

Perceptions of members of households regarding the production and marketing of  
Moringa (*Moringa oleifera*) in Thulamela Local Municipality

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## DECLARATION

I, Maila Matume Maxwell of student no 11611691, hereby declare that this research dissertation for Master of Science in Agriculture (Agricultural Economics) at the University of Venda is my own work, and it has never been submitted previously for a degree at this or any other university. All sources used or quoted have been duly indicated and acknowledged by means of complete references.

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## DEDICATION

I dedicate this research project to my mother Muleka M.J and my supportive family. Thank you so much for your amazing support, motivations and all your sacrifices towards the success of this project. Thanks, be to the Lord Jesus Christ for his astonishing kindness, His generosity, and His gracious favour. Your unfailing love is better than life itself, my lips will always glorify you. This project is also dedicated to you my Lord.

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## ABSTRACT

This study was carried out to determine how members of households perceive economic benefits of production and marketing of Moringa in the Thulamela Local Municipality. The study adopted the snowball sampling procedure to identify the population of members of households who produce and market Moringa. Simple random sampling procedure was adopted to select 146 participants from the identified population. The Cross tabulations and Probit regression model were used as the analytical tools for this study. The results of the study revealed amongst others, that majority of members of households who were producing Moringa had no access to Moringa markets, and most of them were aware of the economic benefits of Moringa. The statistical significant variables which influenced the perceptions of members of households regarding economic benefits of production and marketing of Moringa were level of education ( $p < 0.01$ ), Moringa farming experience ( $p < 0.05$ ), access to market ( $p < 0.05$ ), as well as the access to information ( $p < 0.05$ ) about the production and the demand of Moringa produce. The study concluded that majority of respondents perceived that the production and marketing of Moringa would help to achieve sustainable livelihood for people living in Thulamela Local Municipality, while others were of the view that Moringa has the potential to improve nutrition, boost food security and foster rural development. The study recommended that establishment of Moringa markets, formation of Moringa cooperatives and promotional campaigns to educate members of households about the economic benefits of Moringa should be enhanced.

**Keywords:** Economic benefits. Marketing. Moringa. Perception. Production

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## LIST OF ABBREVIATIONS

ADB	African Development Bank
AMA	American Marketing Association
DAFF	Department of Agriculture, Forestry and Fisheries
FAO	Food and Agriculture Organization
NAMC	National Agricultural Marketing Council
RISE	Rural Investment Support for Europe
SPSS	Statistical Package for Social Sciences

## CHAPTER 1

### INTRODUCTION

#### 1.1 Background

Moringa has gained much prominence due to its multiple uses and benefits for both agricultural and industrial development (Ashfaq *et al.*, 2012). This attention often triggers investments and promotion campaigns to domesticate Moringa, and establish large-scale commercial plantations (Achten *et al.*, 2014). Moringa is a plant that is commonly used as a nutritional food supplement by some communities in South Africa. It has also been well approved as source of food (Pikade *et al.*, 2013). Regarding one of the important reasons for studying development economics, is to understand how members of households can make transition out of poverty, understanding the perception of members of households regarding the improvement of Moringa production and market access are important approaches to rural development. This is because these two activities give members of households the opportunity to specialize and optimize their portfolios with respect to the available resources and subsequently exploit economies of scope and scale (Kamara, 2004).

The production and marketing of Moringa is increasingly recognised as an effective strategy for alleviating poverty and hunger, and it can be stated that a successful process of determining how members of households perceive the production and marketing of Moringa can help to promote inclusive and sustained economic growth and create decent work opportunities for members of households. According to Nadeau and Zakaria (2012) studies have equally shown that Moringa can provide excellent economic opportunities for agricultural producers, traders and processors, thereby making it effective in tackling micronutrient insecurity while equally holding the

promise of sustainable economic returns to members of households. Moreover, Moringa production should stimulate market participation by members of households who produce Moringa. The current emerging issues of economic potential of Moringa as a commercial tree species suggest why it could play a role as a leading edge in the 21st century as a veritable marketable product (Ajayi *et al.*, 2013).

There has been an upsurge of interest in the cultivation and consumption of Moringa in South Africa and many health claims have been reported, and the government has encouraged members of households to cultivate Moringa trees in a drive to decrease malnutrition in many rural areas of South Africa (Hlophe, 2015). The burning desire to cultivate and consume Moringa has alarmed the government to embark on a campaign to encourage members of households to improve their production to commercial farming that brings about high Moringa yields and assist these households with the necessary production inputs. Taking into consideration that members of households expect immediate benefits from farming, any pathway towards sustainable Moringa production will necessarily require the inclusions of improved and predictable household productivity (Vanlauwe *et al.*, 2014). This can only be possible by understanding how members of households view the expansion of Moringa production to a larger scale. Moreover, an analysis of sociocultural perceptions on Moringa would also provide further understanding of the behaviour of members of households regarding the tree (Gandji *et al.*, 2018).

According to the case study compiled by NAMC (2011) commercial production of Moringa in South Africa is still at a very early stage, which makes it difficult to quantify the hectares under production, volume and value of the commodity. However, there are a few households producing the commodity as a food supplement. The study

conducted by the University of Pretoria (2014) affirms that Moringa would benefit the rural communities of South Africa in which large scale plantations would provide many employment opportunities and provide a sustainable income, as Moringa can be consumed and sold as a food source. This is expressing the importance of evaluating households' awareness and perception, as well as to explore more effective ways to increase its production and marketing, as most of members of households produce Moringa in their back yards, due to lack of income, knowledge and other necessary production inputs, such as improved seeds and fertilizers. According to Fadoyin *et al.* (2014) the productivity of Moringa has not grown sufficiently due to under-investment in new technology, slow adoption of existing improved technologies, constraints associated with investment climates and shortage of infrastructure.

Many studies have been carried out on the nutritional and medicinal values of Moringa for both humans and animals (University of Pretoria, 2014). However, to date, only limited numbers of publications which seek to understand how members of households who produce Moringa can benefit from increasing Moringa productivity and marketing in rural areas are available. This study will therefore explore awareness and perception of members of households on increasing the productivity and marketing of Moringa in Thulamela Local Municipality for socio-economic benefits.

## 1.2 Problem statement

Sustainable agricultural production in developing countries is perceived to be essential to meet the growing global food demand (Tilman *et al.*, 2011). Empirical evidence indicates that Moringa production has the potential to enhance incomes and welfare outcomes if constraining factors could be eliminated (Matiku & Bely, 2014). However, members of households in Thulamela Local Municipality are finding it difficult to expand their production and access high value market.

According to Oladiji *et al.* (2013) Moringa is an important economic plant, due to its wide range of uses, such as animal feed, vegetable, ornament, among others. Despite the great potential and benefits of Moringa, Moringa is underutilised as its production and access to its market by members of households in Thulamela Local Municipality is low, moreover, a considerable proportion of members of households are still unaware of economic benefits and multipurpose of Moringa. Obayelu *et al.* (2015) highlighted that major resources are being committed to Moringa products innovation and value added production, yet considerable uncertainties still exist regarding public perception of Moringa in terms of how it can be utilised for socio-economic benefits. It is in the light of these challenges that this study will examine awareness as well as how members of households perceive Moringa production and marketing as a strategy to promote socio-economic development in Thulamela Local Municipality.

### **1.3 Objectives of the study**

#### **1.3.1 Main objective**

- I. The main objective of the study is to determine the perceptions of members of households regarding economic benefits of production and marketing of Moringa in Thulamela Local Municipality.

#### **1.3.2 Specific objectives**

Specifically, the study sought to:

- I. determine the socio-economic characteristics of members of households who produce Moringa in Thulamela Local Municipality.
- II. determine the perceptions of members of households regarding economic benefits of production and marketing of Moringa in Thulamela Local Municipality.
- III. determine factors that influence perceptions of members of households regarding economic benefits of production and marketing of Moringa in Thulamela Local Municipality.

### **1.4 Hypotheses of the study**

The study sought to test the hypothesis that:

- I. group means of socio-economic characteristics of members of households have no significant difference.
- II. factors such as access to information, access to markets and socio-economic variables influence the perceptions of members of households regarding economic benefits of production and marketing of Moringa.

## **1.5 Research questions**

The research questions for the study are:

- I. what are socio-economic characteristics of members of households who produce Moringa in Thulamela Local Municipality?
- II. what are perceived benefits associated with the production and marketing of Moringa in Thulamela Local Municipality?
- III. which factors influence the perceptions of members of households regarding economic benefits of production and marketing of Moringa in Thulamela Local Municipality?

## **1.6 Rationale of the study**

Multiple studies have shown that Moringa is an incredible vegetable tree whose cultivation will help to create sustainable jobs and reduce hunger. However, there was little information regarding the constraints affecting public perceptions regarding large-scale cultivation of the tree in Thulamela Local Municipality. Therefore, this study helped to understand the major constraints which influence the perceptions of members of households regarding the production and marketing of Moringa, as well as examine how members of household perceived Moringa's production and marketing as a strategy for attaining socio-economic development in Thulamela Local Municipality. The outcomes of this study provide recommendations on how to integrate members of households who produce Moringa and local agricultural markets, as well as to increase the footprints of Moringa in Thulamela Local Municipality. In addition, the new information generated from this study could be used by policy makers.

## **1.7 Limitation and delimitation**

The main limitation of this study was unavailable and unwilling respondents. Many respondents were not available during the period of data collection and others refused

to participate as they were expecting compensation after interview. This may have affected the extent and quantity of data needed for the analysis of this study.

The other limitation of the study was that most of the respondents were finding it difficult to provide adequate data; understand the research questionnaire and follow what was expected from them leading to the researcher spending more time explaining the purpose of the study. Furthermore, the scope of interest for this study was only members of households who produce Moringa in the Thulamela Local Municipality, Vhembe District, Limpopo province, South Africa.

## **1.8 Definition of key terms**

### **1.8.1 Moringa (*Moringa Oleifera*)**

Moringa can be defined as a highly nutritional plant which is useful as a source of food and medication. It is a drought-tolerant plant that can be grown in diverse soils, except those that are waterlogged (Nouman *et al.*, 2013). Moringa is a highly valued plant, distributed in many countries of the tropics and subtropics and it has an impressive range of medicinal uses and high nutritional value (Abdalla, 2013). It is universally referred to as the tree of life due to its rich source of certain macro-and micro-nutrients of great importance in human nutrition (Oyeyinka & Oyeyinka, 2016).

### **1.8.2 Perceptions**

In this study perception can be defined as how members of households think about the production and marketing of Moringa and the impression they have about it. This also involves the awareness of economic benefits of production and marketing of Moringa.

### **1.8.3 Marketing**

Marketing can be described as the process through which member of households move Moringa products from their households to the customers. Marketing is the activity, set of institutions, and processes for creating, communicating, delivering, and exchanging offerings that have value for customers, clients, partners, and society at large (AMA, 2017).

### **1.8.4 Production**

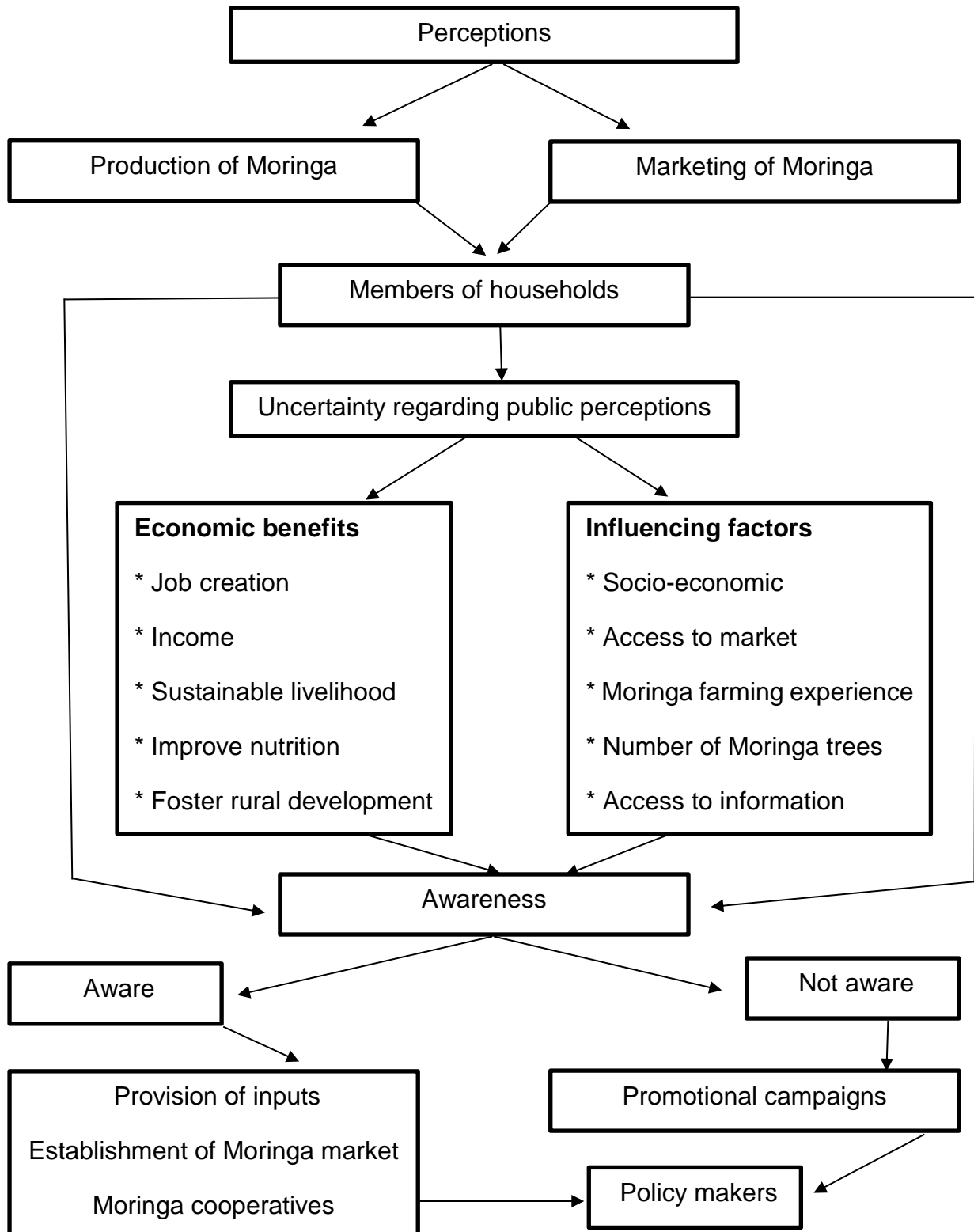
Production is the process of converting inputs (factors, resources) into outputs (products); converting costs into revenues (Drummond & Goodwin, 2014). It a series of activities which involve putting together or transforming different variables into a final product.

