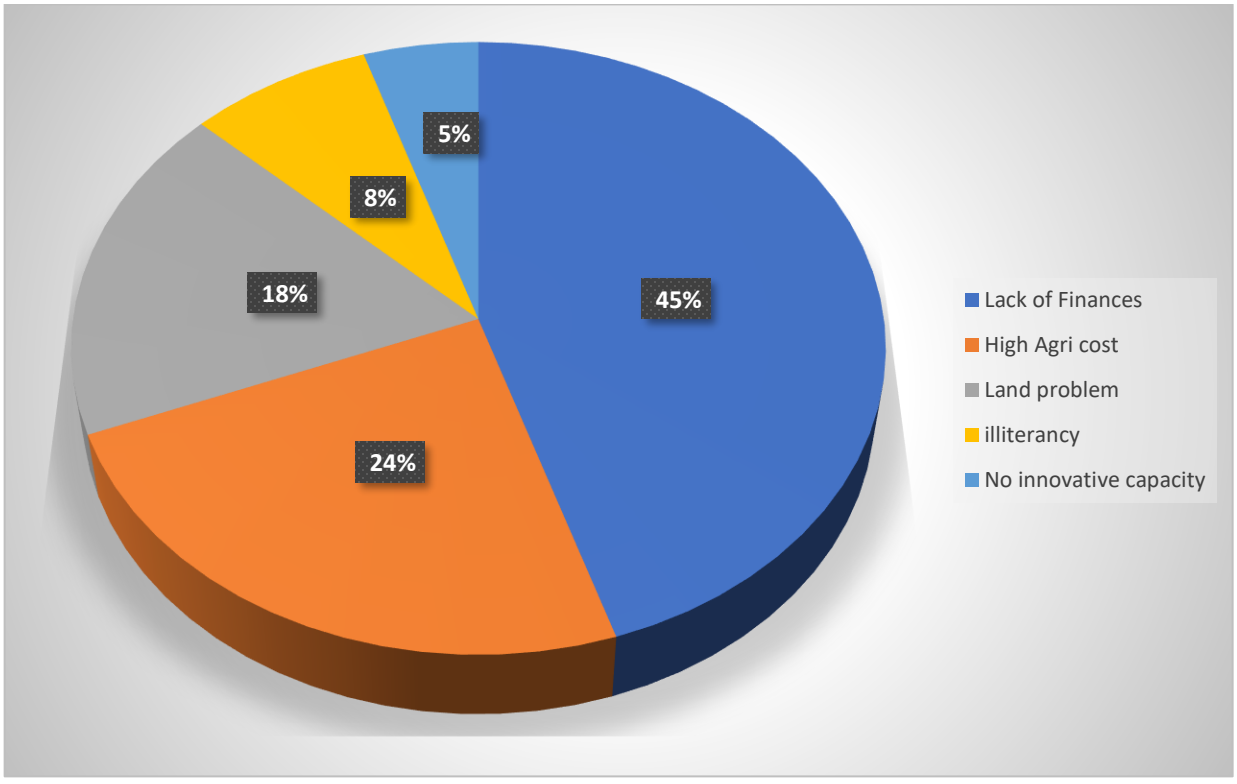

Figure 6: Challenges faced by the youths in *Moringa oleifera* agribusiness

Similarly, Paliwal (2011) found that the high cost of agricultural implements was another challenge that was faced by youths; this could be due to low levels of subsidies that are given by the government in the agricultural sector as well as the tax paid by importers which is likely to increase the selling price above the purchase price of an average youth. As explained by Osewa (2013), land problems which include land degradation and the shortage of land could be due to overuse of land, excessive use of agrochemicals and the land tenure system. Finally, lack of innovative capacity could be due to limited number of capacity building activities that are tailor-made for the youth in the agricultural sector as well as limited youth empowerment training programmes in the *Moringa oleifera* business.

