

**PARTICIPATION AND UTILISATION OF FORMAL VEGETABLE MARKETS BY
SMALLHOLDER FARMERS IN LIMPOPO: A TOBIT II APPROACH**

By

KGABO HECTOR RAMOROKA

MINI-DISSERTATION

**Submitted in partial fulfilment of the
requirements for the degree of**

MASTER OF SCIENCE

in

AGRICULTURE

(AGRICULTURAL ECONOMICS)

in the

FACULTY OF SCIENCE AND AGRICULTURE

(School of Agriculture and Environmental Science)

at the

UNIVERSITY OF LIMPOPO

Supervisor: Dr. P Chaminuka (UL)

Co-supervisor: Ms M.P Senyolo (UL)

2012

DECLARATION

I declare that the mini-dissertation hereby submitted to the University of Limpopo, for the degree of Master of Science in Agriculture (Agricultural Economics) has not previously been submitted by me for the degree at this or any other university; that it is my own work in design and execution, and that all material contained herein has been duly acknowledged.

Surname, Initials (title)

Date

DEDICATION

I dedicate this dissertation to my late father (TATISHI JOHN RAMOROKA) who never saw me graduating my first degree and to my late brother (NARE EMMANUEL RAMOROKA). Both of whom passed away in 2009. "You will always be remembered".

ACKNOWLEDGEMENTS

Most vividly of all, I wish to acknowledge the protection, guidance and wisdom I received from Almighty God. Secondly, I would like to convey my sincere thanks and acknowledgements to a number of people who made important contributions through advice and encouragement during the course of the study. It would not have been possible without your input, time and support; I really appreciate your help.

I am grateful for the opportunity of working under the supervision of my insightful, knowledgeable supervisors. Let me start by passing my sincere thanks and gratitude to Dr P. Chaminuka, for her valuable suggestions, providing current information, supervision, time, words of advice, support and the incentive for doing this work not forgetting her constructive criticisms. I thank you more for your constant patience and devotion you showed throughout the course of this mini dissertation. May the same sense of hard working and support be given to you and many others to come. And sincere thanks to my co-supervisor Ms M.P. Senyolo, who had faith in me and believed I was capable of more than I could imagine. Thank you very much.

I would like to take this opportunity to acknowledge the Department of Agricultural Economics and Animal Production staff at the University of Limpopo for the support, guidance, and motivation given to me directly or indirectly. I wish to extend my appreciation to Prof. A. Belete, Mr J.J. Hlongwane, and Mrs C.L. Muchopa for their advices, motivational words and comments throughout, from the initial to the final stages of this project. I am truly grateful for the financial support in collecting data that the Department of Agricultural Economics and Animal Production have given to me.

To the Department of Agriculture and farmers, your contribution made it possible for me to do this work, it would have been impossible without your willingness to cooperate. For data collection, I would like to extend my gratitude to my friends who assisted me; Moremi, N.F. and M.A. Nkoana. I wish to acknowledge Mr M. RAMATHOKA (Statistician from LDA) for making it possible to access data and to connect with farmers and to Mrs S.R. MAKWARELA, I appreciate your guidance and support and thanks to my mentor Mr N.G.R. Khorommbi.

There are no words to express my profound gratitude to my family; my late father (TATISHI JOHN RAMOROKA), my mom (RAISIBE JOSEPHINA RAMOROKA), my brothers, my sisters, my nieces and nephews. I would like to thank you for standing by my side.

Finally, I further convey my sincere thanks and acknowledgements to the following individuals; Ledwaba, L.J., Badisa, K.T., Shuma, T.G., Manamela, P.P., Mosoane, P., Mphateng, M.A., and all my colleagues and former classmates for your company and support. It would be a mistake not to

acknowledge Ms L.P Molaba, she too played a major role in supporting me in the compilation of this paper.

GOD BLESS YOU ALL!!!!

*Ke tsotwane ya mohlala wa mahlodi,
Ke kgomo ya kata yabo ramaswa a dibe,
e be go ya šia makoba a bokgomokwana a bongwako,
ke nkoana ke thaka di raa makoba,
tau ya tšwella yare ke mokgotse wa gao,
phiri ya tšwella yare ke mokgotse wa gao,
a re nna ga ke ratane le diphiri ke mokgotse wa tau ya makobo,
re batho ba bohlantšha a bohlantšha a motekwane,
kwanetse a hlantšha bo mmasekou,
ke selema ka difeisi makgabeng,
ke kodu kodu e sepe bane dikgomo tša ntong dia tipywa,
di šetše di ralokela madišo, tšaga mpebe di šetše di ipheletše,
ka malofa a kwa maene tšhipi se lle kudu o tla tšhabiša malofa,
ke serobeneng o nametše leswika o swana le mosadi a e tšwa kgonyeng.*

ABSTRACT

Farmers in Polokwane Local Municipality produce many vegetables including beetroot, carrots, spinach, garlic, cabbage and butternut, which they mainly sell in informal local markets through speculating and hawking. Some sell to hawkers, who sell fresh produce from stalls in small markets and on the streets. Although there are a number of fresh produce markets operating successfully in Polokwane, such as Goseame Fresh Produce Market and Polokwane Fruit and Veg City, only a few smallholder farmers supply vegetables to these major markets. This research focused on providing information relevant to vegetable marketing in the province by identifying and analysing those farm and farmer characteristics influencing smallholder farmers' decision to participate and utilise formal vegetable markets.

The overall objective of the study was to examine farm and farmer characteristics of smallholder vegetable farmers that influence their decision to participate and utilise formal markets. The study was conducted in Polokwane Local Municipality and a sample size of 80 subsistence and emerging farmers was interviewed. STATA (2010) was used to analyse the data. Two approaches were used; the separated OLS and logit regression models and the Heckman selection model, although conclusions are based on the Heckman selection model regression results. We recommend the use of the Heckman selection model due to its limited bias compared to the other method.

Results show that two variables; level of education and farmer occupation were positively and significantly associated with smallholder farmers' decision to participate in the formal vegetable markets. Household size, tenure security and distance to the market had a significant negative influence on smallholder farmers' decision to participate in the formal markets. Level of education, farm labour, hectares used and cost of transport were significantly and positively associated with the value of vegetables marketed in the formal markets. Gender of household head, member of a farmer group, farming experience, access to non-farm income and access to extension services had a significant negative impact on the value of vegetables marketed in the formal markets.

In view of the research findings, several policy suggestions are made. These include capacitating farmers, provision of land for farming, establishment of depots and markets closer to the farmers, encouraging formation of farmer groups or organisations, increasing the number of extension visits to farmers, specialised services and encouraging commercialisation of smallholder agriculture in rural areas.

TABLE OF CONTENTS

Content	Page
DECLARATION.....	i
DEDICATION.....	ii
ACKNOWLEDGEMENTS.....	iii
ABSTRACT.....	v
LIST OF TABLES.....	x
LIST OF FIGURES.....	xi
LIST OF APPENDICES.....	xii
LIST OF ABBREVIATIONS.....	xiii

CHAPTER 1

INTRODUCTION

1.1 Introduction and background.....	1
1.2 Key concepts in the study.....	2
1.2.1 Emerging and subsistence farmers.....	2
1.2.2 Market participation and market access.....	2
1.2.3 Formal market and Informal market.....	3
1.3 Problem statement.....	3
1.4 Research questions.....	4
1.5 Research objectives.....	4
1.6 Hypotheses.....	5
1.7 Justification of the study.....	5
1.8 Outline of the study.....	5

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction.....	6
2.2 Smallholder farming sector in South Africa and its role in rural areas.....	6

2.3 Market participation and market access for smallholder farmers.....	7
2.4 Challenges faced by smallholder farmers in participating in the formal markets.....	9
2.5 The role of education, age, household size and gender in the agricultural sector.....	10
2.6 Summary.....	12

CHAPTER 3 RESEARCH METHODOLOGY

3.1 Introduction.....	13
3.2 Description of the study area.....	13
3.2.1 Topography.....	14
3.2.2 Climate.....	15
3.3 Data collection.....	15
3.4 Methods used in data analysis.....	15
3.4.1 Heckman selection model/ type II Tobit model.....	15
3.4.2 Estimation with Heckman's Two-Step Procedure.....	16
3.5 Model specification.....	17
3.5.1 Stage 1: Factors influencing farmers' decision to sell vegetables in the formal markets.....	17
3.5.2 Stage 2: Factors determining the value of vegetables sold in the formal markets.....	19
3.6 Analytical approaches to analyse market participation.....	20
3.7 Limitations of the study.....	21
3.8 Summary.....	22

CHAPTER 4 FARMER AND FARM CHARACTERISTICS OF SAMPLED SMALLHOLDER SUBSISTENCE AND EMERGING FARMERS

4.1 Introduction.....	23
4.2 Sample description.....	23
4.3 Demographic characteristics.....	24
4.4 Farm characteristics.....	28
4.5 Market factors.....	29
4.6 Value of vegetables marketed in the formal markets.....	30