## **1.9 Outline of the study**

Chapter one introduces the introduction and background of the study. It gives a detailed background of what is happening in South Africa regarding Moringa production and marketing. Problem statement, main and specific objectives, rationale of the study, limitation and delimitation of the study and definition of key terms are outlined in this chapter. Chapter two presents the literature review. Current knowledge, including substantive findings, as well as theoretical and methodological contributions related to Moringa production and marketing by other researchers around the world, in Africa and within South Africa were outlined in this chapter. Chapter three presents the methodology of the study. This chapter summarised all the behaviour and instruments used in performing research operations, selecting and constructing research techniques, as well as the study area where data was collected. Chapter four presents the results of the study by interpreting, testing the hypotheses and discussing

the findings. The last chapter, which is chapter five, summarises the findings of the study, provides concluding remarks and gives recommendations.

### 1.10 Conceptual framework



## 1.11 Conclusion

Chapter one presented the background of the study, where the problem statement and the main and specific objectives of the study were also discussed. In this chapter, rationale of study, limitation and delimitation of the study was presented, as well as the definition of key terms.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Introduction

Current knowledge, including substantive findings, as well as theoretical and methodological contributions related to how members of households perceive the production and marketing of Moringa in rural areas were reviewed. The main goal of this section is to review different findings by other researchers, particularly focusing on the specific objectives of this study which are: to determine the socio-economic characteristics of members of households who produce Moringa as well as to determine the perceptions of members of households regarding the production and marketing of Moringa.

#### 2.2 Socio-economic characteristics of members of households

There are different socio-economic factors influencing the cultivation of Moringa in rural areas. It was found that education is another factor that has a bearing on the adoption of agricultural technologies (Ekepu & Tirivanhu, 2016). The level of education influences the capacity of communities to improve farming practices and engage efficiently in other land use activities, as most of the respondents have attained at least one level of formal education (Abah & Petja, 2015). The study conducted by Azeez *et al.* (2013a) revealed that Moringa farmers that had a primary education were more technically efficient in Moringa production than those with no formal education.

There are several factors that add to the perception and fundamental agricultural knowledge of rural subsistence farmers (Halbrendt *et al.*, 2013). Education plays a crucial role in acquiring the relevant knowledge in different areas such as production,

processing, industrialization, marketing, and research, which is therefore important for members of households who are in Moringa production and marketing to have basic education which will enable them to be aware and understand the importance of Moringa. It is expected that education would also aid the farmers to interpret instructions on the use of agrochemicals, adopt modern agricultural technologies and take wise decisions on farming operations (Obasi *et al.*, 2013). The higher the knowledge in such areas, the better and the faster the process of expanding the production and marketing of Moringa.

Education may not be a prerequisite to enter farming business, but farmers' productivity could be enhanced by some level of educational attainment (Fadoyin *et al.*, 2014a). The study conducted by Andriamparany *et al.* (2014) has long confirmed that farmers' livelihoods and economic development are hampered by a low level of education, limited income alternatives and poor infrastructure. This implies that, policy makers need to consider education as the key factor for technology adoption, as different studies have revealed that the intensity of Moringa tree cultivation was influenced positively by the level of education.

Adoption or rejection of an innovation has always been influenced, although to a varying degree, by the complementarity of males' and females' perceptions and roles within the farm families (Ekong, 2003). Empirical evidence indicates that the adoption of integrated, conventional or sustainable agricultural farming is influenced by several socio-economic factors such as gender and equity and farmers' priorities (Anim & Mandleni, 2010). Gender differential gaps could reverse the gains of innovations on Moringa by limiting the adoption of innovations and propagation of the plant among the farm families (Torimiro *et al.*, 2009). The cultivation of Moringa in remote areas

seems to be a result of gender-linked differences in access to complementary input. The results of the study carried out by Baba *et al.* (2015) indicated that, most Moringa farmers were female, while there were few males who were cultivating the product. This suggests that, government and policy makers must ensure that there's equal participation in the production and marketing of Moringa by introducing measures that will enhance and give vigorous support to emerging Moringa farmers. This might be through the provision of complementary inputs such as land and extension services.

It was recommended by Ajayi and Adeyemi (2016) that in order to forecast more accurately, future Moringa plant adoption, policy makers, agricultural planners, institutions and organizations involved in Moringa production and distribution need to consider the key variables as results have showed that the intensity of Moringa plant cultivation is influenced positively and significantly by the level of education, access to extension contact, cooperative society membership, and availability of Moringa plant. Mmbengwa (2009) has long affirmed that the extension support and sustainable production were found to be crucial for farming success in the emerging farming sector. This shows that, access to extension services is the most crucial factor in farming, as the study conducted in western province of Kenya by Adijah *et al.* (2011) revealed that farmers in western province lack awareness of improved agricultural practices and technical knowhow because there are few extension officers, compared to the ratio of farmers.

Agricultural extension and advisory services can play a crucial role in meeting the challenges and assisting rural households harness the enormous opportunities in the production and usage of Moringa. This will also assist in ensuring that Moringa is available for all, help to reduce poverty in the land and improve the economic situation

of our developing Nations (Omotesho *et al.*, 2013). Extension services that provide the members of households in rural areas with the necessary knowledge, skills and technology to improve or add value on raw Moringa products should be established. According to Kumar *et al.* (2017) extension activities promote the tree for further consumption to improve nutrition and medicinal functions and as well as for climate change mitigation.

The members of households' perception regarding the production and marketing of Moringa may be influenced by how a certain age group in the households understand its usefulness. When Moringa is merely produced as a source of traditional medicine, it may be well understood by elderly people, this is because the modern generation does not find the traditional medicine fashionable as they often use the improved western medicine. Therefore, efforts should be made by the government in making agriculture attractive to the youths through media campaigns demystifying the negative myths about agriculture and presenting agriculture as a profitable venture (Omotesho *et al.*, 2017). Moreover, if knowledge regarding the production and marketing of Moringa might be extended or delivered to all groups using necessary strategies, it may play a role in the transformation of this tree.

### **2.3 Perceptions of members of households**

The extent of knowledge and utilisation of Moringa differ across cultures and prevailing socio-economic conditions of users (Mafimisebi *et al.*, 2012). Acceptance of a product is largely determined by what is known as subjective knowledge with regards to the perceived risks and benefits associated with the consumption of Moringa (Ayinde *et al.*, 2015). According to Oladiji *et al.* (2013) a considerable proportion of the respondents were still not aware of the economic values and multipurpose nature of

Moringa, as evident from the fact that not all who claimed to be aware about the plant actually knew the various uses or benefits that could be derived from the plant, which indicates the need to popularise the plant among the people through various sensitisation and enlightenment media, such as newsprint and electronic media. It is therefore recommended that more people should be empowered and encouraged to go into production to ensure food security in the nation and improve family livelihood (Osarenren *et al.*, 2016). As stated therein, the technological knowhow and uses of Moringa varies according to tribal lines, and this is a major concern. Hence people should be schooled about its intake advantages and benefits.

Knowledge on Moringa is still low or scanty in South Africa, as shown by the study carried out within an Atteridgeville community. This is because none of the interviewees from the selected group had heard, used or even seen the Moringa tree (Kwaambwa *et al.*, 2012). There is thus a need for the involvement of extension personnel in assisting Moringa farmers in improving their level of awareness, especially to motivate the farmers to associate themselves with existing and organized cooperative society (Azeez *et al.*, 2013b). Education could also assist the farmers by enabling them to be aware of the benefits of the Moringa crop, thereby enhancing willingness to cultivate the crop (Animashaun *et al.*, 2013b). This implies that if the levels of income, awareness and propagation are raised, the farmers' perception of Moringa would be favourably increased, as greater numbers of farmers would be willing to adopt innovation on Moringa (Torimiro *et al.*, 2009). A high degree of literacy of the society in South Africa will assist farmers to boost income through Moringa cultivation. This entails that regular education workshops will enhance household farmers to plant Moringa all year around.

In South Africa, a significant proportion of the population has recourse to traditional medicine which essentially relies on indigenous plant species (Stevens *et al.*, 2015). Community education about moringa's valuable products needs to be carried out, especially for import replacement (Rajendran, 2017). There is a low level of awareness of Moringa products among the consumers probably owing to the quality of information they had about the products, thus, intensification of awareness and sensitization programs would enhance effective move towards certification and standardization of the Moringa products (Obayelu *et al.*, 2015). Williams *et al.* (2013) recommended that an awareness of the claimed Nutraceutical benefits of Moringa products should be increased since it could increase adoption with a consequent increase in market share.

Information dissemination among members of households who produce Moringa is the most fundamental principle. Before distributing improved technology and working on other innovation platforms associated with Moringa production and marketing, more effort should be expended on educating household members on the opportunities and benefits of Moringa. About 20.70% and 41.0 % of the male and female respondents, respectively, indicated that their parents were their first source of information, 17.90% and 10.70% of the male and female categories claimed that friends were their first source of information (Torimiro *et al.*, 2009). Thus, expansion of Moringa should therefore not primarily be about the use of more fertilizers, pesticides and machinery applied per hectare, but the development of much more knowledge and intensive management of scarce resources to produce food outputs with minimal disturbance to the natural environment, and more environmental outputs too (RISE, 2007). There would be a higher payoff for the productivity and marketing of Moringa if access to education and information dissemination were prioritised. This is because many members of households are not aware of the necessary production inputs and

marketing channels, and they only learn about Moringa from their relatives. This implies that the concrete knowledge that is acquired from intellectuals is of utmost importance in that it assists and equips Moringa farmers and members of households, so that they can achieve high yields of Moringa.

The result of awareness issues indicates that few respondents are aware of the benefits of Moringa (Emtage & Suh, 2004). However, there are also perceived risks and benefits associated with the consumption and cultivation of Moringa. The study conducted by Ayinde *et al.* (2015) implies that apart from the Moringa powder, respondents are ambivalent about the risk associated with the consumption and cultivation of Moringa tree products. In view of this, to effectively engage farmers in tree planting and to make it attractive, policies are needed that address tenure issues for migrants, enable better access to markets both locally and regionally, and establish favourable pricing structures (Etongo *et al.*, 2015). Organizing the Moringa farmers into an association is an essential task, as it will make the work easier. Also, such an association will aid in collective bargaining, soliciting government assistance, Non-Governmental Organizations and other funding agencies (Fadoyin *et al.*, 2014c). In so far as the analysis is concerned, the results of the awareness indicate that few people are aware of the benefits and cultivation of Moringa; therefore, there is a need for vigorous training about the benefits of cultivating and consuming Moringa, and household farmers need assistance from the government to form structures.

There are many benefits and special features associated with the Moringa tree. Omotesho *et al.* (2013) concluded that, the potential of Moringa tree in combating the duo of poverty and hunger remain unassailable. The results of the study conducted by Animashaun *et al.* (2013a), on consumers' perceptions of the effectiveness of

Moringa's nutraceutical benefits, shows that across each use category, most respondents indicate 'agree' and 'strongly agree' for claims and efficacy of Moringa in satisfying the uses it was put to use for. This affirms that Moringa is a multipurpose plant which can be used to satisfy different needs. If it is properly given the necessary attention, people in rural areas can use Moringa production as the source of income and employment activity, and furthermore it can combat diseases and provide fire wood which makes it a centre of attraction or backbone of health at any given society. Farmers in rural or peri-urban Africa can easily undertake Moringa leaf production, as its production creates employment, requires little financial investment and can be cultivated without using chemicals (De Saint Sauveur & Broin, 2010). Apart from bringing in much cash, diversification into cultivation of Moringa, creates a more nutritious household diet and provides remunerative labour opportunities, as well as valuable by-products such as firewood, fibre and fodder for livestock (Animashaun *et al.*, 2016).