4.3 Discussion

The active involvement of youths in agriculture is necessary for their livelihood and for sustainable agricultural systems but currently this is a challenge in many rural areas, especially in developing countries. Using a combination of qualitative and quantitative participatory research methods, this study analysed rural youths' realities, perspectives and aspirations in the *Moringa oleifera* agribusiness in two typical rural villages around Livingstone town, Zambia. The study first looked at the youths' demographics in terms of their gender, age, marital status, education, household size, employment status, farm size and farm ownership.

Gender is an important variable in a given social situation and it is affected by any social or economic phenomenon and globalisation, hence this variable was investigated in this study. According to the 2010 census report, Zambia had a total population of 13,092,666 with 6,454,647 males (49 percent) and 6,638,019 females (51 percent). The same trend was observed in the gender of the respondents in this study where females had a higher percentage (55 percent) than the males (45 percent). This result is in line with the findings of Odeyinka (2007) in Nigeria with regards to the gender demographics in the study of farmers' awareness and knowledge of *Moringa oleifera* in Southwestern Nigeria. This can be attributed to the fact that there are more females than males in the world population. According to the age and gender composition figures from the 2010 census bureau, there were 50.8 percent females and 49.2 percent males in the world population.

The age of the respondents is one of the most important characteristics in understanding their views about particular problems. A study that was conducted by Akinsuyi (2009) found that the majority of

respondents were in the age group of 18 to 30 years who are youths and this is in agreement with the findings of the present study. By and large, age indicates the level of maturity of individuals and hence it becomes more important to examine their response. For age categories of the youths in the present study, this ranged from less than 18 years old to 34 years of age, but it was found that there were no significant differences in the use of *Moringa oleifera* by age. The results seem to suggest that all the age categories of the youth in this study use *Moringa oleifera* to the same extent.

Education is an important characteristic that might affect the person's attitude and the way of looking and understanding any particular socio-economic phenomena. In a way, the response of an individual is likely to be determined by his or her educational status and therefore it becomes imperative to know the educational background of the respondents, hence, the variable educational level was investigated. Most of the respondents had attained secondary school level but fewer had attained some tertiary education, which is a pre-requisite in the creation of a knowledge-based society. As explained by Vera-Toscano (2017), empirical evidence suggests that educational attainment nurtures people's social stability and active participation in society. The results of the current study, however, showed that all respondents used *Moringa oleifera* for different purposes equally despite their educational level. These findings suggest that the use of *Moringa oleifera* is prone to many factors other than formal education, suggesting that policy makers can implement recommendations even after formal education has been completed. Education has been widely acknowledged as the benefits to society that extend beyond the monetary domain.

Moreover, education is also expected to improve access to information and there are various ways to provide individuals with the knowledge and skills to enhance their performance in the labour market and thereby promote economic growth. The results also revealed that *Moringa* products are highly acceptable to the respondents. In the study of the effects of educational level, most of the respondents had secondary level and they were able to read and write. Therefore, they could be aware of the benefits through literature and it was found that they were willing to sell *Moringa oleifera* products. The plant itself was found in most of the households' back yards and the plant is important to the families as they indicated that they used the plant products for different purposes and also that they were willing to sell the products too. Therefore, the use of *Moringa oleifera* in the study areas was far based on indigenous knowledge as opposed to the level of education, in other words, knowledge about the benefits of the tree is also being passed from generation to generation.

Furthermore, the size of the family is a matter of great importance not only for the country as a whole but also for the welfare and health of the individual, the family and the community. Family size normally determines one's social and cultural values, beliefs and behaviour patterns and these ultimately affect his or her attitude towards a particular problem (Thomson, 2001), therefore, it was important to study the effect that family size may have. The study was used to help identify the use of *Moringa oleifera* by different family sizes as a form of livelihood among the youths. Every youth is a member of a household, therefore the determination of the household size was found to be crucial. The results showed that 64.8 percent of the households had less than 5 members, 33.1 percent had between 5 and 10 members, and 2.1 percent had more than 10 members. In this study, the household size and use of *Moringa oleifera* revealed that there was no statistically significant difference at 5 percent level of significance. In general, one would conclude that every respondent used *Moringa oleifera* despite their household size.