4.7 Smallholder farmers' perceptions of market participation.....	31
4.8 Summary.....	32

CHAPTER 5

FACTORS DETERMINING PARTICIPATION AND UTILISATION OF FORMAL MARKETS BY SMALLHOLDER VEGETABLE FARMERS

5.1 Introduction.....	34
5.2 Results of empirical models.....	34
5.2.1 Logistic regression results.....	34
5.2.2 Ordinary least squares (OLS) results.....	36
5.2.3 Heckman selection model results.....	37
5.3 Factors influencing farmers' decision to participate in formal vegetable markets.....	40
5.3.1 Level of education of household head.....	40
5.3.2 Farmer occupation.....	40
5.3.3 Household size.....	41
5.3.4 Access to tenure security.....	41
5.3.5 Distance to the market.....	41
5.4 Factors determining the value of vegetables marketed in formal vegetable markets.....	41
5.4.1 Gender of household head.....	42
5.4.2 Level of education of household head.....	42
5.4.3 Member of a farmer group.....	42
5.4.4 Farming experience.....	43
5.4.5 Access to non farm income.....	43
5.4.6 Farm labour.....	43
5.4.7 Hectares used.....	43
5.4.8 Cost of transport.....	44
5.4.9 Access to extension service.....	44
5.5 Comparison of the analytical models used.....	44
5.6 Summary.....	45

CHAPTER 6

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction.....	46
6.2 Research summary.....	46
6.3 Conclusions.....	47
6.4 Policy implications and recommendations.....	48
6.5 Areas for further research.....	50
REFERENCES.....	51
APPENDICES.....	61

LIST OF TABLES

Table	Page
Table 3.1: Hypothesised influential factors of market participation.....	18
Table 3.2: Hypothesised influential factors of value of vegetables marketed.....	20
Table 4.1 Number of farmers participating in the market summarised.....	24
Table 4.2 Percentages of sampled farmers that planted a particular crop (2009/2010).....	24
Table 4.3 Level of education of household head.....	27
Table 4.4: Household size.....	27
Table 4.5: Farmers' main occupation.....	27
Table 4.6: Farm size.....	28
Table 4.7 State of the road to the market.....	29
Table 4.8: Value of vegetables marketed in the formal markets.....	30
Table 4.9: Smallholder farmers' suggestions on improving market participation.....	32
Table 5.1: Logistic regression estimates of market participation.....	35
Table 5.2 OLS regression estimates of value of vegetables marketed.....	37
Table 5.3 Summary of Heckman selection model estimates.....	39

LIST OF FIGURES

Figure	Page
Figure 3.1: Map of Polokwane Local Municipality.....	14
Figure 4.1: Gender of household head.....	25
Figure 4.2: Age of household head.....	26
Figure 4.3: Distribution of land ownership and tenure security.....	29
Figure 4.4: Membership in Farmer groups.....	30

LIST OF APPENDICES

Appendix	Page
Appendix 1: Questionnaire.....	61

LIST OF ABBREVIATIONS

APOL	Agro-Processors of Limpopo
DALA	Department of Agriculture and Land Affairs
DoA	Department of Agriculture
IDP	Integrated Development Plan
IFAD	International Fund for Agricultural Development
IITA	International Institute of Tropical Agriculture
KM ²	Kilometre squared
LDA	Limpopo Department of agriculture
MALA	Ministry of Agriculture and Land Affairs
NDA	National Department of Agriculture
NEPAD	New Partnership for Africa's Development
OLS	Ordinary Least Square
NAFU	National African Farmers Union
SSA	Sub-Saharan Africa

CHAPTER 1

INTRODUCTION

1.1 Introduction and background

The production of vegetables within the Limpopo Province contributes an average of about 22% to the gross income from agriculture and about 18% to the total gross income of vegetables in the country (NDA, 2002). Horticulture (especially vegetables) is an important source of income for the smallholder farmers (McCulloch and Ota, 2002). It has higher returns than most other cash crops and is suitable for production on the currently declining farm sizes in varying agro-ecological zones (Minot and Ngigi, 2003).

Market participation is both a cause and a consequence of economic development. Markets offer households the opportunity to specialize according to comparative advantage and thereby enjoy welfare gains from trade. Recognition of the potential of markets as engines of economic development and structural transformation gave rise to a market-led paradigm of agricultural development during the 1980s (Reardon and Timmer, 2006). Farmers in the neglected and less developed rural areas are generally poor. According to a discussion paper on food security (DALA, 1997; MALA, 1998), many households are vulnerable to food insecurity. Unemployment is high, and tends to rise as household members lose jobs in the urban centres. Despite the importance of agriculture, farmers in rural areas are not partly engaged in commercial agriculture. This is one of the reasons that the contribution of smallholder agriculture to the gross national product is still limited in South Africa. The majority of disadvantaged farmers are not part of mainstream agriculture and practise subsistence agriculture in over-crowded, semi-arid areas in the former homelands.

A major reason why even those rural farmers who can produce a surplus remain trapped in the poverty cycle is lack of access to profitable markets. All too often farmers are forced to sell to the buyer of convenience at whatever price that buyer dictates (IITA, 2001). A range of constraints and barriers limit smallholder participation in agricultural markets. As a result most of the smallholder products are wasted after harvesting or sold at a very low price. Farmers generally do not have the required information and means to locate better markets. In most cases reliable markets are located further away and are difficult to access. Only farmers with assets such as vehicles are able to move around in search of a better market (Makhura, 2001).

In their dealings with the market, smallholder farmers find themselves at a major disadvantage. Most of them do not understand the market well, how it works and why prices fluctuate; they have little or no information on market conditions and prices; they are not organised collectively; and they have no

experience of market negotiation (IITA, 2001; Heinemann, 2002). Smallholder farmers in Sub-Saharan Africa face a range of marketing and exchange problems, among which informational constraints are much cited but little researched. Producers experience a weak bargaining position vis-à-vis traders because often they do not have timely access to salient and accurate information on prices, locations of effective demand, preferred quality characteristics produce, nor on alternative marketing channels.

In Limpopo Province there are about 303 000 smallholder farmers (Statistics South Africa, 2004). The smallholder farms are located mostly in the former homeland areas and they cover approximately 30% of the provincial land surface area. The smallholder farming sector in Limpopo Province is characterised by low levels of technology and small sized farms of approximately 1.5 hectares per farmer with production primarily for subsistence and leaving less production for the market (LDA, 2008).

Polokwane has marketing outlets (e.g. Goseame Fresh Produce) offering market opportunities to farmers. In order to improve access to these markets for majority of smallholder farmers, the Limpopo Department of Agriculture established the directorate for Agribusiness and Agri-planning, which consists of value chain managers for the main commodity groups namely; grains, livestock, industrial crops, horticulture and fruits. A major challenge confronting value chain economists in the LDA is how to increase smallholder farmers' participation in high value markets (Baloyi, 2010).

1.2 Key concepts in the study

1.2.1 Emerging and subsistence farmers

Emerging farmers in South Africa emanate from the group of smallholder farmers, who were previously excluded from the mainstream of the economy. Chauke and Oni (2004) refer to the emerging farmers as black farmers or the previously disadvantaged. The National Department of Agriculture (NDA, 2006) defines the emerging farmer as a farmer who is a beneficiary of one of the government's land reform programmes, or a farmer who is mainly dependent on the state and semi-state organization for support and finance or as a farmer who consumes and sells some portion of the harvest. In South Africa, the majority of disadvantaged farmers are not part of mainstream agriculture and generally practice subsistence agriculture in the former homelands (Matungul, 2002; Kirsten *et al.*, 1998). Subsistence farming is often equated with a backward, non-productive, non-commercial agriculture that we find in parts of the former homeland areas. Literature defines subsistence farming as farming that supports the farmers' household and produces no surplus.

1.2.2 Market participation and market access

Many scholars have suggested various definitions for market participation. According to Key *et al.*, (2000), market participation refers to any market related activity that promotes the sale of produce.

Market participation can be referred to as commercialisation (Latt and Niewoudt, 1988). Goetz (1992) in his definition of market participation states that in an agricultural market economy, market participation or commercialisation occurs mainly when farmers stop being mostly subsistence farmers and become profit oriented. Killick *et al.*, (2000) define market access as a term which refers to the processes by which people access markets and the nature, efficiency and costs of these processes. Relevant literature often cites the following factors as determinants for smallholder market access: access to credit, availability of extension services, level of organisation, relevant training, and the farmers' socio-economic conditions (Kherallah *et al.*, 2000; Makhura and Mokoena, 2003).

1.2.3 Formal market and Informal markets

Formal market refers to reliable (i.e. contract arrangement) and lucrative (profitable) markets or the high value markets. A number of scholars (e.g. Makhura *et al.*, 1998 and Baloyi, 2010) list fresh produce markets, supermarkets and agro-processors as formal markets for farmer participation. Polokwane has marketing outlets such as Woolworths, Fresh Mark, Pick 'n Pay, Shoprite/Checkers, Fruit and Veg City, Spar and the Goseame Fresh Produce Market and agro-processors including Giant foods, Indemex and the Agro-Processors of Limpopo (APOL). Informal market refers to a market where there is no involvement of any formal arrangement (e.g. contract) for a sale of goods between a farmer and a buyer. DoA (2003) define informal marketing as selling on local market through speculating and hawking. Informal marketing involves selling to hawkers, selling from stalls in small markets and on the streets.

1.3 Problem statement

Participation in agricultural markets holds considerable potential for unlocking opportunities necessary for providing better incomes and sustainable livelihoods for smallholder farmers. Despite this, smallholder farmers find it difficult to make a transition to a more commercial food system (Bienabe *et al.*, 2004) and they are faced with a number of challenges in market participation. For most African smallholder farmers, markets are difficult to access due to a variety of factors (Makhura, 2001). A relatively small proportion of rural households sell staple food crops and for those who do sell, the quantity is often small (Barrett, 2008). The problem is not only about participating in the market, but it is also important to determine what influences the volume and value of products marketed.