Members of households usually produce products that they are assured will benefit them financially as well as to feed their families. This means that if members of households are not certain or have poor knowledge about Moringa product, they cannot just produce it because they would not know how to utilise it. The issue of awareness is crucial because it is evident that this important species is still underutilised and more efforts are required for a fuller exploitation of its rich potentials (Stevens *et al.*, 2015). For Moringa to be well intensified, members of households must be aware about how it functions, how marketable it is as well as its nutritional qualities. Their perceptions or understanding about Moringa can either play a positive or negative role, however, any negative perception about Moringa can be changed if necessary information might be disseminated to them.

## 2.4 Moringa production

Changing the production patterns and marketing channels of Moringa is a process that will be achieved over time, and it will require improved use of factors such as land, capital, labour and great efforts from household members and other agricultural stakeholders. According to FAO (2004), intensification occurs when there is an increase in the total volume of production that results from a higher productivity of inputs, or agricultural production is maintained while certain inputs are decreased. The cultivation of Moringa has become much easier for household farmers in different regions, and it is now widely cultivated in Africa, Central and South America, Sri Lanka, India, Mexico, Malaysia, Indonesia and the Philippines (Ashfaq *et al.*, 2012). However, the productivity of Moringa has not grown sufficiently due to under-investment in new technology, slow adoption of existing improved technologies, constraints associated with the investment climates and lagging infrastructure (Fadoyin *et al.*, 2014a). To some extent, changing the production of Moringa will have a negative impact on the operation system. However, as there are many countries involved in the cultivation of Moringa, there is a need for back up in investment and technological knowhow concerning sustainable production of Moringa in rural areas.

To increase household productivity, the government has enacted ambitious plans to develop and extend new seeds, chemical fertilizers, new crops, and new natural resource management practices, including irrigation (Headey *et al.*, 2014). The study conducted by Ricker-Gilbert *et al.* (2014) found that, any input intensification that occurs seems to be going to increasing yields, as there was no evidence that increases in population density enable farmers to increase gross value of crop output per hectare. However, the systems of intensification of Moringa should be sustainable to meet current needs without negatively impacting on the ability of future generations to

meet their own needs (World Bank, 2006). According to Ojo *et al.* (2016) in order to improve Moringa production, government in conjunction with the private sectors should make available industries and research institutes that can convert or incorporate the output of Moringa into human foodstuffs or livestock feeds other than the medicinal usage of the crop, and farmers should increase their scales of operation, so as to enjoy the economies of scale. This implies that more money should be invested on agro-processing. Furthermore, members of households should be trained and encouraged to form cooperatives, where they will be able to design and develop their own Moringa products.

Part of the challenge faced by members of households who are cultivating Moringa is a decline in land quality. According to Nambiro (2007) agricultural production is increasingly constrained by the scarcity of land amongst other limiting resources. Furthermore, the study explained that the land scarcity problem is worsened by the decline in average land holding per household, because of population growth and the prevailing patrilineal real split-up inheritance system. It is now clear that agricultural production can have other negative local consequences, such as increased erosion, lower soil fertility, and reduced biodiversity; negative regional consequences, such as pollution of ground water and eutrophication of rivers and lakes; and negative global consequences, including impacts on atmospheric constituents and climate (Matson *et al.*, 1997). Members of households, therefore, are having a challenge to realize increased production of Moringa production while avoiding the above detailed extreme effects. Considering the difficulties associated with increasing production at the extensive margin, increasing Moringa productivity through sustainably intensifying output per unit of land is essential (Josephson *et al.*, 2014). With the ever-increasing population and limited farmland, increasing productivity will increasingly entail the

commercialization of smallholder agriculture, involving more intensive use of productivity enhancing inputs, and more market oriented patterns of crop production (Hailua *et al.*, 2015).

The cultivation of Moringa trees needs to be expanded to achieve economies of scale in the production of both Moringa leaves and seeds (SFA, 2015). This is because it offers a significant opportunity for the poorest people to earn a living as producers and traders without requiring large capital investments (Farinola *et al.*, 2014). Moringa must be produced in higher quantity to make its availability and accessibility better. Considering the high demand for Moringa products owing to the medical and nutritional properties, it is obvious that there will be need for large areas of land to sustain its supply (Ojiako *et al.*, 2011). This implies that, increasing the production of Moringa on any scale will require a significant financial investment, however, because Moringa is relatively new in agriculture and industry, it will be very difficult for households to obtain loan to produce a product that has, initially, no guarantee of a market (Ojiako *et al.*, 2011).

Availability of land was also found to be the constraining factor limiting the production of Moringa. The study conducted by Mudyiwa *et al.* (2013) found that growers had small portions of land under Moringa production, and the highest proportion (55%) of growers had less than 5 trees per homestead under Moringa production. The results of the study conducted by Animashaun *et al.* (2013b) affirm that respondents' farm size under production ranges between 0.5 and 12 ha with an average farm size of 1.4 ha. According to Oslon *et al.* (2001) the majority of Moringa farmers are small scale farmers in which their total farm size for Moringa production is less than 1 hectare.

Moreover, most farmers involved in this farming activities were married and actively involved in Moringa plantation as sources of their livelihood (Fadoyin *et al.*, 2014b).

Poor access to financial assistance could negatively affect the perceptions of members of households regarding the production and marketing of Moringa in rural areas. Access to start-up capital and availability of ready markets for produce was identified as major motivational factors for the engagement of educated youths in Agriculture (Omotesho *et al.*, 2017). The lack of financial investments in the production and marketing of Moringa would obviously result to poor growth of Moringa production in rural areas. Looking at the current state of Moringa production and marketing in the Thulamela Local Municipality, it is crucial that financial attention be invested to improve the production and expand the available marketing opportunities. Much financial investment in Moringa production would cater for many issues such as conducting experiments and discover new revelation around product.

Moringa is an agricultural product which needs improved infrastructure for various purposes including storage. Inadequate processing capacity, the lack of cold storage facilities or a functioning cold chain, and the persistence of transport bottlenecks are significant constraints to high value moringa production (Rahim, 2015). For moringa to be of higher quality, its storage must also be in good conditions, this means that, the infrastructure for such storage facilities should always be improved, repaired, cleaned and protected against outbreaks. The study conducted by SEATINI-Uganda (2013) found that access to markets is a big challenge to most small holder farmers mainly due to lack of market information, poor infrastructure (such as roads and market places), exploitation by traders (buyers) and minimal support from government and the private sector. This emphasises that, the availability of improved infrastructure

would mean a step towards the expansion Moringa production and marketing in rural areas. To address this challenge, agribusiness professionals must focus on building their human capacity in understanding key factors involved in community members' perception and willingness to try and/or eventually adopt new agricultural practices (Halbrendt *et al.*, 2013).

There are many opportunities for Moringa production as the species has been observed to be well suited to all kinds of soils and wide range of environment, especially tolerant to poor soils of arid and semi-arid regions (Navie & Csurhes, 2010; Padulosi *et al.*, 2011; Gandji *et al.*, 2018). However, there is minimal government support in helping members of households who produce Moringa to access markets. The South African government does not have enough programmes to enhance the production and marketing of Moringa in rural areas, such programmes would enhance awareness and help to intensify the access of Moringa markets. Members of households who produce Moringa are now in the realms of the private sector who attain more profit than they do using their Moringa produce. Also despite the existence of knowledge, perception and interest to use the product from the market side; there is a very weak willingness to engage for commercial purpose by the potential producers showing that government and concerned bodies need to work on promoting opportunities in Moringa production because there are many opportunities that potential smallholder growers can grab considering the difficult agro-ecological conditions that prevail to secure a better livelihood from Moringa farming (Girma *et al.*, 2016).

## 2.5 Moringa Marketing

The perception of members of households regarding economic benefit of production and marketing of Moringa may also depend on how its products are connected to better market. If Moringa is only marketed in rural areas, its expansion and intensification may be too slow and too difficult to grow. There is a need to integrate members of households who produce Moringa and local agricultural markets as key to pen up markets and explore export opportunities for Moringa products, this is because farmers do not produce commodities that do not have sustainable market. According to Mudyiwa *et al.* (2013) growers have no assured markets for Moringa products and information regarding available markets is scarce. Therefore, a well-functioning relationship between members of households who produce Moringa and local agricultural markets can play a crucial role in the establishment of high value Moringa market that will ensure continuous supply of Moringa products, and ultimately strengthen the Moringa value chain. Such partnership will also be instrumental to ensure scale-up and smooth process of intensification of Moringa production and marketing.

Moringa is an exceptional resource for developing countries, whether processed or fresh, the Moringa leaf is not only a new promising source of income and employment, but also an outstanding, nutritionally rich vegetable for families and markets (De Saint Sauveur & Broin, 2010). Moringa products are now available in the shelves of agricultural markets around South Africa. Moreover, its demand for leaf powder continues to grow in Limpopo due to continued awareness campaigns (NAMC, 2011). Households production requires more than just a well-functioning output market, but also efficient and low cost factor markets that truly reflect the opportunity cost of farm inputs (Abu, 2015). To effectively exploit the existing market potential, the Moringa

production should become more structured and formalised, thus, the vertical coordination between producers, wholesalers and retailers should be improved and reliable data on the national production of Moringa products should be regularly collected and made available (Federal Ministry for Economic Cooperation and Development, 2013). Moringa is now a centre of attraction in South Africa due to its nutritive value, and the scarcity of its leaf powder regionally is an indication of a continuous campaign. Therefore, there is a need for formalisation and restructuring of agriculture marketing policies to make a bond between agriculture markets and Moringa producers.

The study conducted by Mabapa *et al.* (2017) highlighted that most farmers are willing to expand their Moringa production, however the major challenge of effective market access need to be addressed. In order to strengthen access to Moringa market in rural areas, a comprehensive plan need to be adopted to reduce factors limiting its production and marketing, as well as to enable a diverse group of farmers to develop and process Moringa products. Gandji *et al.* (2018) recommended that to effectively exploit the existing market potential, commercialization should become structured and formalised. In addition, there is need to develop value chains for the tree.

The existence of well-functioning market where members of households can participate in trading Moringa products is crucial in the success of Moringa as the newly introduced crop in South Africa. However, in some places where Moringa has been introduced, farmers have no access to markets where there is Moringa product demand (Achten *et al.*, 2014). The study conducted by Kumssa *et al.* (2017) found that lack of access to markets was one of the challenges faced by the members of households who produce Moringa, and it was recommended that community-wide

awareness should be raised on the multiple uses of Moringa, this is required to create market demand and maximise the utilisation of Moringa in rural areas. The problem of uncertainty of markets and inadequate knowledge on how to market Moringa products needs to be efficiently monitored; this would help to enhance the availability and economical productivity of Moringa for industrial purposes (Williams *et al.*, 2017).

For members of households who produce Moringa to be competitive and increase Moringa footprint in rural areas, there is a need for better access to market and sustainable capital to scale up. Although there is clearly a market and growing demand for Moringa products, from the literature it is difficult to make out why Moringa has not yet been more widely commercialised (SFA, 2015), and it can be perceived that a few factors may have contributed to worsen this situation. The issue of value adding should be considered as one of crucial strategy, this is because Obayelu *et al.* (2015) recommended that in order to maximize profit, it is recommended that marketers should package Moringa tea and spices in sachets and Moringa oil in kegs. The findings revealed that there is a demand for the processed Moringa products and have awareness to the benefit of the plant in both rural and urban residents though there is less interest to produce the plant for commercial purpose by farmers (Girma *et al.*, 2016).

Moringa products are also demanded at international markets (USA, China, and India) mainly in the form of leaf powder tablets and drinks, and are regarded as a healthy nutritious food supplement (Animashaun & Toye, 2013). However, growers have no assured markets for Moringa tree products and information regarding available markets is scarce. Thus, there is a need to develop quality standards and efficient packaging and storage of Moringa products, so that they meet both local and global

markets if opened (Mudyiwa *et al.*, 2013). The findings of the study conducted by Marvin *et al.* (2004) indicated that consumers are willing to pay higher prices for processed foods that are closely related to Moringa products in terms of nutritional benefits. It was also confirmed by Animashaun *et al.* (2013b) that, the indication of willingness by respondents to pay a relatively higher price for Moringa at varying amount may be indicative of the satisfaction and/or the relative non-availability of alternative conventional therapies. This simply affirms that the market and demand for Moringa products will eventually grow with continued awareness campaigns which emphasises the benefits derived from the consumption of Moringa.

Access to price information by members of households play a crucial role in the production of Moringa in rural area. Members of households who produce Moringa in rural areas are not making profit due to price volatility and poor access to price information. Bidima (2016) indicated that the price of marketable Moringa produce varies between R7.56 and R44.64, depending on the country (Bidima, 2016). Estimates from MHPFA have indicated that the leaf powder prices were at their highest during year 1999/2000, when the product was introduced on the Uganda market. However, the prices have continued to fall as more trees are being harvested, while there has been no corresponding increase in the market demand (Kyerere, 2015). Globally, India is the largest producer and supplier of Moringa, as exports from this country give a good indication of the growing market for Moringa, followed by smaller producers entering the global market, which include various African countries, such as Kenya, South Africa and Mozambique (Centre for the Promotion of Imports from Developing Countries, 2016). Traditionally, consumers prefer to buy fresh Moringa leaves since they should be consumed within a day after harvest, however, the lack of efficient logistic systems makes fresh Moringa leaves in the market scarce

(Saavedra Gonzalez & van der Maden, 2015). To address this problem, the present research found that the population of Moringa turned to dried Moringa leaves for longer shelf-life.