Marital status is one of the most important social institutions and in a developing country like Zambia, it has undergone many changes. However, the perceptions and attitudes to a great extent are defined by one's marital status, for instance, married persons tend to be more knowledgeable of indigenous knowledge practices, hence the benefits and uses of *Moringa oleifera*. The study found that the majority of single respondents were unemployed/underemployed and/or are being looked after by their parents or guardians in the same household. According to a study by Kumssa (2017), the marital status of an individual makes him or her to socialise in a particular fashion which in turn reflects his or her pattern of behaviours and his or her level of understanding of a particular socio-economic phenomenon. In other words, the person's response to a problem is possibly determined by his/her marital status, hence the variable was investigated. Moreover, the marital status has a bearing on one's personality and the way one looks at the problem before him or her. The quality of life is also determined by an individual's marital status. However, the finding in this study in relation to marital status may have been compromised because the majority of the respondents were single. The use of *Moringa oleifera* and marital status had no statistically significant difference at 5 percent level of significance, implying that every respondent uses *Moringa oleifera* despite their marital status.

In addition, a large number of 84.4 percent unemployed respondents were landless agricultural labourers. This shows that agriculture is still a major sector of employment for the unskilled and less educated youths in rural areas. This youthful population constitutes a crucial resource but without sufficient job prospects, it is a resource that will remain untapped. Of even greater concern is that youth unemployment in the

country appears to be on the rise and high rates of youth unemployment represent both widespread personal hardships for individuals and a lost opportunity for critical national and global economic development. If a high number of the youth is economically disadvantaged, they may also contribute to social instability. Given this, unemployment among the youth is a policy issue requiring urgent attention. Additionally, addressing this issue requires an understanding of the nature of youth unemployment in the country. Data in Table 6 highlights the magnitude of youth unemployment in Livingstone rural areas in Zambia and as such, the youth face many barriers when entering the labour market. Furthermore, the lack of a sufficient entrepreneurial culture and financial support appear to be some of the barriers preventing them from venturing into business, particularly agribusiness. Though unemployment in Zambia is high overall, it is particularly higher among the youths, women, and those residing in rural areas. Job creation programmes thus need to be targeted at these groups and any other vulnerable groups. For instance, programmes such as women in agribusiness and entrepreneurship development may help in addressing the problems articulated above. Furthermore, experienced entrepreneurs could provide mentorship to upcoming young ones. Moreover, the promotion of policies that support self-employment among the youth in rural areas have been found to be effective in addressing youth unemployment (Glover-Amengor, 2017).

In addition, poor physical infrastructure, lack of social amenities, lack of local farming equipment and general dislike of village life are some of the factors hindering youths' participation in agribusiness. However, youths have been noted to play a vital role in family farming especially in developing countries, including Zambia, and their contribution is paramount. Studies have shown that youths contribute significantly in agricultural activities (Magagula, 2019) and commercial farms in the village neighbourhoods are currently the biggest employers of rural youth. Those who are unable to find employment in the commercial farmers end up working with their parents in subsistence farming for their livelihood. Given the opportunity, young farmers can constitute a formidable force for the development of family farming in any nation particularly the agrarian ones. For instance, the youths are directly involved in farming activities through planting, weeding, herding livestock and harvesting. Furthermore, family farms represent a large percentage of the total agricultural sector in most African countries and they are dependent on family labour, including both men and women, the elderly and the youths. It has also been observed that family farms differ from one country or region to another in terms of farm size and production type. About seventy percent of the world's food products are produced by family farmers, whose activities are therefore crucial to combating hunger and malnutrition (FAO, 2019).