Farmers in Polokwane Local Municipality produce vegetables including beetroot, carrots, spinach, garlic and butternut, and they mainly sell in informal local markets, through speculating and hawking. Some sell to hawkers, who sell fresh produce from stalls in small markets and on the streets. Although there are a number of fresh produce markets operating successfully in Polokwane, very few smallholder

farmers supply vegetables to these major markets such as Goseame Fresh Produce Market and Polokwane Fruit and Veg City. The major markets are dominated by white commercial farmers (Baloyi, 2010).

The Department of Agriculture is involved in attempts to improve smallholder participation in these markets but the success to date is limited (DoA, 2003). According to Baloyi (2010), a major challenge confronting LDA is how to increase access of smallholder farmers to high value markets. Household characteristics e.g. age, education level have been identified in the past as being important determinants of market participation together with other factors (Makhura, 2001). In Limpopo Province, there is however, limited information on the factors that determine farmer participation in the formal vegetable markets in the province, and the factors that determine the value of vegetables marketed in these markets. Existing studies are not specifically on vegetables. For example Makhura (2001) focused on different enterprises (horticultural crops, livestock, maize and other field crops) and there is a difference between market access for maize or livestock compared to vegetables. The study adds to the available information by specifically focusing on vegetables and giving more recent data to assist decision making.

1.4 Research questions

This study intends to answer the following questions:

- i. What are the socio-economic factors that distinguish farmers who participate in the formal markets from those who do not?
- ii. What are the socio-economic factors that influence the value of vegetables that a farmer brings to the market?

1.5 Research objectives

The overall objective of the study was to examine farm and farmer characteristics of smallholder vegetable farmers that influence their decision to participate and utilise formal markets. Specific objectives were the following:

- i. To identify socio-economic factors that influence smallholder farmers' decision to sell vegetables in the formal vegetable markets.
- ii. To identify socio-economic factors that determines the value of vegetables marketed by smallholder farmers in the formal vegetable markets.

1.6 Hypotheses

The main hypothesis of the study was that farm characteristics (e.g. farm size, distance to the market) and farmer characteristics (e.g. gender, age of the farmer) influence smallholder vegetable farmers' decision to participate and utilise formal markets. Specific hypotheses to be tested are:

- i. There are no socio-economic factors that influence smallholder farmers' decision to sell vegetables in the formal vegetable markets.
- ii. There are no socio-economic factors that determine the value of vegetables marketed by smallholder farmers in the formal vegetable markets.

1.7 Justification of the study

Participation of smallholder farmers in markets makes a substantial contribution to rural income growth and creates income diversification. Literature related to smallholder market participation show that smallholder farmers are faced with a number of challenges in market participation (Bienabe *et al.*, 2004 and Makhura, 2001), and little has been researched on the role of socio-economic factors in smallholder farmers' decision to participate and utilise formal markets. This study, therefore, will be important as little is understood about the role of socio-economic characteristics on smallholder farmers' decision to participate and utilise formal vegetable markets. An understanding of socio-economic factors that affect smallholder market participation will also provide basis for policy makers in developing appropriate policies which will ensure improved participation and utilisation of formal markets by smallholder vegetables as well as increasing agricultural production which may result in food self-sufficiency.

1.8 Outline of the study

The study is organised as follows. Chapter one has given the background on the subject and justification of the study. An outline of the problem statement, research hypothesis, research questions and research objectives guiding this study is presented. The second chapter discusses the literature review of smallholder market participation. In the third chapter, the methodology is presented. The study area is described and data collection procedures, methods used in data analysis and the variables considered are explained. Justification for the selection of the research approach is also given. Chapter four presents the descriptive analysis of key variables and the sample, and chapter five gives the model results. In Chapter 6, the findings are summarised and major conclusions and policy implications are presented.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This study is about market participation behaviour of smallholder and resource poor vegetable farmers in Polokwane Local Municipality. The study endeavours to examine the role of socio-economic factors (in this study also regarded as farm and farmer characteristics) in smallholder farmers' decision to participate in the formal markets and utilise them. Findings from standard market participation studies understate the role of socio-economic characteristics on smallholder farmers' decision to participate and utilise formal agricultural markets. Several studies focused on the constraints facing smallholder farmers in market participation (e.g. Delgado, 1998) and also on the role of transaction costs in market participation by smallholder farmers (e.g. Makhura, 2001). The objective of this chapter is to review relevant literature on market participation and market access of smallholder farmers with a view of identifying and analysing the most important factors that affect farmers' decision to sell/market their crops and the level of participation in the market, especially formal markets.

2.2 Smallholder farming sector in South Africa and its role in rural areas

The National Department of Agriculture (NDA, 2005) suggests that production systems of smallholder farmers are of simple, outdated technologies, low returns, high seasonal labour fluctuations and women playing a vital role in production. In addition, Dixon *et al.*, (2005) suggests that most smallholders have diverse sources of livelihood including significant off-farm income yet are still vulnerable to economic and climatic shocks. Smallholder farmers differ in individual characteristics, farm sizes, resource distribution between food and cash crops, livestock and off-farm activities, their use of external inputs and hired labour, the proportion of food crops sold and household expenditure patterns. It is important to note that with all these differences, smallholder farmers do contribute to the economy in different forms. The role of smallholder agriculture makes it significant to be either ignored or treated as just another small adjusting sector of the market economy (Delgado, 1998).

The Millennium Project Hunger Task Force (2004) asserts that smallholder agriculture is the main source of food for the rural population as well as an income generating occupation because it is the main activity for many rural parts in developing countries. This implies that smallholder agricultural productivity is very crucial in alleviating poverty and hunger.

The smallholder farm sector of South Africa is characterised by rudimentary production technology (LDA, 2008). Kalibwani (2005) argues that smallholder farmers in Southern Africa mainly use traditional

production techniques and productivity levels are often low. Given this condition, a narrow production base often characterise smallholder farming (Kalibwani, 2005). The rudimentary technology status can be explained by the fact that the sector is also labour intensive with minimal usage of machinery (MALA, 1998 and Cousins, 2005). Production in smallholder farming is mainly for subsistence purposes and to a lesser extent marketable surplus (LDA, 2008). Cousins (2005) also confirm this characteristic by asserting that output from smallholder farming for some rural households constitutes a greater proportion of their total livelihoods.

Despite the fact that smallholder farmers face difficulties in marketing, they continue to produce and survive in the face of unfavourable conditions. It is worth noting that smallholder farmers fulfil numerous functions in the agricultural economy. These functions make the sector important. Moreover, smallholder farming has the potential to contribute towards income and employment generation to the rural poor. This potential to create employment in rural areas, generate income, and contribute to food security has been recognised by the South African government and reflected in the Agricultural Policy (MALA, 1998).

According to Haggblade *et al.*, (1990), in areas where small farmers are efficient and successful, other non-farm economic activities usually emanate as a result. Generally, the growth of the small farms allows for the growth of business activities through forward and backward linkages. In support, Van Rooyen *et al.*, (1995) pointed out that gains in output resulting from investments in any given sector of the economy stimulate demand for production inputs from other sectors (backward linkages). The initial output gains also raise incomes and consequently spur consumer demand for other goods and services (forward linkages). Thus, successful smallholders create a demand for non-farm sector goods. In sectors where excess capacity exists, these increases in demand translate into higher output and consequently higher incomes.

2.3 Market participation and market access for smallholder farmers

According to the IFAD (2003), the issue of market access can be considered according to three dimensions: physical access to markets (distances, costs etc.); structure of the markets (asymmetry of relations between farmers, market intermediaries and consumers); and producers' lack of skills, information and organisation (understanding of the market, prices, bargaining etc). Mayson (2003) states that smallholder farmers producing surpluses often do not have access to markets at whatever scale they are producing. The extent to which market access for smallholder farmers has improved with market liberalisation varies across crops and countries (Dorward *et al.*, 1998). Although new opportunities might have emerged for some farmers, formal markets are difficult to access because of

the challenges that smallholder farmers face (Boughton *et al.*, 2006). Even in more accessible areas, smallholder farmers require more assurance that they will be able to sell what is produced and obtain a reasonable price (Dorward and Kydd, 2003). Literature indicates that smallholder farmers face a range of barriers that hamper improved market access and market participation (Boughton *et al.*, 2006; Haggblade *et al.*, 2004; Maltoglou and Tanyeri-Abur, 2005; Macheche, 2004; Makhura *et al.*, 2001).

In general, farmers engaged in small-scale agriculture have limited access to factors of production, credit and information, and markets are often constrained by inadequate property rights and transaction costs (Lyne, 1996). According to Morrison *et al.*, (2000), transaction costs are the costs associated with the transaction that are necessary for transformation to take place. In addition, most of the literature related to smallholder agricultural marketing e.g. Dorward *et al.*, (1998); Freeman and Silim (2001); IFAD (2003); Jayne *et al.*, (2002), Kherallah and Kirsten, (2002); Killick *et al.*, (2000) reiterates that the problem of market access is linked to the following constraints: price risk and uncertainty, difficulties of contract enforcement, insufficient numbers of middlemen, cost of putting small dispersed quantities of produce together, inability to meet standards. Other problems relate to physical market access like physical infrastructure; roads, market facilities, power and electricity. In rural areas, for example smallholders are often geographically dispersed, roads and communications are poor and the volumes of business are insufficient to encourage private sector service provision. Rural people are also the most difficult group for potential buyers to reach.