The production of Moringa production should stimulate the existence of greater participation or an improved ability to participate in the output markets. However, in rural areas of South Africa, like in other developing countries, members of households who produce Moringa find it difficult to participate in markets because of a range of constraints and barriers reducing the incentives for participation (Makhura, 2001). The study conducted by Mitiku (2014) affirms that, in many parts of the country, market participation of household family farms is limited and agricultural markets are fragmented and not well integrated into wider market systems, which increase transaction costs and reduces farmers' incentive to produce for the market.

The issue of poor access to market plays a significant role in the success of farm enterprises owned by members of households. Baloyi (2010) is of the view that individual producers have greater access to farm infrastructure which includes sustainable farming methods which help producers to perform better and have closer links to formal markets, compared to farming enterprises owned by groups of households. Moreover, this ensures that the number of household farmers are still facing constraints in having a clear target market and strategies on how to disperse their products. The marketing of agricultural products is an important function of the agricultural industry, as it plays a major role in transferring products from the farm to the final consumer (Hlongwane *et al.*, 2014). This implies that any pathway to a greater market participation will require a transparent sustainable market that will be accessible to members of households. Moreover, government and policy makers must

ensure that there is greater market participation by disseminating new market trends and Moringa price information.

The distance travelled by members of households from their households to Moringa markets is one of the most critical factor which needs special attention to enhance the expansion of Moringa production in rural areas. It is an undisputable fact that to deliver products to different markets needs fuel or transport for hiring, which may be too expensive for members of households who reside in rural area where infrastructure development is also a challenge. Majority (82.6%) of the households sold their produce within 5Kms, implying that access to markets may no longer be defined in terms of distance to point of sale, but rather in terms of the ability of farmers to obtain and negotiate for a remunerative price (SEATINI-Uganda, 2013). Moringa is widely used as vegetable and grown commercially for its edible pods and leaves (Sekhar *et al.*, 2018a), this means that, the products should be delivered on time which is a challenge, because members of households are finding it difficult do access affordable transport for their products.

## **2.6 Conclusion**

This chapter reviewed the literature on socio-economic characteristics of members of households who produce Moringa as well as the perceptions of members of households regarding economic benefits of Moringa. As observed from the literature review, the study draw the following conclusion: Information dissemination among members of households who produce Moringa is the most fundamental principle. Agricultural extension and advisory services can play a crucial role in meeting the challenges and assisting rural households harness the enormous opportunities in the production and usage of Moringa.

## CHAPTER 3

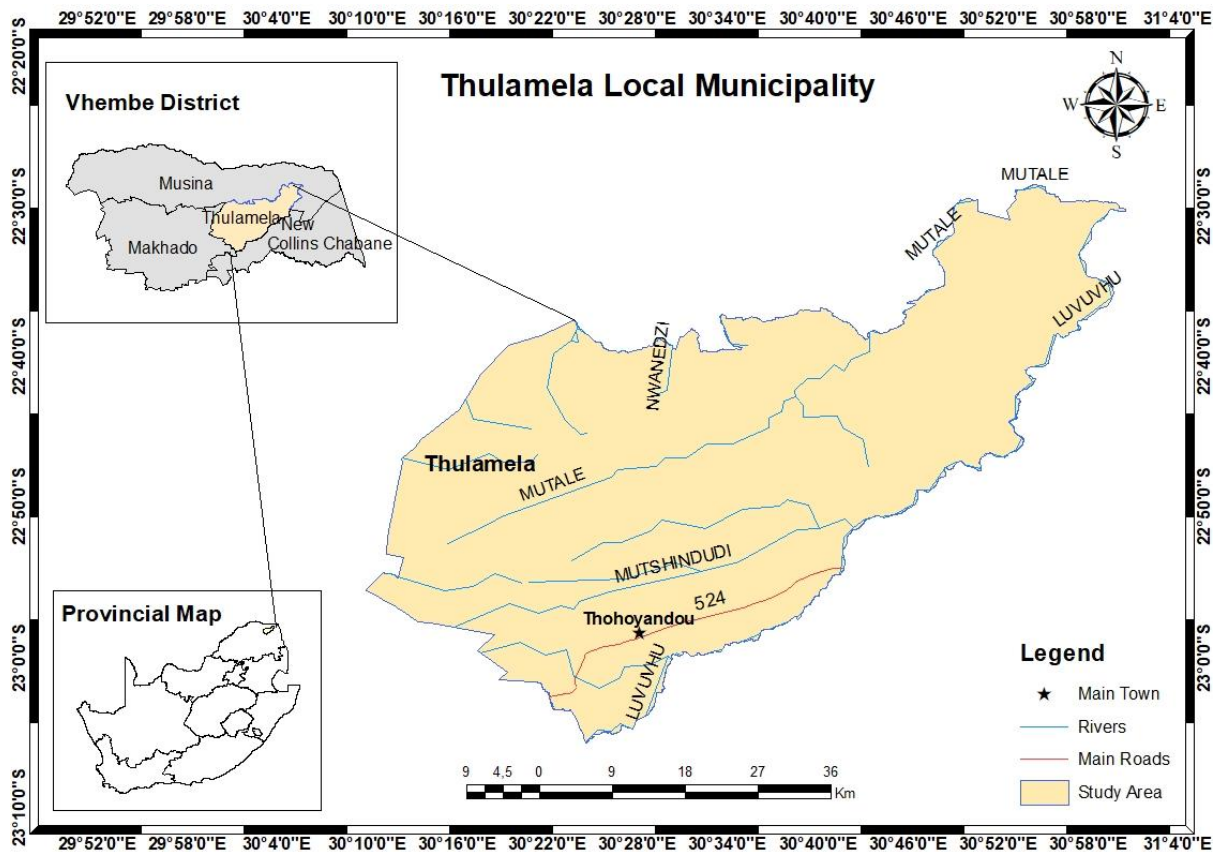
### METHODOLOGY

#### 3.1 Introduction

This chapter summarised all the behaviour and instruments used in performing research operations, selecting and constructing research techniques. Under this chapter, the research methods were categorised into three different groups. These are methods concerned with data collection and statistical techniques used for establishing relationships between the data and the unknowns; it also include methods used to evaluate the accuracy of the results obtained.

#### 3.2 Study area

The study was conducted in the Thulamela Local Municipality, Vhembe District, Limpopo, South Africa. Thulamela Municipality is one of the four local municipalities in Vhembe District, sitting on coordinates of 30° 27' 38.67" East and 22° 58' 15.87". The municipality is situated within the Vhembe District in the far north of the Limpopo Province. The Kruger National Park forms the boundary in the East, while sharing the border with Makhado in the South and South-west. According to Municipalities SA (2018) Thulamela Local Municipality is the smallest municipality of the four in the district, making up 10% of its geographical area. It is the largest municipality in the province in terms of population. Part of Thulamela Local Municipality was merged into Collins Chabane Local Municipality in 2016.



**Figure 3. 1:** The study area in Limpopo province (South Africa)

**Source:** Created using the ArcGIS system software (2018)

### 3.3 Research design

A cross-sectional approach was adopted for this study. Cross-sectional study design is a type of observational study design. In a cross-sectional study, the investigator measures the outcome and the exposures in the study participants at the same time (Setia, 2016). The participants in a cross-sectional study are just selected based on the inclusion and exclusion criteria set for the study. Since the main purpose of this study is to determine the perceptions of members of members of households regarding economic benefits of production and marketing of Moringa, only members of households who produce Moringa in Thulamela Local Municipality were selected as the participants for the study. Cross-sectional study design was appropriate for this

study because it allow the researcher to gather information about the prevalence of outcomes or exposures.

The study used both qualitative and quantitative research methods. Qualitative approach was utilized to collect the in-depth details on perceptions of members of households on Moringa production and marketing, while the quantitative approach was used to gather numerical data pertaining the socio-economic characteristics and factors influencing the perceptions of members of households regarding economic benefits of production and marketing of Moringa in Thulamela Local Municipality.

### **3.4 Population and sampling**

The targeted population for this study was members of households who produce Moringa in the Thulamela Local Municipality. A two-stage sampling procedure, non-probability and probability sampling methods was adopted for this study. Probability sampling method is any method of sampling that utilises some form of random selection, however, non-probability sampling procedure do not give all individuals in the population equal chances of being selected.

On the first stage of the sampling procedure, the researcher obtained data sources about the known or available members of households who produce Moringa from two sources. At first, the researcher got the list of 44 members of households who produce Moringa through the office of the extension officer at Limpopo Department of Agriculture, Vhembe district. Secondly, the researcher obtained a list of 25 Moringa growers from Vhembe Moringa Growers cooperative. However, the population obtained from both institutions were not enough for the sample size needed for the study, therefore, the researcher adopted the Snowball sampling procedure to identify enough population of members of households who produce Moringa in the Thulamela

Local Municipality. Snowball sampling is one of the non-probability sampling techniques used to identify targeted individuals who are hard to locate (Salganik & Heckathorn, 2004). According to Faugier and Sargeant (1997), snowball sampling is a method of chain referral in which researchers contact members of the targeted population, already known to them, who are invited to participate in the survey and are in turn asked to refer their peers and/or help researchers to identify them.

In this study, the researcher made initial contact with individuals from both Vhembe Moringa Growers and Limpopo Department of Agriculture, Vhembe district who know other members of households who are producing Moringa in their respective villages, and then used them as referral to identify the population of the study. The total population of 235 members of households who produce Moringa from Vhembe Moringa Growers Cooperative, Limpopo Department of Agriculture, Vhembe district, and eight other villages located in Thulamela Local Municipality were identified. These villages included Makonde with a population of 20, Tshivhilwi with a population of 26, Manamani with a population of 17, Tshidzini with a population of 31, Tshikambe with a population of 22, Ha-Dumasi with a population of 13, Maniini with a population of 15 and Matangari with a population of 22.

On the second stage of the sampling procedure, Simple random sampling procedure was adopted to select participants from the identified total population of members of households who produce Moringa in each village. The researcher randomly selected every available respondent in the identified population. This approach was appropriate for this study because each participant had equal opportunity of being selected. A representative sample size of 146 members of households who produce Moringa was selected, were the researcher sampled 12 participants in Makonde, 15 in Tshivhilwi, 8 in Manamani, 20 in Tshidzini, 17 in Tshikambe, 11 in Ha-Dumasi, 7 in Maniini, 18 in

Matangari, 16 from Vhembe Moringa Growers, and 22 from Limpopo Department of Agriculture, Vhembe district.

**Table 3. 1: Sampling frame**

Place	Population	Sample
Makonde	20	12
Tshivhilwi	26	15
Manamani	17	8
Tshidzini	31	20
Tshikambe	22	17
Ha-dumasi	13	11
Maniini	15	7
Matangari	22	18
Vhembe Moringa Grower	25	16
Limpopo Department of Agriculture	44	22
<b>Total</b>	<b>235</b>	<b>146</b>

Source: survey data (2018)

### 3.5 Data collection

#### 3.5.1 Primary data

Primary data was collected from members of households who produce Moringa using a designed research questionnaire. Close ended questionnaires and open ended questionnaires were used to collect qualitative and quantitative data with the aid of thoroughly trained enumerator. In this study, information on socio-economic characterises of respondents and their perceptions regarding economic benefits of production and marketing of Moringa was collected through face to face interviews which were conducted using respondents' home language.

### 3.6 Data analysis

The collected data was processed and examined to detect errors and omissions and corrected where possible. Based on the objectives of the study, the collected data was

analysed using the IBM SPSS Statistics. According to Landau and Everitt (2004) SPSS is a powerful, user-friendly software package for the manipulation and statistical analysis of data. The package is widely used in the social and behavioural sciences. It does an extensive range of both univariate and multivariate procedures for different disciplines. Probit regression model and Cross-tabulations were used as the analytical tools for this study. These analyses were computed to respond to the objectives and hypotheses of the study.

Specific objective, number one was to determine the socio-economic characteristics of members of households who produce Moringa in Thulamela Local Municipality. For this purpose, Cross-tabulation was used to examine the relationship between the socio-economic characteristics of members of households who produce Moringa and their level of awareness regarding the economic benefits of producing and marketing Moringa. The Test of Equality of Group Means was then used to compare two groups of members of households who produce Moringa and their respective means. In this case, members of households who are aware and those who are not aware of the economic benefits of producing and marketing Moringa were compared to find the dimensions that they differed on and each group was assessed for significance.

Specific objective number two, was to determine the perceptions of members of households regarding economic benefits of production and marketing of Moringa in Thulamela Local Municipality. For this purpose, 4 point Likert scale was used to measure the perceptions of members of households regarding economic benefits of production and marketing of Moringa. Likert scale provides independence to a participant to choose any response in a balanced and symmetric way in either directions (Joshi *et al.*, 2015). In this study, several statements were administered to members of households to allow them to choose their responses based on whether

they strongly disagree, disagree, agree or strongly agree with the statement, and respondents were not allowed to select neutral options.