More so, governments and their development partners have a key role to play in creating a supportive and enabling environment for agriculture and agribusiness including providing a new focus on rural youth through rural agricultural policy development and investment as the majority of the youths do not own land. Given the changing dynamics of farming domestically and internationally, agriculture and agribusiness sectors offer new opportunities for job creation. Increasingly national and international agribusinesses are recognising the role of small-scale farmers as valued business partners through the export of products. Thus, the private sector can also play a key role in supporting new business models that can enable the expansion of agriculture in the rural areas as a way to promote and support the youth in farming and the acquisition of land. Therefore, choices must be made for different groups of small-scale farmers, including young farmers, to enable rural transformations to take place over the coming decades, thereby minimising risks for food security and livelihoods by making land accessible to the youth. Stimulating the growth of farms and rural agribusinesses is essential to improve rural labour market performance for this generation and the next.

Furthermore, *Moringa oleifera* as a source of income is increasingly becoming an important source of livelihood. As a multipurpose tree, *Moringa oleifera* uses are vast and they include medicine, vegetable, ornamental and as a source of oil, firewood, water treatment, fencing, construction, making ropes and as animal fodder. It is a popular tree for indigenous agroforestry in Zimbabwe and in Africa (Maroyi, 2006). For instance, villagers in parts of Matebeleland in Zimbabwe have started nurseries to grow *Moringa oleifera* in large quantities for sale to other villagers and other provinces. In most cases, group members share some seedlings for planting in their farms, and sell the rest to other farmers. Of late, the small town of Binga in Zimbabwe for example, has become a hive of activity hosting people from all over the country who come to buy the *Moringa oleifera* products in bulk. The products range from fresh leaves and pods to powdered leaves for medicine, tea and as a food supplement and these uses are similar to what was found in the current study. However, farmers' reasons for planting and perceptions of benefits vary across the country. Three most common and important reasons are for food, medicine and a cash earning enterprise. The cultivation of this multiple-purpose species is an economic proposition unlike many slower growing and more habitat-specific medicinal plant species. The selling of *Moringa oleifera* by the respondents in the current study was to generate income for sustainable livelihoods and those who were not selling it used it for consumption. This is the same trend in the study that was conducted in Zimbabwe (Maroyi, 2006).

In addition, opportunities for establishing communal plantations are almost non-existent, so there is no doubt that any efforts to introduce programmes with the aim of providing self-sustainable supply of *Moringa oleifera* must concentrate on the promotion of its cultivation and utilisation. As mentioned earlier, there are however, several challenges that the youths generally experience when venturing into agribusiness such as lack of finances, the high cost of agricultural implements, no access to land, illiteracy and lack of innovation capacity as studied by Akpan (2013). In this study, it was found, for instance, that lack of finances by respondents had the highest score of 45 percent. This was because most of the respondents are unemployed and they do not have access to credit schemes and facilities for agribusiness in order for them to be involved in agricultural production and processing. Agricultural implements are expensive and as such, capital investment is needed. Unfortunately, the majority of the respondents cannot afford agricultural implements for agricultural production and this hinders their involvement in agribusiness. Moreover, lack of access to land ownership is another challenge as most of the farmland belongs to the family, and only the head of the family in most cases is the father, and traditionally the owner of the land.

Moringa oleifera is available in the study area as every household had the tree in their backyards and 30.3 percent of the youth use *Moringa oleifera* for medicinal purposes. However, youths are not aware of the agribusiness potential and 0.3 percent of the youth used *Moringa oleifera* for income generation from the selling of *Moringa oleifera* products. Therefore, policy makers will have to engage the youths in the study area on how they can use *Moringa oleifera* for income generation to mitigate the lack of employment among the youths. This can be done by introducing processing,marketing and packaging industries to add value to the *Moringa oleifera* products so that they can be sold to the international markets. The youth's involvement in *Moringa oleifera* cultivation for income generation is hindered by several factors such as lack of finance (45 percent), lack of innovation capacity (5 percent), high cost of the agricultural machinery (24 percent) , illiteracy (8 percent) and lack of access to land (18 percent).

CHAPTER 5 CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter provides the conclusions of the study on the potential of *Moringa oleifera* for youth agribusiness ventures in Livingstone rural areas, Zambia and to examine the factors that determine the use of *Moringa oleifera* for agribusiness development and rural youths' self-employment around the Livingstone rural area in Zambia. . Recommendations for policy and further research are also presented in this chapter.