The need for promoting smallholder market participation has been increasingly recognised in efforts to bring about agricultural transformation in developing countries (Von Braun and Kennedy, 1994). However, subsistence agricultural producers, especially in Sub-Saharan Africa (SSA), face several barriers that make it difficult for them to gain access to markets and productive assets.

Makhura (1994) determined factors affecting commercialisation of small-scale farmers in the former Kangwane area of Mpumalanga in South Africa. The study suggested that access to agricultural information, the use of formal marketing channels and information management were distinguishing factors and significant for determining level of farmers' participation. Makhura's (2001) study on overcoming transaction cost barriers to market participation among smallholder farmers in the Northern Province of South Africa showed that decreased market participation is due to high transaction costs. A study conducted in Mexico, investigated smallholder market participation in maize markets (Key *et al.*, 2000). According to Key *et al.*, (2000), selling to formal markets tended to significantly increase production and selling for smallholder farmers. Ownership of certain assets, such as vehicles, assisted farmers to reach potential buyers. This implies that ownership of assets tends to reduce entry barriers

into markets because farmers are able to reach potential buyers using their own resources. Despite many problems faced by smallholder farmers, Matungul *et al.*, (2001) found that smallholder farmers in some rural areas of KwaZulu-Natal have managed to produce sufficient for their own consumption and sell their surplus to informal markets.

2.4 Challenges faced by smallholder farmers in participating in the formal markets

Subsistence and emerging farmers face difficulties in participation in formal markets, and as a result, markets do not serve their interests. Effective market participation is further challenged by a lack of innovative institutions to support farmers (Hazell, 2005; NEPAD, 2002). According to Jari (2009), in South African's less developed rural areas, smallholder and emerging farmers find it difficult to participate in commercial markets due to a range of technical and institutional constraints. Factors such as poor infrastructure, lack of market transport, dearth of market information, insufficient expertise on, and use of grades and standards, inability to conclude contractual agreements and poor organisational support have led to inefficient use of markets, hence, results in commercialisation bottlenecks. Furthermore, smallholder farmers lack vertical linkages in the marketing channels, which result in their exclusion from the use of formal markets (Fenwick and Lyne, 1999; Makhura, 2001; Delgado, 1999). Smallholder farmers have weak financial and social capital and limited access to legal resource, implying that it is difficult to change these negative market factors individually (Fenwick and Lyne, 1999). As a result, they are trapped and continue to operate within the given market constraints and they do not receive rewarding incomes from their agricultural activities.

There are various constraints that impede the growth of smallholder farmers. Some of the systems constraints are lack of access to land, poor physical and institutional infrastructure. Most smallholder farmers are located in the rural areas, particularly in the former homelands where both physical and institutional infrastructure limits their expansion. Lack of access to proper roads, for example, limits the ability of a farmer to transport inputs, produce and also access information. Delgado (1999) suggests infrastructure is typically poor, markets for agricultural inputs and outputs are often missing and unreliable for smallholder farmers. This means that the acquisition of agricultural resources becomes difficult and the supply of market services also becomes limited. Lack of assets, information and access to services hinders smallholder participation in potentially lucrative markets. On the other hand, it should be accepted that, there are risks attached to market participation which means that the markets provide both opportunities and pressures for smallholders.

Transactions costs related factors are the main impediments and determinants of market participation. They have been used as definitional characteristics of smallholder farmers and as the main factor

responsible for market failure in developing countries. However, they pose challenges relating to measurements (Alene *et al.*, 2008; De Janvry *et al.*, 1991). Sufficiently high transactions costs prevent smallholder farmers from market participation and as the result these costs are not observed. Even if exchange takes place, these costs cannot be easily recorded in a survey (Alene *et al.*, 2008). High transaction costs are one of the major factors constraining growth of smallholder agriculture in African countries and this is largely attributed to poor infrastructure. Kirsten *et al.*, (Undated) give an example of poor infrastructure as a poor network and conditions of roads influencing the farmers' strategies and practices. A poor road network and unreliable distribution will force farmers to grow their own food and less of perishable commodities causing a lower productivity of resources employed. Increased costs of transportation will also affect inputs used and the market strategies followed by the farmers. This means that, provision of good infrastructure is a requirement for achieving higher levels of agricultural productivity and profitability.

In order to participate in markets, smallholder farmers must determine who to deal with, what the terms of trading are, negotiate bargains, draw up contracts and undertake the inspections needed to make sure that the terms of the contract are being observed (Makhura, 2001). This process is often very costly and farmers may not realise or account for these costs (Maltsoglou and Tanyeri-Abur, 2005). Transaction costs tend to reduce the net benefits of exchange resulting in low, or no market participation by smallholder farmers (Matungul, 2002).

To overcome these problems, farming communities have formed cooperatives, collective marketing associations, and other mutual alliances to increase their buying and selling power in the market place. Larger commercial players have also been active, forming mutually beneficial alliances with farmers supplying marketable products at agreed prices. Clearly, it is only by such means that most developing country farmers can move from a poverty cycle to an income cycle, and begin to make a real contribution to overall economic development (IITA, 2001). Other options explored in literature include warehouse receipt systems e.g. Coulter and Onumah (2001), contract farming e.g. Kirsten and Sartorius (2002), rural assembling point system Freeman and Silim (2001). Other firms embark on a process specifically termed: vertical integration, where they would be involved at all stages of a product processing.

2.5 The role of education, age, household size and gender in agricultural sector

Education plays a crucial role in the agricultural industry wherein competition is high between the previously disadvantaged and previously advantaged farmers in the commercial markets. The high level of education amongst the farmers may assist them to understand and interpret market information

correctly; have ability to network and communicate their business ideas; to have better general farm management principles and marketing skills; and develop financial intelligence (Moloi, 2008). According to Montshwe *et al.*, (2005), the training received by small scale farmers was found to have improved the possibility of the farmers to sell livestock which in turn created income for them.

The age of the head of the household is considered a crucial factor, since it determines whether the household benefits from the experience of an older person, or has to base its decisions on the risk-taking attitude of a younger farmer (Makhura, 2001). Another attribute of importance relates to the level of education attained by the heads of the households who normally are the decision-makers. In most instances, due to the past dispensation most of the older household's heads did not have access to education whereas the younger ones had. As a result, most of the younger household's heads are most likely to migrate to urban areas in search for urban employment (Ngqangweni and Delgado, 2003). According to Magxinga *et al.*, (2005), as a farmer's age increases, it becomes more difficult to respond to opportunities, including accessing the local market. Age can, to a large extent, also affect the response to modern innovations in farming practices. In a study that investigated the decisions to keep livestock in Limpopo by Ngqangweni and Delgado (2003), it was found that the older households are the ones that are likely to invest in livestock, although it seems unsustainable if agriculture is to be important livelihood source. However, in a study that included all the farm enterprises by Makhura, in 2001, the older farmers were found to be more likely to participate in horticultural market, but tended to sell significantly less as compared to younger farmers (Makhura, 2001).

In the same study Makhura (2001), found that the household size negatively affected the chance of participating in the markets for horticulture and livestock. In addition to that, household size had a negative impact on the value of sales. In a study investigating the effects of market orientation on income and food security of small scale farmers by Mathonzi (2000), the size of the household size was found to have a negative impact on farm income. A large household size which is actively involved in farming is useful to provide farm labour, but if the household size is big and most members are just dependants it brings a negative impact on farm income.

The South African government is currently promoting and advocating the participation and involvement of women in all economic spheres, including agriculture. Land is an important resource in agriculture and the disparities in land ownership have a greater impact on income generation. Argawal (1994 and 1997) argued forcefully that women's ownership of land leads to improvements in women's welfare, productivity, equality, and empowerment. A study by Deere *et al.*, (2005) explored whether or not female land rights led to higher rural household income in Paraguay and Peru. In Peru, they found that

lack of female land rights were negatively associated with farm income. The study by Deere *et al.*, (2005) has shown that there is an existing relationship among land ownership, gender and farm income. In a study by Makhura (2001) female households were positively related with livestock sales and female farmers generally participate in livestock markets more than male farmers do.

2.6 Summary

Participation in the formal markets offers households the opportunity to enjoy gains from the main stream economy and develop as business entities. Participation in the formal markets is, however, limited by a number of factors. This research seeks to identify and analyse those farm characteristics (e.g. farm size, distance to the market) and farmer characteristics (e.g. gender, age of the farmer) influencing smallholder farmers' decision to participate and utilise formal vegetable markets.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter reviews the research methods used in collecting and analysing variables that were considered to be influencing smallholder farmers' decision to participate in the formal market and those considered to determine the value of vegetables marketed in the formal markets by smallholder farmers in Polokwane Local Municipality. The chapter is intended to show how the study was conducted using research tools. It starts by explaining the study area, data collection and data analysis. The chapter goes on to describe the data collection methods. The analytical framework follows, outlining descriptive statistics and the model for data processing, giving reasons why the model has been chosen. Polokwane Local Municipality boundary map is also shown.

3.2 Description of the study area

Polokwane Local Municipality is located within the Capricorn District in the Limpopo Province. It covers a surface area of 3775 km² and accounts for 3% of the Province's total surface area of ±124 000 km². In terms of its physical composition Polokwane Municipality is 23% urbanised and 71% still rural (Polokwane IDP document, 2010). The remaining area (6%) comprises small holdings and institutional, industrial and recreational land. The municipal spatial pattern reflects that of the historic apartheid city model, characterized by segregated settlements (see figure 3.1). At the centre of the area is the Polokwane economic hub, which comprises the central business district, industrial area, and a range of social services and well-established formal urban areas servicing the more affluent residents of Polokwane (Polokwane IDP document, 2010).