**Table 3. 2: Likert scale table**

		Independent variables (statements)					Total
		Strongly disagree	Disagree	Agree	Strongly agree		
<b>Dependent variables</b>	Not Aware	N	x	x	x	x	x
		Sub-total	%	%	%	%	%
	Aware	N	x	x	x	x	x
		Sub-total	%	%	%	%	%
<b>Total</b>		N	x	x	x	x	x
		Total	%	%	%	%	%

Specific objective, number three was to determine factors that influence perceptions of members of households regarding economic benefits of production and marketing of Moringa in Thulamela Local Municipality. The Probit model was employed to estimate the probability of members of households' perceptions regarding economic benefits of production and marketing of Moringa. The Probit model is a statistical probability model with two categories in the dependent variable (Liao, 1994; Uzunoğlu & Akcay, 2012). This study was interested on whether members of households were aware of the economic benefits of producing and marketing Moringa or not. The Probit model was more useful in this study because the dependent variable that was thought to be influenced was dichotomous.

The Probit model is a type of regression where the dependent variable can only take two values; the two possible outcomes in this study were aware and not aware denoted by 0 and 1. With reference to the study conducted by Krystalogianni *et al.* (2004), the Probit model in this study provides statistically significant findings of which the predictor variables increase or decrease the probability of members of households' awareness which is estimated as:

$$\Pr(P = 1|x) = \Pr(P = 1 | x_1, x_2, \dots, x_k) \quad (1)$$

A variable  $P$  is defined so that:

$P = 1$  Aware

$P = 0$  Not aware

Where  $x$  denotes the full set of explanatory variables  $(x_1, x_2, \dots, x_k)$  which is a vector of leading indicator series in the present study. Looking at first equation, the Probit model can be interpreted as:

$$\Pr(P = 1|x) = F(\beta_0 + \beta_{1x_1} + \dots + \beta_{kx_k}) = F(\beta_0 + x\beta) \quad (2)$$

where  $F$  is a function taking on values strictly between zero and one, which ensures that the estimated response probabilities are strictly between zero and one;  $\beta$  is the set of coefficients corresponding to the indicator variables  $x$ . To make the Probit approach operational the probability of obtaining  $P = 1$  is linked to an unobservable index  $I$ . The higher the value of the index  $I$  the more likely the members of households would be aware of the economic benefits of producing and marketing Moringa. The unobservable index  $I$ , which is required to be normally distributed for a Probit to apply, is determined by the set of explanatory variables  $x$ :

$$I = \beta_0 + x\beta \quad (3)$$

A threshold value is also required to indicate the possible occurrence of awareness.

If the estimated  $I$  is greater than a threshold value  $I^*$ , then  $T = 1$ :

$$\Pr(T = 1|x) = \Pr(I^* \leq I) = \Pr(I^* \leq \beta_0 + x\beta) \quad (4)$$

The Probit model will estimate the coefficients  $\beta_0$  and  $\beta$  and the unobservable series  $I$ . Once an estimate for  $I$  is obtained one can accept  $P = 1$ : (Awareness) if  $I$  is greater

than  $I^*$ , the threshold value of  $I$ . The normality assumption for the unobservable index  $I$  means that one can obtain the probability that  $I^* \leq I$  from the standardized normal cumulative density function. Therefore:

$$\Pr(I^* \leq I) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^I e^{-t^2/2} dt = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\beta_0 + \beta x} e^{-t^2/2} dt \quad (5)$$

Where,  $p \sim N(0,1)$ .

The probability of a being aware ( $\Pr(P = 1)$ ) is therefore measured by the area of the standard normal cumulative curve from  $-\infty$  to  $I$ . Awareness, therefore, will be more likely to occur the larger the value of  $I$ . Equation 5 shows the probability that a standard normal variable ( $I$  in this case) will be less than or equal to the threshold  $I^*$ .

### 3.7 Ethical consideration

Information collected from members of households who produce Moringa will only be used for academic purposes and it will not be shared with other participants or displayed to anyone without members of households' consent. Participants were not promised any compensation after the publication of the study, however, the study can be used to influence extension services and other developments in Thulamela Local Municipality. At the end of every questionnaire session, respondents were acknowledged or thanked for their participation.

#### 3.7.1 Ethical clearance and permission

The research proposal was presented to the Department of Agricultural Economics and agribusiness, and the School of Agriculture. The ethical clearance certificate was granted by the University Research Ethics Committees prior to data collection. The ethical clearance certificate granted was presented to the supervisor. It was also presented to the leader of Vhembe Moringa Growers cooperative and the extension

officer at Limpopo Department of Agriculture under Vhembe district for permission to gain access to participants in the study area.

### **3.7.2 Informed consent**

Participants were approached to gain contacts, ask them to participate and give them an opportunity to suggest other members of households who produce Moringa in the Thulamela Local Municipality. Research background and its purposes were thoroughly explained to the participants of the study. Before the commencement of data collection, all participants were told that participating in this study was not compulsory and they may withdraw from participating should they feel they were no longer comfortable.

Primary data was collected from members of households using a designed research questionnaire presented on Appendix C. Participants were assisted to understand the research questionnaire by using the language they understood the most. In this study, participants were not allowed to write their names on the questionnaire, this was done to ensure that they remained unknown and their permission was obtained before taking pictures of their household Moringa production. Information collected in this study was treated with the highest confidentiality and participants were not exposed to any harm. Should there be any research-related harm or injury, participants were told that they would be given full support by visiting them during their stay in hospital, and no monetary compensation would be provided. The researcher and the appointed enumerator also explained to the participants that, they were not expected to contribute or cover any costs towards the study.

### **3.8 Conclusion**

This chapter summarized all the methods used to collect and analyse data for this study. It can be concluded that all research methods were thoroughly followed to collect adequate data used for this study. This study adopted the cross-sectional approach to collect quantitative and qualitative data. The targeted population for this study was members of households who produce Moringa in the Thulamela Local Municipality.

## CHAPTER 4

### RESULTS AND DISCUSSION

#### 4.1 Introduction

This chapter presents the results of the socio-economic characteristics of members of households who produce Moringa, and their perceptions regarding economic benefits of production and marketing of Moringa in Thulamela Local Municipality. The results were obtained using the Descriptive statistics, Cross tabulation, Probit Model and Likert scale.

#### 4.2 Socio-economic characteristics

This section summarises the description of socio-economic characteristics of members of households who produce and market Moringa in the Thulamela Local Municipality.

**Table 4. 1: Gender**

			Female	Male	Total
Awareness of economic benefits of Moringa	Not aware	N	22	22	44
		Sub-total	15.1%	15.1%	30.1%
	Aware	N	55	47	102
		Sub-total	37.7%	32.2%	69.9%
Total	N	77	69	146	
	Total	52.7%	47.3%	100.0%	

**Source: survey data (2018)**

The findings of this study revealed that majority (52.7 percent) of respondents who were producing Moringa in the study area were females. Amongst those respondents, 37.7 percent were aware of the economic benefits of Moringa, while only 15.1 percent of female respondents were not aware. 47.3 percent of members of households who

were producing Moringa in Thulamela Local Municipality were males. Amongst those male respondents, 32.2 percent were aware, while 15.1 percent were not aware. These results support the results of the study carried out by Baba *et al.* (2015) which revealed that most Moringa farmers were female, while there were few males who were cultivating the tree.

**Table 4. 2: Level of education**

			No formal education	Primary level	Secondary level	Tertiary level	Total
Awareness of economic benefits of Moringa	Not aware	N	9	18	10	7	44
		Sub-total	6.2%	12.3%	6.8%	4.8%	30.1%
Moringa	Aware	N	15	37	45	5	102
		Sub-total	10.3%	25.3%	30.8%	3.4%	69.9%
Total		N	24	55	55	12	146
		Total	16.4%	37.7%	37.7%	8.2%	100.0%

**Source: survey data (2018)**

According to the table presented above (Table 4.2), 37.7% of respondents had primary and secondary education respectively. The study conducted by Abah and Petja (2015) revealed that the level of education influences the capacity of communities to improve farming practices and engage efficiently in other land use activities, as most of the respondents have attained at least one level of formal education. Table 4.2 showed that 25.3 percent of members of households who had primary education were aware of the economic benefits of Moringa. About 83.6 percent of respondents in the study area had formal education, while only 16.4 percent of respondents interviewed had no formal education. Amongst 16.4 percent of respondents who had no formal education, only 10.3 percent were aware of the economic benefits of producing Moringa. This results emphasise the importance of education in the production of Moringa, because the more members of households acquire education the better the chances of their awareness of the economic benefits of Moringa.

**Table 4. 3: Marital status**

			Single	Married	Divorced	Widowed	Cohabit	Total
Awareness of economic benefits of Moringa	Not aware	N	7	9	2	8	18	44
		Sub-total	4.8%	6.2%	1.4%	5.5%	12.3%	30.1%
	Aware	N	21	32	3	11	35	102
		Sub-total	14.8%	21.9%	2.1%	7.5%	24.0%	69.9%
Total		N	28	41	5	19	53	146
		Total	19.2%	28.1%	3.4%	13.0%	36.3%	100.0%

**Source: survey data (2018)**

The findings of study conducted by Kola-Oladiji *et al.* (2014) revealed that marital status distribution of the respondents shows that greater percentages of the respondents were married and they depend on numerous benefits of Moringa by which they sustain their family. In this study, 28.1 percent of members of households who were producing Moringa were married, and amongst those married respondents, 6.2 percent were not aware, followed by 21.9 percent who were aware of the economic values of producing Moringa. Most (36.3 percent) respondents who participated in this study were in a cohabiting relationship. 24.0 percent of members of households who were in a cohabiting relationship were aware and only 12.3 percent were not aware of the economic benefits of producing Moringa. These results imply that most of members of households in the study area were producing Moringa to feed their families as most of them were either married or in a cohabiting relationship.

**Table 4. 4: Age group**

			18-35 (Youth)	36-45 (Young adults)	46-60 (Adults)	Above 61	Total
Awareness of economic benefits of Moringa	Not aware	N	7	7	12	18	44
		Sub-total	4.8%	4.8%	8.2%	12.3%	30.1%
Aware	Aware	N	24	27	39	12	102
		Sub-total	16.4%	18.5%	26.7%	8.2%	69.9%
Total		N	31	34	51	30	146
		Total	21.2%	23.3%	34.9%	20.5%	100.0%

**Source: survey data (2018)**

It can be observed from Table 4.4 that there was less participation of youth in the production of Moringa in Thulamela Local Municipality. 21.2 percent of respondents in the study were youth in which most (16.4 percent) of them were aware of the economic benefits of cultivating Moringa while only 4.8 percent of youth were not aware. Table 4.5 indicated that 34.9 percent of respondents who produce Moringa in the study area were adults between the age 46 and 60, while 23.3 percent were young adults between the age of 36 and 45. The results of this study also indicated that 26.7 percent of respondents who were between 46 and 60 years were aware, while 8.2 of those respondents were not aware. These results imply that most members of households who were aware of the economic benefits of cultivating Moringa were above the age of 36.

**Table 4. 5: Access to information**

			No	Yes	Total
Awareness of economic benefits of Moringa	Not aware	N	34	10	44
		Sub-total	23.3%	6.8%	30.1%
Moringa	Aware	N	26	76	29
		Sub-total	17.8%	52.1%	69.9%
Total		N	60	86	146
		Total	41.1%	58.9%	100.0%

**Source: survey data (2018)**

The results presented in Table 4.5 above showed that majority (58.9 percent) of respondents in the study areas had access to information about the demand and the importance of Moringa, while 41.1 percent of respondents did not have access to such information. This finding contradicts the findings of the study conducted by Oladiji *et al.* (2013) which revealed that a considerable proportion of the respondents were still not aware of the economic values and multipurpose nature of Moringa. 52.1 percent of members of households who had access to information about the demand and the importance of Moringa were aware of the economic benefits of producing Moringa, while 23.3 percent of respondents who did not have access to information were not aware of the economic benefits of producing Moringa. During the survey, some respondents indicated that they received information about the demand of Moringa from family and friends.

**Table 4. 6: Production of Moringa per year**

			Below average	Above average	Total
Awareness of economic benefits of Moringa	Not aware	N	42	2	44
		Sub-total	28.8%	1.4%	30.1%
	Aware	N	75	27	102
		Sub-total	51.4%	18.5%	69.9%
Total	N	117	29	146	
	Total		80.1%	19.9%	100.0%

**Average production per year 53kg**

**Source: survey data (2018)**

Table 4.6 presented above, show that 80.1 percent of members of households were producing Moringa below average in the Thulamela Local Municipality. The average production in this study was 53kg per year, this average production was derived by dividing the total Moringa output produced by members of households per year (7738 kg) by each unit of respondents (146). The findings of the study conducted by Peddi (2018) revealed that the yields of Moringa were different in each location, most probably due to differences in the cultivation methods, genetic differences or climatic conditions. Only 19.9 percent of respondents in the study area were producing Moringa above average. The results also showed that 69.9 percent of respondents were aware of the economic benefits of Moringa, while 30.1 percent were not aware. Within those members of households who were aware of Moringa benefits, 51.4 percent were producing Moringa below average, with only 18.5 producing above average. These results emphasise the need to increase Moringa production as well as to enhance promotional campaigns to educate members of households about the importance of Moringa.