5.2 Conclusion

The findings from this study presented a reality of varying potentials *Moringa oleifera* cultivation and utilisation could achieve in the study area if necessary interventions which cut across information dissemination, proactive use of tools of communication, pragmatic and enduring government policies, people's interest and readiness to participate, political will of the populace, ingenuity and creativity of the local people and availability of supportive infrastructures are put in right perspective. Also, available data analysed from this study indicated that present awareness level of the populace is a far cry from what is needed to achieve empowerment and sustainability. However, the level of interest exhibited by respondents showed a positive hope and future for *Moringa oleifera* use in the study area. Although majority of the respondents attested to the fact that *Moringa oleifera* as a source of empowerment can only be achieved when such feasible factors (as land and market availability, increase in awareness, enabling environment that cut across government participation and support for all potential *Moringa oleifera* cultivators, processors and marketers as well as security and well defined and regulated market that is competitive in all sense) are put into consideration.

The youth in the study area are generally aware of the *Moringa oleifera* as it is generally found in the backyards of their homesteads. The uses include, among others, medicine, animal fodder, vegetable, tea, food supplement and oil from the seeds. The youths in the study area are faced with a number of challenges in agriculture and these include lack of access to finance, high cost of agricultural implements, lack access to land, illiteracy and lack of innovation capacity. Due to these challenges, livelihood depends on subsistence farming with parents and guardians who own the land and farming implements.

The study found that demographic categories based on gender, age, education level, household size, employment status, farm size and farm ownership do not influence the use of *Moringa oleifera* among the youths in the study area.

Moreover, a considerable number of youths are still unaware of the socio-economic benefits of this multipurpose tree. This is evident from the fact that not all the youths that claimed to be aware of the plant knew that they could derive income from the tree. Therefore, there is a need to promote the cultivation and socio-economic benefits of this natural resource for income generation by the youths in rural areas of the country. The promotion among the youths, both literate and illiterate, could be done through various media that are accessible and affordable to the community.

Furthermore, the promotion of youth entrepreneurship in agribusiness should be approached comprehensively to achieve lasting goals. The study revealed that the majority of youths were aware of the *Moringa oleifera* tree as they grow it in their back yards and family farms. The *Moringa oleifera* tree is accessible in the area and the majority of the youths are aware of the health benefits and they use it for medicine. However, they youths in the study area were unaware of the potential of the tree for income generation purposes. The findings also showed that they do not sell the *Moringa oleifera* products for income generation only a small percentage of the youth showed that they do sell *Moringa oleifera* products. Furthermore, the study found out the factors influencing rural youth participation in agribusiness which were namely, the lack of credit facilities, land ownership, infrastructure and agricultural knowledge and poor marketing opportunities. Youths get income to meet their socio-economic needs through selling of curios which is a seasonal business to tourists who visit the Victoria Falls but due to climate change, the business is not lucrative, thereby affecting the livelihood of the majority of the youths in the study area.

The study findings are significant for policy makers and donors as it would help them know how to direct their support to the youths to venture in agribusiness development by the cultivation of *Moringa oleifera*. In the case of policy makers, the study findings can enable them to appreciate the reasons why the youths are not engaging as much in agribusiness despite the importance of the sector in Zambia's economy. The findings can also help to enlighten the authorities in their efforts to have more youths to engage in agribusiness with *Moringa oleifera* products and become self-employed and be able to generate income

and meet their socio-economic needs and eradicate poverty. *Moringa* is a highly profitable enterprise as the investment analysed has revealed.

Lastly, agricultural extension and advisory services can play a vital role in meeting the challenges and assisting rural youths to harness the enormous opportunities in the production and usage of *Moringa oleifera*. This will make *Moringa oleifera* products available, help reduce poverty and improve the economy. If the youth are involved in agribusiness, it would encourage them to stay in their villages and develop their communities. The current state of affairs is that rural youths are not involved in agribusiness activities to improve their livelihood. On the one hand, the study indicated that there is considerable interest to participate in *Moringa oleifera* business if the authorities would provide access to the credit facilities, land ownership, infrastructure, agricultural training and good markets.