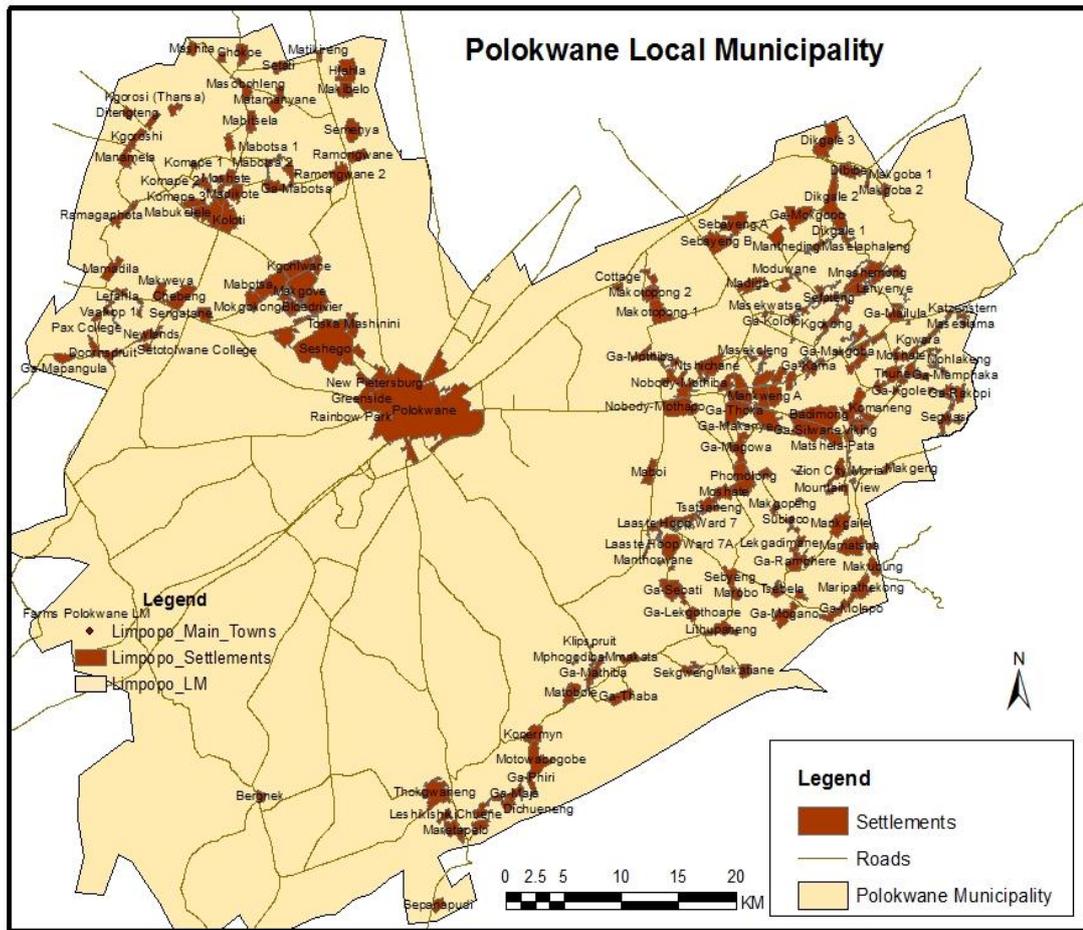


Figure 3.1: Map of Polokwane Local Municipality

Source: LDA (2011)

3.2.1 Topography

The Municipal area is divided into two rough topographical units, namely ‘Moderately Undulating Plains’ (mainly the eastern half of the municipal area) and ‘Strongly Undulating Plains’ in the west. The Polokwane Municipal area is situated on the so-called ‘Pietersburg Plateau’, which is bordered in the south by the Strydpoort Mountains, in the west and north by the Waterberg Mountains and in the east by the Great Escarpment. The highest part of the Plateau lies in the south near the Strydpoort Mountains, which forms the watershed between the Olifants and Sand River systems. There are a number of ridges, which form constraints on development, due to their visual exposure, potential as recreation or educational sites, former importance as sacred sites (likelihood of heritage sites) and likelihood of supporting sensitive plant communities (Polokwane IDP document, 2010).

3.2.2 Climate

Polokwane Municipality lies in the summer rainfall region and has a warm climate. Frost is rare. The highest temperatures occur during December and January. The daily average high is 28.1 degrees Celsius in January and the highest recorded temperature is 36.8 degrees Celsius. The average minimum winter temperature is 4.4 degrees Celsius in July with a record low of -3.5 degrees Celsius in 1964. The mean annual daily variation is 15 degrees Celsius. The mean annual precipitation for the region is 478 mm. Most precipitation falls between October and March with the peak period being December/January. Rainfall between the months of May and September is generally low with the average precipitation rate for the period June to August being 4,6 mm. Large-scale surface airflow over the region is dominated throughout the year by easterly and north-easterly winds. October and November are typically windy with wind speeds up to 13.8m/s. The frequency of southerly winds increases during June and July (Polokwane IDP document, 2010).

3.3 Data collection

This study used a combination of primary and secondary data. Secondary data was collected in 2009 by Limpopo Department of Agriculture (LDA) in Polokwane Local Municipality from the settlements surrounding the Polokwane city, by interviewing farmers using a structured questionnaire. The questionnaire covered farm and farmer characteristics e.g. age of farmers. A supplementary questionnaire was developed to collect additional information that was required for analysis from the 80 farmers who were randomly selected from the Limpopo Department of Agriculture data base. According to Babbie, (1973), although simple random sampling is laborious and not usually the most convenient sampling method, it was the most convenient method because every element or number of the population had equal chances of being selected. A supplementary questionnaire consisting of both open ended and closed ended questions was used to collect primary data. The questionnaire was administered to farmers through face-to-face and telephonic interviews.

3.4 Methods used in data analysis

STATA (2010) was used to analyze data. STATA is the basic statistical and econometric computer package. Descriptive statistics including means, frequencies, and standard deviations were also calculated.

3.4.1 Heckman selection model/ type II Tobit model

This model is known as the Heckman selection model, or the type II Tobit model (Amemiya, 1985), or the Probit selection model. Tobit model was designed to deal with estimation bias associated with censoring, the Heckit model (Heckman,1979) is a response to sample selection bias, which arises

when interest centres on the relationship between x and y but data are available only for cases in which another variable, z^* , exceeds a certain value. Using standard notation and denoting the determinant factors by the vector W , the selection stage can be written as:

$$z_i^* = \gamma' w_i + \eta_i \quad (1)$$

$$y_i^* = \beta' x_i + \varepsilon_i \quad (2)$$

where w_i is a vector of characteristics and η_i is unobserved.

but only observe y such that

$$z_i = 1 \text{ if } z_i^* > 0 \quad z_i = 0 \text{ if } z_i^* \leq 0$$

The first equation (the decision equation z_i^*) explains whether an observation is in the sample or not.

The second equation (the regression equation y_i^*) determines the value of y_i . The sample selection model is often estimated in a two-step way. The two-step procedure is due to Heckman (1979) and is based on the following regression:

$$y_i = x'_{1i} \beta_1 + \sigma_{12} \lambda_i + \eta_i \quad (3)$$

where $\lambda = \sigma_{12} \{ \Phi(x'_{1i} \beta_1) / \Phi(x'_{1i} \beta_1) \}$

the error term in this model $\eta_i = \varepsilon_{1i} - E\{\varepsilon_{1i} | x_{1i}, y_i = 1\}$

ε_{1i} is independent of x_i , η_i is uncorrelated with x_i and λ_i by construction. This means that we could estimate β_1 and σ_{12} by running a least squares regression of y_i upon the original regressors x_i and the additional variable λ_i . The model can be written as:

$$\begin{aligned} E\{y_{2i} | y_{1i} = 1\} &= x'_{2i} \beta_2 + E\{\varepsilon_{2i} | y_{1i} = 1\} \\ &= x'_{2i} \beta_2 + E\{\varepsilon_{2i} | \varepsilon_{1i} > -x'_{1i} \beta_1\} \\ &= x'_{2i} \beta_2 + \sigma_{12} / \sigma_1^2 E\{\varepsilon_{2i} | \varepsilon_{1i} > -x'_{1i} \beta_1\} \\ &= x'_{2i} \beta_2 + \sigma_{12} \{ \Phi(x'_{1i} \beta_1) / \Phi(x'_{1i} \beta_1) \} \end{aligned} \quad (4)$$

Using $E\{\varepsilon_2 | \varepsilon_1\} = (\sigma_{12} / \sigma_1^2) \cdot \varepsilon_1$ and setting $\sigma_1^2 = 1$

$\Phi(x'_{1i} \beta_1) / \Phi(x'_{1i} \beta_1)$ is known as inverse Mill's ratio or Heckman's lambda.

3.4.2 Estimation with Heckman's Two-Step Procedure

Heckman proposed a two-step procedure which only involves the estimation of a standard probit and a linear regression model. The two step procedure draws on the conditional mean

$$E(y_i | x_i, z_i) = x_i' \beta + \rho \sigma_\varepsilon \{ \varphi(z_i' \gamma) / \Phi(z_i' \gamma) \} = x_i' \beta + \rho \sigma_\varepsilon \lambda(z_i' \gamma)$$

of the fully observed y 's. Step 1 is the consistent estimation of γ by ML using the full set of observations in the standard probit/logit model.

$$z_i^* = \gamma' w_i + \eta_i$$

$$z_i = 1 \text{ if } z_i^* > 0 \quad z_i = 0 \text{ if } z_i^* \leq 0$$

We can use this to consistently estimate the inverse Mills ratio $\hat{\lambda}_i = \{\varphi(z_i' \gamma) / \Phi(z_i' \gamma)\}$ for all observations.