**Table 4. 7: Number of Moringa trees**

			Less than 4	5-10 trees	11-15 trees	16-20 trees	More than 21 trees	Total
Awareness of economic benefits of Moringa	Not aware	N	31	8	1	0	4	44
		Sub-total	21.2%	5.5%	0.7%	0.0%	2.7%	30.1%
Moringa	Aware	N	35	16	19	12	20	102
		Sub-total	24.0%	11.0%	13.0%	8.2%	13.7%	69.9%
Total		N	66	24	20	12	24	146
		Total	45.2%	16.4%	13.7%	8.2%	16.4%	100.0%

**Source: survey data (2018)**

From Table 4.7 above, 45.2 percent of respondents who participated on this study had less than 4 Moringa trees in their properties, and most (24.0 percent) of those respondents were aware of the economic benefits of cultivating Moringa. The study conducted by Mudyiwa *et al.* (2013) found that the highest proportion of growers had less than 5 trees per homestead under Moringa production. There were many factors which contributed to less availability of Moringa trees in Thulamela Local Municipality. These include management practices and perceived benefits associated with the cultivation and consumption of Moringa; some respondents indicated that they planted 1-2 trees of Moringa so that they may have access to its fresh leaves whenever they are not feeling well. 16.4 percent had 5-10 Moringa trees as well as those who had more than 21 trees. Most (13.7 percent) respondents who had more than 21 trees were aware of the economic benefits of cultivating Moringa. This implies that, the more members of households had many Moringa trees in their households the better the chances of their awareness on the economic benefits they can derive from producing and marketing Moringa.

**Table 4. 8: Moringa farming experience**

			Less than a year	2-3 years	4-5 years	More than 6 years	Total
Awareness of economic benefits of Moringa	Not aware	N	19	14	8	3	44
		Sub-total	13.0%	9.6%	5.5%	2.1%	30.1%
	Aware	N	23	42	21	16	102
		Sub-total	15.8%	28.8%	14.4%	11.0%	69.9%
Total		N	42	56	29	19	146
		Total	28.8%	38.4%	19.9%	13.0%	100.0%

**Source: survey data (2018)**

Table 4.8 indicated that 38.8 percent of respondents have been in Moringa production for 2-3 years with only 13.0 percent having more than 6 years Moringa farming experience. This illustrates that some of members of households in Thulamela Local Municipality had the necessary Moringa farming experience and knowledge. A total of 28.8 percent of respondents had just ventured into Moringa production with less than a year experience, and they showed the ability of expanding their Moringa production since 15.8 percent were aware of the economic benefits of Moringa. The low level of farming experience among members of households who produce Moringa is an indication that most of them are new in the production (Ojo *et al.*, 2016). Those respondents with less experience in Moringa production indicated that their main reason to get into Moringa production was because they have learned and seen its potential in terms of nutritional qualities and the ability to create wealth. 28.8 percent of members of households who were producing Moringa for 2-3 years were aware, while 9.6 percent were not aware.

**Table 4. 9: Access to market**

			No	Yes	Total
Awareness of economic benefits of Moringa	Not aware	N	41	3	117
		Sub-total	28.1%	2.1%	30.1%
Moringa	Aware	N	49	53	104
		Sub-total	33.6%	36.3%	69.9%
Total	N		90	56	146
	Total		61.6%	38.4%	100.0%

**Source: survey data (2018)**

The results of the study presented in Table 4.9 revealed that only 38.4 percent of members of households interviewed had access to Moringa markets while 61.6 percent did not. The results above illustrate that there were few members of households who produce Moringa with the aim of attaining economic benefits associated with Moringa. This is because only 36,3 percent of respondents who had access to Moringa markets were aware of the economic benefits of Moringa. 28.1 percent of respondents who do not have access to Moringa markets were not aware of the economic benefits of producing and marketing Moringa. The study conducted by Kumssa *et al.* (2017) found that lack of access to markets was one of the challenges faced by the members of households who produce Moringa, and it was recommended that community-wide awareness should be raised on the multiple uses of Moringa, this is required to create market demand and maximise the utilisation of Moringa in rural areas.

**Table 4. 10: Market segment**

			Community members	Farmers	Sick people	Others	Total
Awareness of economic benefits of Moringa	Not aware	N	2	0	1	0	3
		Sub-total	3.6%	0.0%	1.8%	0.0%	5.4%
Moringa	Aware	N	23	3	19	8	53
		Sub-total	41.1%	5.4%	33.9%	14.3%	94.6%
Total		N	25	3	20	8	56
		Total	44.6%	5.4%	35.7%	14.3%	100.0%

**Source: survey data (2018)**

Table 4.10 showed that most (41.1 percent) respondents who were aware of economic benefits of producing and marketing Moringa indicated that they sell their Moringa products to general members of communities, while 33.9 percent of respondents sell their Moringa products to people with medical attention. These findings affirm the findings by Mabapa *et al.* (2017) that majority of Moringa growers sell their products within their immediate community, while only a few of well-established producers sell to the supermarkets and pharmaceutical shops. The results presented in Table 4.10 above showed that 5.4 percent of members of households who were aware of the economic benefits of producing and marketing Moringa were selling their Moringa products to livestock producers.

**Table 4. 11: Test of Equality of Group Means**

<i>Variables</i>	<i>Not aware</i>	<i>Aware</i>	<i>Pooled</i>	<i>Wilk's<math>\lambda</math></i>	<i>F</i>	<i>df1</i>	<i>df2</i>	<i>P-value</i>
EDU( $X_1$ )	2.34	2.39	2.38	0.999	0.109	1	144	0.741
MRTS( $X_2$ )	3.48	3.07	3.19	0.986	1.979	1	144	0.062
AGE( $X_3$ )	2.93	2.38	2.55	0.941	8.976	1	144	0.003
GEN( $X_4$ )	0.50	0.46	0.47	0.999	0.187	1	144	0.666
NMT( $X_5$ )	1.59	2.67	2.34	0.893	17.230	1	144	0.000
MFE( $X_6$ )	1.89	2.29	2.17	0.964	5.348	1	144	0.022
INFAM( $X_7$ )	0.23	0.75	0.59	0.767	43.799	1	144	0.000
ACMK( $X_8$ )	0.09	0.33	0.26	0.936	9.890	1	144	0.002
MP ( $X_9$ )	0.05	0.26	0.20	0.936	9.778	1	144	0.002

**Source: survey data (2018)**

Table 4.11 presented above measured the equality of group of means of independent variables between the members of households who are aware of the economic benefits of Moringa and those who are not aware. It can be observed from the test of group of equality of means that, there was a significant difference between socio-economic variables at 1 percent, 5 percent and 10 percent level. A significant difference was observed at 1 percent level between independent variables such as Age group (AGE), number of Moringa trees (NMT) produced by members of households, access to information (INFAM) as well as access to Moringa market (ACMK). Moringa farming experience (MFE) showed a significant difference at 5 percent level, while the marital status (MRTS) showed a significant difference at 10 percent level.

Based on the results of test of groups of equality of means presented in Table 4.11 above, the age group mean scores of members of households who were aware of the

economic values of Moringa (2.38) was low compared to those who were not aware (2.93). These results also indicated that there was a statistically significant difference between group means at 1 percent. The significant difference implied that members of households who were not aware of the economic benefits associated with the production of Moringa were elderly people; this might be because some elders are not familiar with modern technologies compared to modern generation who can familiarise themselves with different communication channels which can assist them to gain knowledge on how Moringa can be utilised.

The results presented in Table 4.11 indicated that there was a significant difference in the mean scores at 1 percent level. The marital status mean scores of members of households who were not aware on the economic benefits of Moringa (3.48) was high compared to those who were aware (3.07). Access to information showed a statistically significant difference in the mean scores of members of households who were aware and those who were not aware at 10 percent. The mean scores of access to information showed that members of households who were aware of the economic values of Moringa had a greater mean (0.75) compared to their counterpart (0.23).

### 4.3 Analysis of respondents' perceptions

This section presents the results of cross tabulation computed to compare awareness of members of households and the perceived benefits and potential associated with the production and marketing of Moringa.

**Table 4. 12: The rising demand of Moringa**

			The rising demand of Moringa can help to achieve sustainable livelihoods				
			Strongly disagree	Disagree	Agree	Strongly agree	Total
Awareness of economic benefits of Moringa	Not Aware	N	1	2	29	12	44
		Sub-total	0.7%	1.4%	19.9%	8.2%	30.1%
	Aware	N	0	2	51	49	102
		Sub-total	0.0%	1.4%	34.9%	33.6%	69.9%
Total	N	1	4	80	61	146	
	Total		0.7%	2.7%	54.8%	41.8%	100.0%

**Source: survey data (2018)**

Table 4.12 above indicated that most (34.9 percent) of members of households who were aware of the economic benefits of producing Moringa in the study area agreed that the rising demand of Moringa products can help to achieve sustainable livelihoods for people living in rural areas, followed by 33.6 percent of respondents who strongly agreed to the same statement. The study conducted by Mabapa *et al.* (2017) found that Moringa production has a high commercial value thus making its cultivation a potential cash earning opportunity that can enhance the livelihoods of rural dwellers in the province. Amongst the members of household who participated in this study, 19.9 percent of those who were not aware of the economic benefits of producing Moringa agreed to the statement that Moringa products can help to achieve sustainable livelihoods if constraining factors could be eliminated, followed by 8.2 percent of respondents who strongly agreed to the same statement. A total number of

respondents (54.8 percent and 41.8 percent) who were aware and those who were not aware agreed and strongly agreed with the above statement respectively.

**Table 4. 13: Potential of Moringa**

Moringa has the potential to improve nutrition and boost food security						
			Disagree	Agree	Strongly agree	Total
Awareness of economic benefits of Moringa	Not aware	N	2	29	13	44
		Sub-total	1.4%	19.9%	8.9%	30.1%
	Aware	N	0	53	49	102
		Sub-total	0.0%	36.3%	33.6%	69.9%
Total	N		2	82	62	146
	Total		1.4%	56.2%	42.5%	100.0%

**Source: survey data (2018)**

The study revealed that about 36.3 percent and 33.6 percent of respondents who were aware of economic benefits of Moringa agreed and strongly agreed that Moringa has the potential to improve nutrition, boost food security and foster rural development. Only 1.4 percent of members of households disagreed with the statement. The table presented above (Table 4.13) showed that there is a need to intensify campaigns which educate members of households about the importance and potential of Moringa in rural livelihoods, this is because within 30.1 percent of members of households who were not aware of the economic benefits of producing Moringa, 19.9 percent indicated that they agree to the statement that Moringa has the potential to improve nutrition, boost food security and foster rural development. This was also affirmed by the paper published by Agbogidi and Ilondu (2012) that expansion of Moringa production will significantly contribute to food security thereby, alleviating poverty and improving rural health care.

**Table 4. 14: Availability of land**

The production of Moringa is constrained by availability of land							
			Strongly disagree	Disagree	Agree	Strongly agree	Total
Awareness of economic benefits of Moringa	Not aware	N	11	6	22	5	44
		Sub-total	7.5%	4.1%	15.1%	3.4%	30.1%
	Aware	N	10	11	49	32	102
		Sub-total	6.8%	7.5%	33.6%	21.9%	69.9%
Total		N	21	17	71	37	146
		Total	14.4%	11.6%	48.6%	25.3%	100.0%

**Source: survey data (2018)**

The results of the study presented in Table 4.14 above revealed that, 48.8 and 25.3 percent of members of households in Thulamela Local Municipality agreed and strongly agreed that amongst other limiting resources, the production of Moringa is increasingly constrained by scarcity of land. The study also revealed that most (33.6 percent) respondents who were aware of the economic benefits of cultivating Moringa agreed to the same statement. This entails that land availability seems to be one of contributing factors holding back the large-scale cultivation of Moringa, as most of members of households who produce Moringa do not have enough space of land to produce Moringa. Mudyiwa *et al.* (2013) affirmed that members of households had small portions of land under Moringa production, which limits their capacity to produce quantity of Moringa products. Only 4.1 and 7.5 percent of respondents disagreed and strongly disagreed with the statement.

**Table 4. 15: Financial investment**

Increasing the production of Moringa will require significant financial investment							
			Strongly disagree	Disagree	Agree	Strongly agree	Total
Awareness of economic benefits of Moringa	Not aware	N	3	9	21	11	44
		Sub-total	2.1%	6.2%	14.4%	7.5%	30.1%
	Aware	N	1	7	56	38	102
		Sub-total	0.7%	4.8%	38.4%	26.0%	69.9%
Total		N	4	16	77	49	146
		Total	2.7%	11.0%	52.7%	33.6%	100.0%

**Source: survey data (2018)**

It was observed from the results (Table 4.15) of the study that amongst 69.9 percent of members of households who were aware of economic benefits of Moringa in the study area, 38.4 percent and 26.0 percent of them agreed and strongly agreed to that increasing the production of Moringa on any scale will require a significant financial investment. This was followed by 14.4 percent and 7.5 percent of those who were not aware who as well agreed and strongly agreed to the same statement. This statement was also supported by Achten *et al.* (2014) who revealed that under investment in Moringa production is influenced by investors who generally lack sufficient insight into uncertainties and risks related to their investments, which consequently hold sustainability risks. 6.2 percent and 2.1 percent of respondents disagreed and strongly disagreed with the statement respectively.