5.3 Recommedations

Drawing from the above conclusions, the youth are aware of the health benefits of *Moringa oleifera* but are not knowledgeable on how they can use the *Moringa oleifera* products as a source for income generation. In order to improve youth desire for agribusiness development for self-employment and eradicate poverty among them. A call for concerted effort on the part of government of Zambia and Non-Governmental Organisations(NGOs) need to embark on empowerment,provision of financial support and enforcement of regulation of youth empowerment programmes and campaign.

Youth aspiration in the study area is for the government of Zambia and Non-Government Organisatio(NGOs) to provide accessibility of productive resources such as finances, land, labour and farm inputs. Agribusiness development involves sending of an agricultural good to the market, production processing and distribution. Therefore, there is a need for the youth in the study area to have manufacturing industries where the processing of *Moringa oleifera* products can be done to add value. An education on how the *Moringa oleifera* products are to be handled, harvested ,processed, packaged and marketed is required by the youth from the agriculturalist and extension workers.

There is a need to promote *Moringa oleifera* production with the aim of sustaining its commercialization. There is also a need to increase the level of cultivation of *Moringa oleifera* species among rural youth. *Moringa oleifera* as a potential crop in agribusiness development, marketing and processing to reduce the unemployment among the youth in rural areas. *Moringa oleifera* showed with no doubt that it can be

a good crop can survive harsh conditions such as high temperatures and moisture deficit which occur under the semi-arid conditions of Livingstone rural area, where the frequency of drought periods prevail. There is a need to study the root system of *Moringa oleifera* under different locations of the Livingstone rural area, to explore their potential contribution to the plants high nutrient accumulation properties. An awareness campaign is needed to increase the level of cultivation of *Moringa oleifera* species among rural youths at large due to its enormous benefits.

This makes *Moringa oleifera* a valuable crop to be produced by smallholder farmers and also by the youth in the backyard to sustain food security and serve as a good source of food supplement for the human body. Government and Non-Government Organisations(NGOs) needs to acknowledge and recognize the needs of the rural youth dictated by globalization. Admission of the challenges and opportunities that youths with agribusiness ventures have faced and some of the ways to navigate these challenges through dialogue for trade-offs since this will ensure that culture is not compromised as well as meeting the needs of the youth.

5.4 Recommendations for Further Research

This study provides a basis to explore new ideas for future researchers. Further research could focus on . exploring the vast economic opportunities and establish campaigns, in the form of workshops and seminars, on *Moringa oleifera* commerilization.

Future researchers could investigate ways of empowering and training youths on the benefits of cultivating *Moringa oleifera* and the provision of sound marketing facilities that will prevent market glut and facilitate income generation at a household level.

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APPENDICES

APPENDIX 1: QUESTIONNAIRE

Community: _____

Date: _____

Dear participant

My name is Esther Lombe Kwaambwa, a Masters student in Agribusiness Management, at the Namibia University of Science and Technology (NUST), doing a study by investigating the potential of *Moringa oleifera f*or agribusiness development and youths 'self-employment in Livingstone rural areas, Zambia: A case study of Musokotwane and Mukuni village. This questionnaire is intended to collect information on perceptions, challenges and aspiration of youths in the selected area. This study is for academic purposes only and all information will be kept confidential.

I hereby affirm that I am willing to participate in this study.

Signature Participant: _____

INSTRUCTIONS

- Answer every question by ticking (X) the appropriate box or filling in the answer in the blank space.