Step 2 is the estimation of the regression equation with the inverse Mills ratio as an additional variable

$$y_i = x_i' \beta + \beta_\lambda \lambda_i + \eta_i$$

for the subsample of full observations. The OLS regression yields $\hat{\beta}$, $\hat{\beta}_\lambda$, $\hat{\sigma}_\varepsilon$ and thus the correlation $\hat{\rho} = \hat{\beta}_\lambda / \hat{\sigma}_\varepsilon$. Heckman's two step estimator is consistent but not efficient. Furthermore, the covariance matrix of the second-step estimator provided by standard OLS is incorrect as one regressor (the Mills ratio) is measured with error and the error term η_i is heteroskedastic. Therefore the standard errors need to be corrected (Greene, 2003). The parameters β and β_λ are theoretically identified by the non-linearity of the inverse Mills ratio $\lambda(\cdot)$.

3.5 Model specification

The data set is such that some farmers sell vegetables in the formal markets and some do not. Some explanatory variables affect both the decision of a farmer to sell vegetables in the formal markets and the value of vegetables sold in the formal markets, once the farmer has decided to sell vegetables in the formal markets, therefore this study involves two stages. First stage, the farmer must decide to sell vegetables in the formal markets or not and the second stage is conditional to a farmer's decision having decided to participate in the formal markets. Farmers decide to sell vegetables in the formal market and other farmers decide not to sell vegetables in the formal markets, and their decisions are affected by different socio-economic factors. Since some farmers sell vegetables in the formal markets and others do not, there is a need for a binary choice model taking the limits 1 and 0. According to Hosmer and Lemeshow (2000), a typical method used to solve such dichotomous variables is the logistic regression. Ordinary least square (OLS) regression was used in stage two to explain factors that determine the value of vegetables sold by smallholder farmers in the formal markets. Heckman selection model (type II Tobit model) was applied on the same variables to identify factors that influence farmers' decision to sell vegetables in the formal markets (selection) and factors determining the value of vegetables sold in the formal markets (outcome).

3.5.1 Stage 1: Factors influencing farmers' decision to sell vegetables in the formal markets

Logit regression analysis model describe the choice between two discrete alternatives. Market participation is a qualitative dependant variable and takes the values 0 and 1. And it is explained as: 1 if a farmer participate in the formal market, 0 if a farmer is not participating in a formal market (See Table 3.1). Logistic regression estimates the probability of participating in the formal market. The relationship between the probability of $Y = 1$ and the explanatory variables are determined through the logit function

and that is the natural logarithm of odds of $Y = 1$. The logistic regression model is based on the probability that Y equals to one ($P = P1$). The value of Y is assumed to depend on the value of X_1, \dots, X_k .

Table 3.1: Hypothesised influential factors of market participation

Variable name	Description	Unit	Expected sign
Dependant variable			
MKTPN	1 if a household participate in the formal market, 0 otherwise	Dummy	
Independent variables			
GENDHH	1 if household head is female, 0 otherwise	Dummy	-
AGEHH	Age of household head	Years	+
HHLVED	1 if a household head passed grade 12, 0 otherwise	Dummy	+
HHLDSZ	Household size	Number	-
LNDOWP	1 if household head is the owner of land, 0 otherwise	Dummy	+
FMSZ	Hectares of land owned	Hectare	+
FOCP	1 if farming is main occupation household head, 0 otherwise	Dummy	+
FMRGRP	1 if member of a farmer group, 0 otherwise	Dummy	+
FMEX	Number of years farming on that land	Years	+
NONFARM	1 if household head have access to non-farm income, 0 otherwise	Dummy	+
TENRSR	1 if household head have tenure security, 0 otherwise	Dummy	+
LABR	Number of workers employed on the farm	Number	+
TRNEQP	1 if household head own a vehicle, 0 otherwise	Dummy	+
STATRD	1 if state of road good, 0 otherwise	Dummy	-
DSTMKT	1 if the distance is over 15km, 0 otherwise	Dummy	-

The logit model representing the relationship of Y and X is given by:

General model:

$$\text{Log} [p/(1-p)] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k$$

Where: P= Predicted probability that Y is equals to one

β_0, \dots, β_k = Estimated parameters

X_1, \dots, X_k = Independent variables

$$\text{MKTPN} = \beta_0 + \beta_1 \text{GENDHH} + \beta_2 \text{AGEHH} + \beta_3 \text{HHLVED} + \beta_4 \text{HHLDSZ} + \beta_5 \text{LNDOWP} + \beta_6 \text{FMSZ} + \beta_7 \text{FOCP} \\ + \beta_8 \text{FMRGRP} + \beta_9 \text{FMEX} + \beta_{10} \text{NONFARM} + \beta_{11} \text{TENRSR} + \beta_{12} \text{LABR} + \beta_{13} \text{TRNEQP} + \beta_{14} \text{STATRD} + \\ \beta_{15} \text{DSTMKT} + U_i$$

3.5.2 Stage 2: Factors determining the value of vegetables sold in the formal markets

In stage two Ordinary Least Squares regression was used to estimate factors influencing the value of vegetables marketed in the formal markets by smallholder farmers. This stage looks at the conditional expected value of produce (vegetables) marketed, given that farmers are selling in the market, thus in this stage not all observations are used. Value of vegetables marketed is a continuous dependant variable and OLS allow us to estimate the relationship between the dependant variable (value of vegetables marketed) and explanatory variables e.g. Highest level of education (See Table 3.2).

General model

$$r = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_n X_n + U$$

Where: r is dependant variable

X_1, \dots, X_n are explanatory variables

β_0, \dots, β_n are the parameters

U... is the disturbance term

$$\text{VALVSOLD} = \beta_0 + \beta_1 \text{GENDHH} + \beta_2 \text{AGEHH} + \beta_3 \text{HHLVED} + \beta_4 \text{HHLDSZ} + \beta_5 \text{FMRGRP} + \beta_6 \text{FMEX} + \\ \beta_7 \text{NONFARM} + \beta_8 \text{LABR} + \beta_9 \text{TRNEQP} + \beta_{10} \text{HAUSED} + \beta_{11} \text{CSTTRN} + \beta_{12} \text{EXTSERV} + \beta_{13} \text{FAMACTV} + \\ \beta_{14} \text{AVGDST} + U_i$$

Table 3.2: Hypothesised influential factors of value of vegetables marketed

Variable name	Description	Unit	Expected sign
Dependant variable			
VALVSOLD	Value of the vegetables sold	Rand	
Independent variables			
AGEHH	Age of household head	Years	+
GENDHH	1 if household head is female, 0 otherwise	Dummy	-
HHLVED	1 if a household head passed grade 12, 0 otherwise	Dummy	+
HHLDSZ	Household size	Number	-
HAUSED	Area of land planted	Hectare	+
FMRGRP	1 if member of a farmer group, 0 otherwise	Dummy	+
NONFARM	1 if household head have access to non-farm income, 0 otherwise	Dummy	+/-
LABR	Number of workers employed on the farm	Number	+
FAMACVT	1 if grow vegetables only, 0 otherwise	Dummy	+
EXTSERV	1 if household have access to extension service, 0 otherwise	Dummy	+
FMEX	Number of years farming	Years	+
AVGDST	Average distance travelled to the market	Km	+/-
COSTTRN	Cost of transport to the market	Rand	-
TRNEQP	1 if household head own a vehicle, 0 otherwise	Dummy	+/-

3.6 Analytical approaches to analyse market participation

Several studies used Heckman selection models. Bellemare and Barrett (2006) investigated pastoralists' market participation in livestock markets in Ethiopia and Kenya by applying an ordered tobit model to assess whether market participation and volume decisions are made simultaneously or sequentially. Goetz (1992) studied the participation of Senegalese agricultural households in grain markets using a probit model of households' discrete decision to participate in the market followed by a

second stage switching regression model of the market transaction volume. Makhura *et al.*, (2001), followed the same approach to investigate smallholder farmers' participation in maize markets in the Northern Province in South Africa. Key *et al.*, (2000) developed a structural model to estimate structural supply functions and production thresholds for Mexican farmers' participation in the maize market based on a censoring model with unobserved censoring threshold. Alene *et al.*, (2008) used a sample selection model of maize marketed supply in Kenya by first estimating a probit model of maize market participation and a second stage regression model to explain maize supply among maize selling households.

The Heckman selection model (type II Tobit model) is useful to avoid biased estimates from using ordinary least squares (OLS) and is more efficient. However, it does distinguish between the separate decisions to participate in the formal markets or not, and if so, how much to sell in the formal markets. It overcomes this potential shortcoming by modifying the likelihood function of the tobit model to allow for two stages: a selection stage (where the decision to participate in the formal market or not is determined) and an outcome stage (where the value of vegetables marketed is determined). In effect, some of explanatory variables are assumed to be relevant for both stages.

Senyolo *et al.*, (2006) applied factor analysis model to investigate Patterns of access and utilisation of output markets by emerging farmers in South Africa. Musemwa *et al.*, (2008) investigated the probability of small-scale cattle farmers participating in the Nguni project not selling their cattle with logistic regression model. Jari (2009) also used multinomial logistic regression to identify factors that demoralized smallholder and emerging farmers in the Kat River Valley from the effective use of output markets.