**Table 4. 16: Improving Moringa productivity**

Improving Moringa productivity should be linked with accessible markets							
			Strongly disagree	Disagree	Agree	Strongly agree	Total
Awareness of economic benefits of Moringa	Not aware	N	1	1	25	17	44
		Sub-total	0.7%	0.7%	17.1%	11.6%	30.1%
	Aware	N	0	3	50	49	56
		Sub-total	0.0%	2.1%	34.2%	33.6%	69.9%
Total		N	1	4	75	66	146
		Total	0.7%	2.7%	51.4%	45.2%	100.0%

**Source: survey data (2018)**

Improving productivity of Moringa should always be associated with accessible market for the accumulation of profit. This statement was supported by 34.2 percent and 33.6 percent of members of households who were aware of the economic benefits of producing Moringa in the Thulamela Local Municipality. In the study conducted by Omotesho *et al.* (2013) market uncertainty was found to be one of the major challenges to the large-scale cultivation of Moringa in developing countries. This implied that accessible Moringa market is crucial in the advancement of Moringa. The results presented above (Table 4.16) also indicated that among 30.1 percent of respondents who were not aware of economic benefits of Moringa, 17.1 percent 11.6 percent agreed and strongly agreed respectively to the statement that improving productivity of Moringa should always be associated with accessible market for the accumulation of profit. A total of 51.4 percent and 45.2 agreed and strongly agreed with the same statement respectively, while only 0.7 percent and 2.7 percent of respondents disagreed and strongly disagreed with the statement.

**Table 4. 17: Market and demand for Moringa products**

The market and demand for Moringa products will eventually grow							
			Strongly disagree	Disagree	Agree	Strongly agree	Total
Awareness of economic benefits of Moringa	Not aware	N	1	4	27	12	44
		Sub-total	0.7%	2.7%	18.5%	8.2%	30.1%
	Aware	N	0	0	63	39	102
		Sub-total	0.0%	0.0%	43.2%	26.7%	69.9%
Total	N		1	4	90	51	146
	Total		0.7%	2.7%	61.6%	34.9%	100.0%

**Source: survey data (2018)**

The results shown in Table 4.17 above indicated that majority (61.6 percent) of respondents agreed that the market and demand for Moringa products will eventually grow with continued awareness campaigns which emphasise the benefits derived from the consumption of Moringa. Most (43.2 percent) respondents who were aware of the economic benefits of producing Moringa agreed to the same statement. 18.5 percent and 8.2 percent of respondents who were not aware and who agreed and strongly agreed to the same statement. Obayelu *et al.* (2015) indicated that increasing awareness and sensitization programs would as well enhance effective move towards certification and standardization of the Moringa products. Only 2.7 percent and 0.7 percent disagreed and strongly disagreed that the market and demand for Moringa products will eventually grow with continued awareness campaigns which emphasises the benefits derived from the consumption of Moringa.

**Table 4. 18: Moringa value chain**

Value chain can help to strengthen Moringa markets							
			Strongly disagree	Disagree	Agree	Strongly agree	Total
Awareness of economic benefits of Moringa	Not aware	N	3	6	24	11	44
		Sub-total	2.1%	4.1%	16.4%	7.5%	30.1%
	Aware	N	0	1	61	40	102
		Sub-total	0.0%	0.7%	41.8%	27.4%	69.9%
Total		N	3	7	85	51	146
		Total	2.1%	4.8%	58.2%	34.9%	100.0%

**Source: survey data (2018)**

Based on the table presented above (Table 4.18), most respondents (41.8 percent) who were aware of the economic benefits of producing Moringa agreed that Moringa value chain can help to strengthen competitive advantage and increase the accumulation of profit, followed by 27.4 percent of respondents who strongly agreed to the same statement. This emphasises the need to encourage formation of Moringa processing companies to ensure there is value addition on Moringa products. The study conducted by Sekhar *et al.* (2018b) revealed that the need of value added products of Moringa is growing alarmingly both in Regional, National and International Markets and hence the technology and infrastructure support must be provided with a focus on precision farming technologies for enhancing higher productivity. A total of 58.2 percent and 34.9 percent of respondents agreed and strongly agreed to the statement that Moringa value chain can help to strengthen competitive advantage and increase the accumulation of profit, with only 2.1 percent of respondents who strongly disagreed with the statement.

**Table 4. 19: Role of extension officers**

Extension officers play can a crucial role in Moringa production							
			Strongly disagree	Disagree	Agree	Strongly agree	Total
Awareness of economic benefits of Moringa	Not aware	N	5	1	26	12	44
		Sub-total	3.4%	0.7%	17.8%	8.2%	30.1%
	Aware	N	0	2	57	43	102
		Sub-total	0.0%	1.4%	39.0%	29.5%	69.9%
Total		N	5	3	83	55	146
		Total	3.4%	2.1%	56.8%	37.7%	100.0%

**Source: survey data (2018)**

The study conducted by Kola-Oladiji *et al.* (2014) observed that some of respondents were not aware of Moringa, therefore, there is the need for extension workers to expose such rural dwellers to the numerous benefits attached to the use of Moringa and encourage the production and consumption to sustain their livelihood. The results presented in Table 4.19 above indicated that most (17.8 percent) respondents who were not aware of the economic benefits of producing Moringa agreed that, extension and advisory services can play a big role in assisting rural far harness the enormous opportunities in the production and usage of Moringa. The statement was also supported by 39.0 percent and 29.5 percent of respondents who were aware of economic benefits of Moringa who agreed and strongly agreed to the same statement. Only 3.4 percent of respondents strongly disagreed with the statement.

**Table 4. 20: Formation of Moringa cooperatives**

Formation of Moringa cooperatives should be encouraged							
			Strongly disagree	Disagree	Agree	Strongly agree	Total
Awareness of economic benefits of Moringa	Not aware	N	3	3	26	12	44
		Sub-total	2.1%	2.1%	17.8%	8.2%	30.1%
	Aware	N	0	1	57	44	102
		Sub-total	0.0%	0.7%	39.0%	30.1%	69.9%
Total		N	3	4	83	56	146
		Total	2.1%	2.7%	56.8%	38.4%	100.0%

**Source: survey data (2018)**

According to the table presented above (Table 4.20), 39.0 percent and 30.1 percent of respondents who were aware of the economic benefits of producing Moringa agreed and strongly agreed that formation of Moringa cooperatives should be encouraged to enhance large-scale plantation of Moringa. Most respondents (17.8 percent) who were not aware of the economic benefits of producing Moringa in the Thulamela Local Municipality agreed to the mentioned statement. A total of 56.8 percent and 38.4 percent of members of households who participated in this study agreed and strongly agreed to the same statement. Only 2.7 percent of respondents disagreed with the statement.

#### 4.4 Probit analysis

The Probit model was employed to estimate the probability of members of households' perceptions regarding economic benefits of production and marketing of Moringa. In this case, the study was interested on whether or not the perceptions of members of households were influenced by predictor variables.

**Table 4. 21: Description of variables**

Variable	Mean	Std. Dev	Variance
<i>Dependent variable:</i>			
Awareness (0=Not aware; 1=Aware)	0.70	0.460	0.212
<i>Independent variable:</i>			
Level of education ( $X_1$ ) 1=no formal education 2=primary level; 3=secondary level;4=tertiary level	2.38	0.856	0.733
Age group ( $X_2$ ) 1=no formal education; 2=primary level; 3=secondary level; 4=tertiary level	2.55	1.044	1.091
Number of Moringa trees ( $X_3$ ) 1=less than 4trees; 2=5-10 trees; 3=11-15trees; 4=16- 20trees; 5=more than 21trees	2.34	1.515	2.296
Moringa farming experience ( $X_4$ ) 1=less than a year; 2=2-3years; 3=4-5years; 4=more than 6years	2.17	0.992	0.984
Access to markets ( $X_5$ ) 0=no; 1=yes	0.26	0.440	0.194
Access to information ( $X_6$ ) 0=no; 1=yes	0.59	0.494	0.244

**Table 4. 22: Parameter estimates of the Probit model**

Variables	Coefficients	Std. Error	z-Statistics	P-value
Level of education ( $X_1$ )	-1.053*	0.227	-4.643	0.000
Age group ( $X_2$ )	-0.644	0.414	-1.555	0.120
Number of Moringa trees ( $X_3$ )	-0.686	0.511	-1.342	0.180
Moringa farming experience ( $X_4$ )	1.198**	0.511	2.343	0.019
Access to markets ( $X_5$ )	2.180**	1.063	2.050	0.040
Access to information( $X_6$ )	1.364**	0.693	1.968	0.049

\* $p < 0.01$ ; \*\* $p < 0.05$ ; N = 146

Table 4.22 above presents the estimated coefficients for Probit regression equations. The estimated coefficients and standard error showed which factors influence the perceptions of members of households regarding economic benefits of production and marketing of Moringa. The Probit model in this study was significant at 1 percent level of probability, and the likelihood test statistic results of the model showed that access to market, Moringa farming experience and access to information were positive and statistically significant at 5 percent level of probability. The results also showed that level of education has negative and statistically significant (1 percent) effect on awareness of economic benefits of producing and marketing Moringa.

#### 4.3.1 Level of education

As noted in Table 4.22 above, members of households who had no formal education were less likely to be aware of the economic benefits of producing and marketing Moringa. These results implied that the level of education had a negative significant impact on the perceptions of members of households regarding economic benefits of

production and marketing of Moringa in the study area. It was affirmed by the study conducted by Azeez *et al.* (2013a) which revealed that Moringa farmers that had a primary education were more technically efficient in Moringa production than those with no formal education.

#### **4.3.2 Moringa farming experience**

Moringa farming experience was one of the factors influencing the perceptions of members of households regarding the production and marketing of Moringa in the study area. The results of the study presented in Table 4.22 showed that members of households who had knowledge and experience in the production and marketing of Moringa were more likely to be aware of the economic benefits of producing and marketing Moringa. These results revealed that the farming experience in Moringa production had a positive impact on how members of households perceived the production and marketing of Moringa in the Thulamela Local Municipality. Experience and education could also assist the farmers by enabling them to be aware of the benefits of the Moringa, thereby enhancing willingness to cultivate the tree (Animashaun *et al.*, 2013b).

#### **4.3.3 Access to market**

The results of the study revealed that perceptions of members of households on Moringa production and marketing was influenced by access to its market. As per the results of the study (Table 4.22), members of households who had access to Moringa markets were more likely to be aware of the economic benefits they can derive from the production and marketing of Moringa. The study conducted by Mabapa *et al.* (2017) found that most farmers are willing to expand their Moringa production, but they are finding it difficult due to lack of effective market. This implies that members of

households had positive perceptions on how they can utilise Moringa for socio-economic benefits, therefore, the challenge of effective market access has to be addressed.

#### **4.3.4 Access to information**

The results of the study presented in Table 4.22 showed that members of households who had access to information about the demand of Moringa were more likely to be aware of the economic benefits of producing and marketing Moringa. These results implied that access to information about the demand of Moringa by members of households had a positive significant impact on how members of households in the Thulamela Local Municipality perceived the production and marketing of Moringa. The study conducted by Obayelu *et al.* (2015) revealed that there was a low level of awareness of Moringa products among the consumers probably owing to the quality of information they had about the products, thus, intensification of awareness and sensitization programs would enhance effective move towards certification and standardization of the Moringa products.

#### **4.5 Conclusion**

The results presented on this chapter were obtained using the descriptive statistics, cross tabulation, Probit Model and Likert scale. For the results presented on this study, it can be concluded that socio-economic characteristics of members of households who produce Moringa in Thulamela Local Municipality are different.

## CHAPTER 5

### SUMMARY, CONCLUSION AND RECOMMENDATIONS

#### 5.1 Introduction

This chapter provides the summary of the study, conclusion and recommendations on the main findings of the study. It summarises and briefly discusses the results with respect to the descriptive statistics findings, cross tabulation results and Probit analysis. It further provides suggestions for possible future research opportunities to address the missing gaps.

#### 5.2 Summary

This section provides the summary of the study mainly responding to the research questions and the hypotheses of the study.

##### 5.2.1 Socio-economic characteristics

The findings of the study revealed that majority of members of households who were producing Moringa had formal education, and they were aware of the economic benefits of Moringa. The study found that there was less participation of youth in the production of Moringa in the study area, and most respondents were in a cohabiting relationship. The production of Moringa in the Thulamela Local Municipality was dominated by members of households who produced Moringa below the average of 53kg per year, moreover, most of them had less than 4 Moringa trees in their households. The study revealed that most respondents in the study area had knowledge and experience in the production of Moringa and they have been cultivating Moringa for more than 2 two years. Majority of respondents in the study area had no access to Moringa market. Majority of members of households in Thulamela Local

Municipality had access to information about the production and the demand of Moringa.