1. Name of the interviewer:
2. Geographic location

3. Gender

Male	
Female	

4. Age(in years)

5. Marital status

Single	
Married	
Divorced	
Separated	

Widow/Widower	

6. Employment status

Employed	
Unemployed	
Self employed	

7. Educational level

No formal education	
Primary school level	
Secondary school level	
Technical/Vocational level	
Tertiary level	
Other	

If other, please specify: _____

8. Position in household

Head of household	
Other position	

9. Are you the head of the family?

yes	
no	

10. What is your family size?

11. Which of the following best describes your household/family composition?

Live alone	
Own family	
Parents and extended family	
Other, specify	

12. Are you or family involved in agribusiness?

Yes	
No	

13. If so, which agribusiness are you involved in?

Crop farming	
Livestock farming/herding livestock	

Food processing	
Poultry keeping	
Collecting /cutting fodder	
Coordinating employees	
Fruit harvesting	
Bee keeping	
Milking cows	
Other , specify	

14. What is /are main sources of income?

Working on a family	
Run own farm	
Work on a farm as a labourer	
Collection of wild plants	
Charcoal trade	
Selling of curios	
Other, specify	

15. What is the size of your farm? (if applicable)(Tick X where applicable)

16. Which of the following do you think influence or would influence your involvement in agribusiness?

Family tradition	
Subsistence means	
Attractive financial means	
Lack of capital	
Lack of technical assistance	
High cost of inputs	
Low prices of farm produce	
Other, specify	

17. What would you say with regard to the challenges that the youths are likely to face with regards access to agriculture production resources and services?

I) Farm inputs

II) Landholdings

III) Credit availability

18. Which of the following is needed in order for you to be involved in agriculture or agribusiness?

19. Are you aware of the following *Moringa oleifera* attributes:

Attribute	Yes	No	Quantity
Are you aware of the *Moringa* tree?			
Is *Moringa* easily accessible in the Area?			
Is *Moringa* cheap as compared to other crops?			
Are you aware of the socio-economic benefits?			
Are you aware of the *Moringa* health benefits?			
Are you aware of the price of other vegetables?			

20. What do you use *Moringa oleifera* for?

Use	Tick	Quantity
Animal fodder		
Construction (poles, fibre)		
Food supplement		
Vegetable		
Source of oil		
Tea		
Ornamental (Hedge, shade)		
Fuel wood, e.g. cooking		
Medicinal (leaves, roots, seeds)		
Intercropping (improve soil fertility and prevent soil erosion)		
Source of income		
Other		

21. Do you sell *Moringa oleifera?*

Yes	No

If yes, which part of *Moringa oleifera* do you sell and what is the price*?*

22. Which part of *Moringa* do you sell?

Part(s): (Tick X)	Price	Quantity
Leaves		
Roots		
Flowers		
Bark		
Seeds		

23. How much do you sell *Moringa* products for (Answer only about the part you sell)?

Part	Price	Quantity	Cost (production)	Quantity

Leaves				
Roots				
Flowers				
Bark				
Seeds				

24. Who are your Customers? (Indicate by a Tick X)

Market	Quantity
Namibian Market	
International Market	
Other	

25. If not, why? Please specify: _____

THANK YOU FOR YOUR COOPERATION!

APPENDIX 2: DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

Variable		Frequency	Percent
Gender	Female	424	55
	Male	341	45
Age (years)	Less than 18	210	28
	Between 19-22	186	24
	Between 23-26	155	20
	Between 27-30	114	15
	Between 31-34	87	11
Education level	No formal education	12	1.6
	Primary school level	121	15.8
	Secondary school level	533	69.7
	Technical/Vocational level	57	7.5
	Tertiary level	38	5.0
	Adult education	2	0.3
	Other	2	0.3
Household size	Less than 5 people	496	65
	Between 5 and 10 people	253	33
	More than 10 people	16	2
Marital status	Single	544	71.1
	Married	217	28.4
	Separated	3	0.4
	Widow/Widower	1	0.1
Employment	Formal employment	31	4.1
	Unemployed	646	84.4
	Self-employed	88	11.5
Farm size	Less than 1.0 acre	345	45.1
	1.0 acres	164	21.4
	2.0 acres	142	18.6
	3.0 acres	34	4.4
	4.0 acres	19	2.5
	5.0 acres	57	7.5
	6.0 acres	1	0.1
	More than 8.0 acres	3	0.4
Farm ownership	No	670	88
	Yes	95	12
	Total	765	100.0