3.7 Limitations of the study

The problem of farmers being unable to recall some of the needed information was some of the major problems that were encountered during the survey; some of the farmers could hardly recall the amount of vegetables they harvested per vegetable crop. In addition, financial shortage limited the sample size of surveyed smallholder farmers. The result of the study will reflect an image of farmer and farm characteristics affecting market participation in the formal vegetable markets by smallholder farmers in Polokwane Local Municipality. This study was based on the assumption that marketing of different vegetables is affected in similar ways by different factors. This might however, be an over generalising assumption, therefore a similar study can be conducted on different vegetables crops individually.

3.8 Summary

The aim of this chapter was to give an overview of the study area and to explain the methods used in data collection, the research methodology and model specifications with hypothesised variables that are used in this study. This study used more than one research technique to compare the results but the main research technique used is Heckman selection model/type II Tobit model. Conclusions in the study were made based on Heckman selection model. The study intended to identify the significant factors that influence the decision to participate in the formal markets by smallholder farmers in Polokwane Local Municipality and the factors determining the value of vegetables marketed in the formal markets.

CHAPTER 4

FARMER AND FARM CHARACTERISTICS OF SAMPLED SMALLHOLDER SUBSISTENCE AND EMERGING FARMERS

4.1 Introduction

This chapter aims to provide some insight into the socio-economic characteristics of the smallholder farmers in Polokwane Local Municipality. The information given below is derived from the descriptive analyses of the data collected as described in Chapter 3. In this chapter, basic demographic characteristics of farmers and farm characteristics are discussed in the context of market participation. Within the chapter, descriptive statistics such as mean, maximum and minimum values, frequencies and standard deviation is used. Chi squared tests were performed to verify the statistical relationship between some of the important hypothesised variables influencing farmers' decisions to participate in the formal markets and the level of participation.

4.2 Sample description

In the smallholder farming sector, crop production is mainly for subsistence purposes. Few of the households farm exclusively to make money. Most of the farmers in Polokwane Local Municipality sold crops when they had surpluses that could not be stored. The surpluses were donated, bartered or sold for cash to avoid losses through the rotting of the produce.

The study used a sample size of 80 households in Polokwane Local Municipality. Table 4.1 presents the number of households who participated in the formal markets by gender. Most households that participated in the formal markets were headed by man with 19% participation rate as compared to 14% participation rate by female headed households. Only 33% of the households in the study site sold vegetables in the formal markets in the production year 2009-2010. Vegetables such as spinach, beetroots, tomatoes, cabbages, onions, carrots, butternuts and green peppers were the types of crops sold. Types of vegetables planted and the percentages of farmers who planted a particular crop are shown in Table 4.2.

Table 4.1: Number of farmers participating in the market summarised

Participating in the formal market	Percentage (Formal market)	Percentage (Non-formal market)	Total
Female	14	42	56
Male	19	25	44
Total	33	67	100

Table 4.2: Percentages of sampled farmers that planted a particular crop (2009/2010)

Crop planted	Percentage of farmers (%)
Spinach	91
Beetroots	50
Tomatoes	44
Cabbage	41
Onions	26
Carrots	21
Butternuts	19
Green peppers	14
Sweet potatoes	9
Potatoes	8
Pumpkins	6
Lettuce	4

Ranked according to most popular crop

4.3 Demographic characteristics

The conditions of livelihood in the rural areas are to a considerable extent reflected in the socio-economic factors of households, which in turn influence the households' economic behaviour (Makhura, 2001) and affect market participation decisions. According to Randela (2005), demographic characteristics of households are essential when analysing economic data because such factors influence the households' economic behaviour. As such, it is relevant to include household demographic attributes in analysing factors influencing smallholder farmers' decision to participate in the formal vegetable markets and the level of participation.

As shown in Figure 4.1, in this survey 56% of the respondents were females while the rest of the respondents were male. The female headed households included those females whose husbands were migrant workers, were deceased or the females were never married. The households with husbands working in other towns were considered female headed as the females would be more involved in farming activities. Chi-square statistics (3.0426, p-value 0.081) confirmed a significant relationship between market participation and gender of household head.

Age group of sampled farmers was categorised into five groups; age range from 18-35; 36-45; 46-55; 56-65 and greater than 65 years. Figure 4.2 shows that the majority (35%) of sampled vegetable farmers fell in the age range between 46 and 55 followed by 27% of farmers who fell in the age range between 56 and 65. About 20% of farmers were 66 years and older. The statistics show that smallholder farming in the Polokwane Local Municipality is generally practised by older people usually pensioners, with only 1.3% of farmers who fell in the age range between 18 and 35 and this could be because of most of the youths may be employed in the formal sector and other informal sectors as most of them view agriculture as a dirty business (Musemwa *et al.*, 2007).

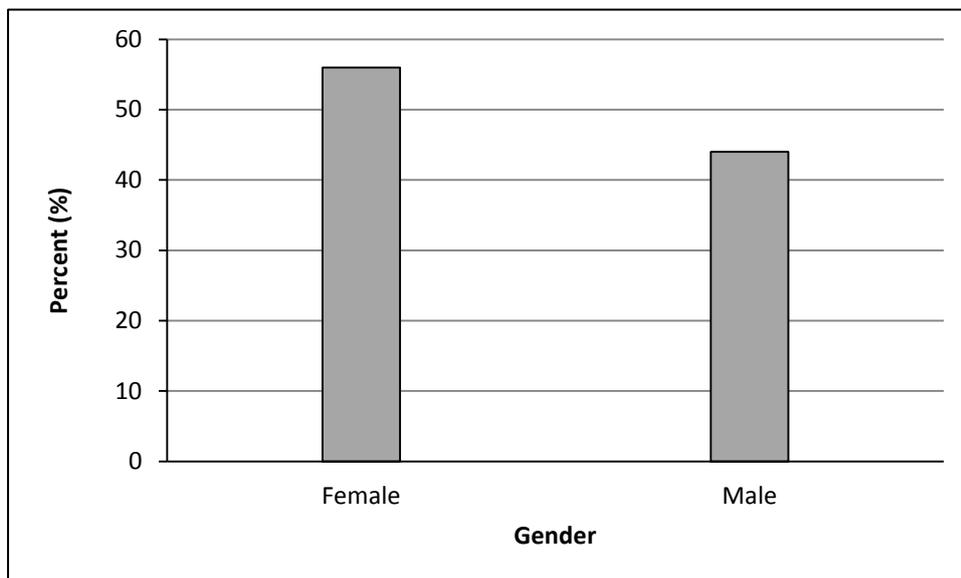


Figure 4.1: Gender of household head

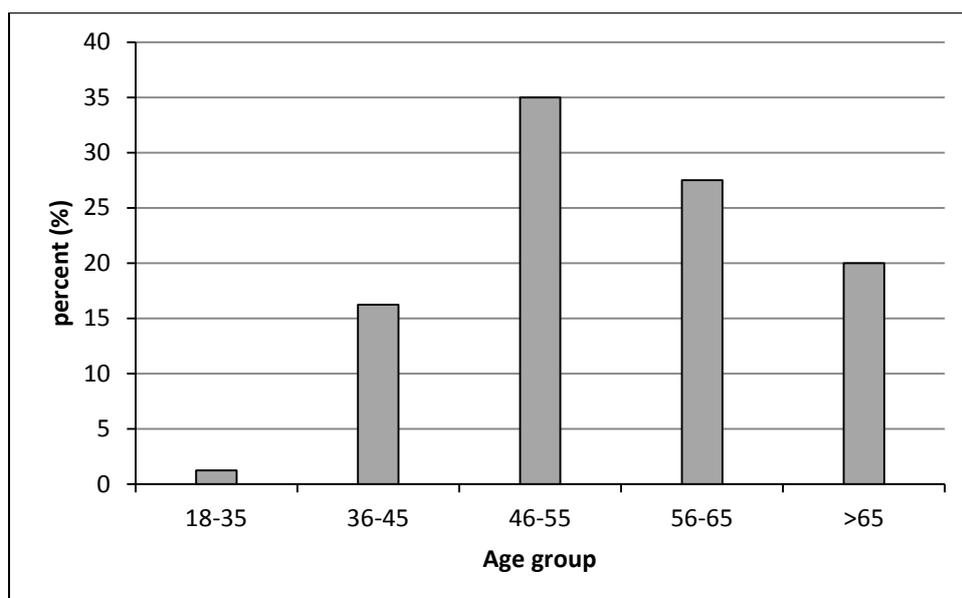


Figure 4.2: Age of household head

Educational level was divided into five categories; no education, primary education, secondary education, college diploma and university degree. Results from descriptive statistics, in Table 4.3 shows that most emerging and subsistence farmers had secondary education (51.3%). Only 5% of farmers had no formal education. Very few farmers had tertiary education, only 8.8% of farmers had a college diploma and 17.5% of farmers had a university degree. Chi squared tests show that, there is statistically significant relationship between level of education and market participation (Chi-square = 12.4439, $p = 0.000$). Household size refers to the number of people living together in a household including non-family members.

Household size plays an important role as a source of a labour; however, the household size also has an impact on household expenditures per month. In this sample, the average household size consisted of 7 people, while the minimum household size was 1 and the maximum was 23. A larger household size discourages selling because the household needs to supply household consumption before it decides to sell (Jari, 2009). These results are presented in Table 4.4.