### **5.2.2 Perceptions of members of households**

The cross-tabulation results provided the perceptions of members of households regarding economic benefits of production and marketing of Moringa in Thulamela Local Municipality. In this study, the perceptions of members of households who were aware compared to those who were not aware of the economic benefits of Moringa were determined. The findings of this study revealed that members of households had different perceptions regarding the production and marketing of Moringa. Majority of respondents perceived that the production and marketing of Moringa would help to achieve sustainable livelihood for people living in Thulamela Local Municipality, while others understand that Moringa has the potential to improve nutrition, boost food security and foster rural development. Only few members of households in the Thulamela Local Municipality had negative perception about the production and marketing of Moringa.

### **5.2.3 Factors influencing perceptions**

The Probit model was employed to estimate the probability of members of households' perceptions regarding economic benefits of production and marketing of Moringa. The results of Probit regression revealed that perceptions of members of households regarding economic benefits of production and marketing in Thulamela Local Municipality was influenced by different variables. The statistical significant variables which influenced the perceptions of members of households regarding economic benefits of production and marketing of Moringa in Thulamela Local Municipality were level of education ( $p < 0.01$ ), Moringa farming experience ( $p < 0.05$ ), access to market

( $p < 0.05$ ), as well as the access to information ( $p < 0.05$ ) about the production and the demand of Moringa produce

#### **5.2.4 Hypotheses test**

**H<sub>1</sub>** Group means of socio-economic characteristics of members of households have no significant difference.

- It was observed from the test of equality of group of means that there was a statistically significant difference between groups of means. The null hypothesis is therefore rejected since the group of means of members of households who produce Moringa in Thulamela Local Municipality was different.

**H<sub>2</sub>** Factors such as access to information, access to markets and socio-economic variables influence the perceptions of members of households regarding economic benefits of production and marketing of Moringa.

- The estimated coefficients for Probit equation showed that level of education, Moringa farming experience, access to market, as well as the access to information about the production and the demand of Moringa produce influenced the perception of members of households regarding economic benefits of production and marketing of Moringa in Thulamela Local Municipality. The null hypothesis is therefore accepted.

#### **5.3 Conclusion**

From the results of the study, it can be concluded that members of households had positive perception about the production and marketing of Moringa in Thulamela Local Municipality as majority of respondents perceived that the production and marketing of Moringa would help to achieve sustainable livelihood for people living in Thulamela

Local Municipality, while others were of the view that Moringa has the potential to improve nutrition, boost food security and foster rural development. It can also be concluded that, members of households who had no formal education were less likely to be aware of the economic benefits of producing and marketing Moringa. Furthermore, members of households who had access to information about the demand of Moringa were more likely to be aware of the economic benefits of producing and marketing Moringa. Majority of members of households in Thulamela Local Municipality had no access to Moringa Markets.

#### **5.4 Recommendations**

To effectively increase the production and marketing of Moringa in Thulamela Local Municipality, the study recommended that establishment of Moringa market, formation of Moringa cooperatives and promotional campaigns to educate members of households about the economic benefits of Moringa should be enhanced. Members of households who are aware of the economic benefits of Moringa should be encouraged through the provision of necessary inputs.

#### **5.5 Future research opportunities**

The finding that almost 4 out of every 10 households were living in a cohabiting relationship, it may become necessary to investigate the extent of household headship by female respondents towards the production and marketing of Moringa. A research could also be done on factors influencing less participation of youth in the production and marketing of Moringa in the study area.

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## Appendix A: Respondents' information sheet

### Title: Perceptions of members of households regarding the production and marketing of Moringa (*Moringa oleifera*) in Thulamela Local Municipality

Dear research participant, thank you for showing interest in this study. My name is Maila Matume Maxwell, a master's student at the University of Venda under the School of Agriculture, Department of Agricultural Economics. I am conducting research with the above title under the supervision of Prof. Anim F.D.K. As part of the requirements for my degree, I am required to complete a study.

The objectives of the study are:

- determine the socio-economic characteristics of members of households who produce Moringa in Thulamela Local Municipality.
- determine the perceptions of members of households regarding economic benefits of production and marketing of Moringa in Thulamela Local Municipality.
- determine factors that influence perceptions of members of households regarding economic benefits of production and marketing of Moringa in Thulamela Local Municipality.

Take note that participation in this study is voluntary. Participation will not cause any harm and your participation will be treated with confidentiality. The data that I will collect is for study purposes only and I give assurance that the data will only be used for research. No costs involved and no reward will be attained for participating.

For any inquiries, you may contact the researcher on the following line

Cell: 0724764055

E-mail: matumemaxmaila@gmail.com

Researcher signature.....

Date.....

## Appendix B: Respondent Consent form

### Title: Perceptions of members of households regarding the production and marketing of Moringa (*Moringa oleifera*) in Thulamela Local Municipality

The consent form is designed to check that you understand the purposes of the study, that you are aware of your rights as a participant and to confirm that you are willing to take part.

I (full names of respondent) ..... have read and understood the content of the information sheet. My understanding is that my participation in this study is voluntary, I may withdraw from the study at any time and information provided will be treated as confidential. I willingly consent to participate in this research study.

I confirm that quotations from the interview can be used in the final research report and other publications. I understand that these will be used anonymously and that no individual respondent will be identified in such report.

Respondent's signature.....

Date.....

## Appendix C: Research Questionnaire

### Title: Perceptions of members of households regarding the production and marketing of Moringa (*Moringa oleifera*) in Thulamela Local Municipality

Questionnaire no:

#### Instructions:

Mark one cross (X) in each question and specify where necessary. The main purpose of this questionnaire is to collect relevant data pertaining to the socio-economic characteristics and perceptions of members of households regarding the production and marketing of Moringa.

#### Section A: Socio-economic characteristics of respondent

1. Estimated age.....

1.1 Age group

1. 18-35 (Youth)	2. 36-45 (Young adult)	3. 46-60 (Adult)	4. Above 61

2. Gender

0.Female	1.Male

3. Marital status

1. Single	2. Married	3. Divorced	4. Widowed	5. Cohabit

4. Estimated years of education.....

4.1 Level of education

1.Primary level	2.Secondary level	3.Tertiary level	4.No formal education

5. How many children do you have in your household? .....

6. How many are you in your household? .....

7. Source of land ownership

1. Private	
2. Communal/PTO	
3. Other (Specify)	

8. Occupation

1. Employed	2. Unemployed	3. Fulltime on farm	4. Self-employed	5. Other

9. What is your estimated household income per month (in Rand)? .....

**Section B: Perceptions of members of households**

1. How would you say you are aware with the commercial benefits of cultivating Moringa?

1. Extremely aware	2. Moderately aware	3. Somewhat aware	4. Slightly aware	5. Not aware

2. What is the perceived benefit associated with the consumption of Moringa?

1. Very nutritious	
2. Prevent and heal many diseases	
3. End starvation	
4. Skin treatment	
5. Other (Specify)	

3. What is the perceived potential of cultivating Moringa?

1. Boost food security	
2. Income generation	
3. Create Jobs	
4. Foster rural development	
5. Other (Specify)	

4. How did you become aware of these benefits?

1. Mass media	2. Family & friends	3. Research institutes	4. Other (Specify)

5. Below are several statements regarding the benefits and potential of Moringa, please read each statement and indicate to what extent you agree or disagree with each statement.

Statement	1. Strongly disagree, 2. disagree, 3. Agree, 4. Strongly agree
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- I. The rising demand for Moringa products can help to achieve sustainable livelihoods.
- II. Moringa has the potential to improve nutrition, boost food security and foster rural development.
- III. Amongst other limiting resources, the production of Moringa is increasingly constrained by scarcity of land.
- IV. There is limited information regarding farmers' perceptions on production, utilisation, processing and commercial production of Moringa.
- V. Increasing the production of Moringa on any scale will require a significant financial investment.
- VI. Improving productivity of Moringa should always be associated with accessible market for the accumulation of profit.
- VII. Producers are finding it difficult to crack down the way to higher Moringa markets.
- VIII. A considerable proportion of people are still unaware of economic values and multipurpose nature of Moringa.
- IX. There will be a higher payoff for the productivity and marketing of Moringa if access to education and information dissemination are prioritized.
- X. The market and demand for Moringa products will eventually grow with continued awareness campaigns which emphasise the benefits derived from the consumption of Moringa.
- XI. Moringa value chain can help to strengthen competitive advantage and increase the accumulation of profit.
- XII. Advisory services can play a big role in assisting rural farmers harness the enormous opportunities in the production and usage of Moringa.

- XIII. Formation of Moringa cooperatives should be encouraged to enhance large-scale plantation of Moringa.
- XIV. The process of producing Moringa is very easy.
- XV. Consumers are willing to pay higher prices for processed Moringa products.

### Section C: Production of Moringa

1. Where are you producing Moringa?

1. Back of the yard	2. On farm	3. Back yard + farm

2. In how many hectares (ha) are you producing Moringa?

1. Less than 0.5ha	2. 1-2ha	3. 3-4ha	4. 5-6ha	5. More than 7ha

3. How many Moringa trees do you have in your farm/household?

1. less than 4	2. 5-10 trees	3. 11-15 trees	4. 16-20 trees	5. More than 21 trees

4. Are you only producing Moringa in your farm/household?

1. Yes		2. No	
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5. Do you incur any production cost?

1. Yes		2. No	
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If yes, what is your total estimated production cost?

1. Weekly		2. Monthly		3. Yearly	
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6. How much do you harvest per tree (Kg)? .....

7. How much do you earn per tree (Rands)? .....

8. What is the total estimated production of Moringa you produce in your household (Kg)?

1. Weekly		2. Monthly		3. Yearly	
-----------	--	------------	--	-----------	--

9. How long have you been cultivating Moringa?

1. less than a year	2. 2-3 years	3. 4-5 years	4. More than 6 years

10. What is your main purpose for cultivating Moringa?

1. For animal feed	
2. Food supplement	
3. Traditional medicine	
4. Other (Specify)	

11. Do you receive any information about the demand for Moringa products?

1. Yes		2. No	
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If yes, where do you receive the information from?

1. Other farmers	
2. Internet	
3. Family & friends	
4. Extension officers	
5. Other (Specify)	

12. Do extension officers visit you?

1. Yes		2. No	
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If yes, how often?

1. Weekly		2. Monthly		3. Yearly	
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13. Do you actively seek information regarding sustainability of Moringa production by, for instance, go to conferences, reading magazines or visiting websites?

1. Yes		2. No		3. Not often	
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14. Constraints affecting large-scale cultivation of Moringa.

Constraints	Yes	No
16.1. Access to land		
16.2. Access to inputs		
16.3. Access to reliable market		
16.4. Access to funds/credits		
16.5. Access to improved technologies		

15. Source of funds/credit

1. Loan from financial institutions	
2. Personal savings	
3. Family & friends	
4. Cooperatives	
5. Agricultural credit banks	
6. Informal sources/Money lenders	
7. Other (Specify)	

16. Which of the following strategies do you think can help to achieve the sustainable production of Moringa?

1. Substantial research funding	
2. Establish Moringa markets	
3. Information dissemination	
4. Promote agro-processing	
5. Encourage formation of cooperatives	

17. What are possible suggested solutions to improve the current state of Moringa production? .....

18. How likely is it that you will continue to produce Moringa in the upcoming years?

Not at all likely					Extremely likely				
1	2	3	4	5	6	7	8	9	10

## Section D: Marketing of Moringa

1. Do you sell your Moringa Products?

1. Yes		2. No	
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If **NO**, the following questions will not be applicable. Thank you!

2. What segment of market are you targeting?

1. Food industry	
2. General members of communities	
3. Livestock producers	
4. People with medical attention	
5. Agricultural markets	
6. Other (Specify)	

3. How do you reach them?

1. Social media	2. Door to Door	3. On farm/household	4. Other(Specify)

4. Distance from your farm/household to your customers/market.

1. Very far	2. Fairy far	3. Far	4. Close	5. Very close

5. How often do you sell your Moringa products?

1. Daily	2. Weekly	3. Monthly	4. Yearly

6. Which Moringa products do you sell?

1. Powder	2. Moringa capsules	3. Moringa tea	4. Moringa oil	5. Other(Specify)

7. How much do you sell Moringa products (Rand)?

1. Per 200g	2. Per 500g	3. Per kg

8. What is the value of Moringa powder do you sell in the market (Kg)?

1. Weekly		2. Monthly		3. Yearly	
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9. What is the level of demand for Moringa products?

1. Very high	2. High	3. Neutral	4. Low	5. Very low

10. Do you have access to price information?

1. Yes		2. No	
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If yes, where do you receive the information from?

1. Other farmers	
2. Internet	
3. Family & friends	
4. Extension officers	
5. Other (Specify)	

11. Who determines the price of your products?

1. Customers	2. Agric markets	3. Own price	4. Other(Specify)

12. How would you say you are satisfied with the available marketing opportunities for Moringa products?

1. Very satisfied	2. satisfied	3. not sure	4. Dissatisfied	5. Very Dissatisfied

13. How can access to market be improved? .....

***Thank you, your participation is highly appreciated.***

***Compiled by Maila Matume Maxwell from the University of Venda.***