Table 4.3: Level of education of household head

Level of education	Percentage of farmers (%)
No formal education	5
Primary education	17.5
Secondary education	51.2
College diploma	8.8
University degree	17.5
Total	100

Table 4.4: Household size

Variable	Mean	Std Deviation	Min	Max
Household size	6.79	4.79	1	23

Farmers in the study site were asked whether farming was their main occupation or whether they were employed in the formal sector. The variable farmers' main occupation was measured as whether a farmer was farming full time or otherwise. From the results shown in Table 4.5 very few farmers who did not farm fulltime participated in the formal markets. Employment of farmers in the formal sector tends to reduce the time invested in farming and this might affect production negatively and as a result affect the decision of farmers to participate in the formal markets. Farmers also indicated that when they are being employed else where they do not focus much on farming. The Chi-squared test was also performed and the Chi-square statistics is 1.724 with p-value of 0.189.

Table 4.5: Farmers' main occupation

Farming main occupation	Formal market (N=26)	Non-formal market (N=54)	Total (N=80)
YES	23	41	64
NO	3	13	16

4.4 Farm characteristics

Households with larger farms can expand their farming operation, therefore such farmers are expected to be profit oriented and are likely to participate in the formal markets. Table 4.6 shows that most of sampled subsistence and emerging farmers were using land area of less than 4 hectares (45%). This indicates that the smallholder farmers in Polokwane Local Municipality are still having small farm sizes for farming operations. This is clearly indicated by the proportion of farmers who had land sizes of more than 150 hectares, only 2.5% of the sampled farmers owned more than 150 hectares of land for farming operations even though the land was not fully utilised to grow vegetables. This implies that farmers did not plant vegetables on larger piece of land and this could negatively affect their decision to participate in the formal markets and also affect the value of crops marketed.

Table 4.6: Farm size

Farm size	Household percentage
<4ha	45
4-10ha	27.5
11-60ha	22.5
61-150ha	2.5
>150ha	2.5
Total	100

Households that did not have title deeds for land usually had trouble in obtaining loans for agricultural purposes because they cannot use the land as collateral. According to Randela *et al.*, (2000), ownership of land can influence agriculture productivity, because farmers who do not own land can be reluctant to develop and maintain the land. Majority of sampled farmers in Polokwane Local Municipality did not own the land they farmed on as shown in Figure 4.3 Only 25% of farmers owned the land they farmed on compared to the 75% of sampled farmers who did not own the land.

According to Ortmann and Machete, (2003) cited by Moloji (2008), in smallholder agriculture, insufficient security of land tenure and free rider problems associated with communal land ownership, are widely considered to be obstacles to agricultural development. In addition, most smallholder farmers do not own the land they farm on, even though they have rights to use it. Figure 4.3 show that most farmers (about 55%) in the study site had user rights on land even though they did not own the land they farmed on.

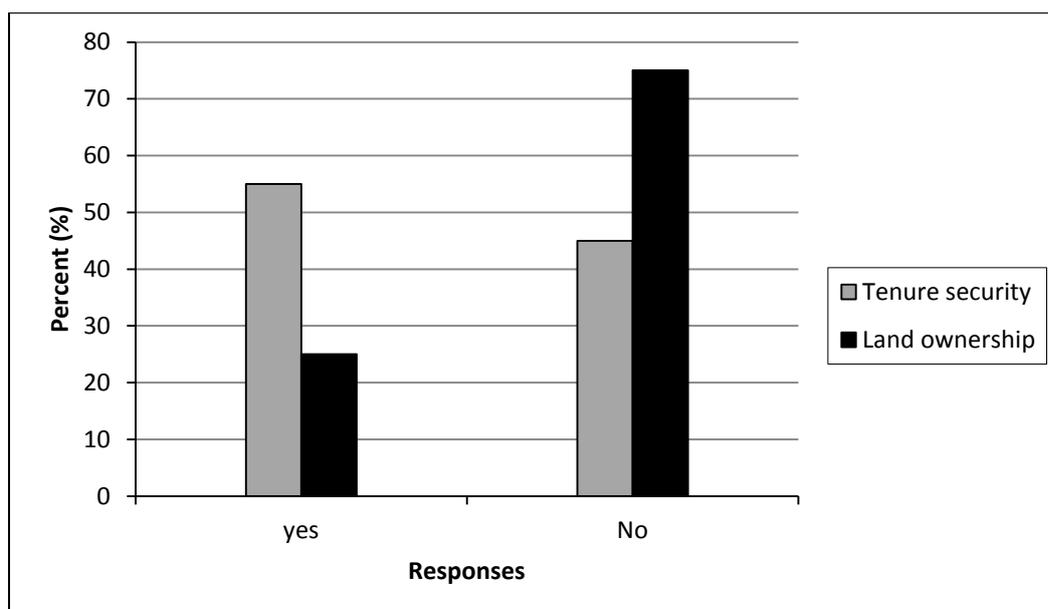


Figure 4.3: Distribution of land ownership and tenure security

4.5 Market factors

Conditions of the road to the nearest towns determine accessibility of markets. In contrast, a lack of road connectivity can lead to delays in transferring produce to market areas, which can lead to quantitative and qualitative losses in farm produce. Sampled farmers were asked to tell how they rated the road they used to the market. The road conditions were rated as bad (gravel), average (both gravel and tarred) and good (tarred). Results presented in Table 4.7 indicates that farmers who participated in the formal markets rated road conditions as good with the standard deviation of 0.86. Informal marketers indicated that the roads they used were average compared to those used by farmers that did not participate in the market. According to the results presented in Table 4.7 roads which were used by farmers who did not sell were bad. Roads conditions could have been one of the factors that discouraged farmers to transport their produce to the market.

Table 4.7: State of the road to the market

State of the road	Mean	Std Dev.	N
Not selling	0.975	0.733	40
Informal markers	1.642	0.497	14
Formal marketers	1.5	0.86	26

Farmer groups or organisations are important means of linking producers with markets, where an individual producer cannot individually enjoy economies of scale (Randela, 2005). Membership in Farmer Organisations often enables farmers to have greater access to agricultural production and

marketing information, as well as increasing a farmer’s bargaining power. Few farmers were members of farmer groups or organisations e.g. NAFU and this implies that, they did not enjoy the benefits that members of farmer groups have from their respective groups or organisations. Only 27.5% of sampled farmers participated in farmer groups compared to 72.5% of farmers who did not participate in the farmer groups (Figure 4.4).

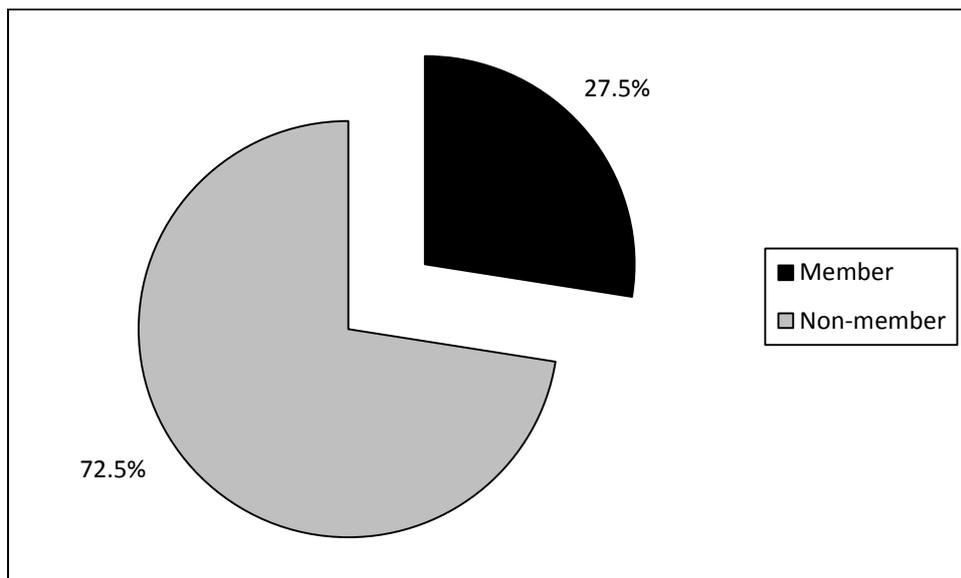


Figure 4.4: Membership in farmer groups

4.6 Value of vegetables marketed in the formal markets

Value of vegetables marketed in the formal markets is an important variable that highlights the level of participation by farmers in the market. Since farmers in the study site planted more than one type of vegetable crops, sampled farmers (households) were asked to give value of four major vegetable crops they marketed in the formal markets in the production season 2009-2010. Following Makhura (2001), it is assumed, however, that the different vegetable crops might be influenced in similar ways by different socio-economic factors affecting farmers in the process of participation in the markets. Table 4.8 shows that the average value of vegetables marketed in the formal markets was R32134.35. Only 26 farmers out of the 80 sampled farmers participated in the formal markets. The value of vegetables marketed is conditional on participation decision by farmers in the formal markets.

Table 4.8: Value of vegetables marketed in the formal markets

Variable	Number of farmers (N)	Mean	Minimum	Maximum
Value of vegetables	26	R 32134.35	R26750	R83000.0

4.7 Smallholder farmers' perceptions of market participation

Farmers were also asked about their perceptions on the challenges to market participation. Farmers did not participate in the formal markets because of a range of constraints; some of the constraints mentioned by sampled farmers included lack of transport facilities, difficult entry into the formal markets, lack of training as some of farmers used traditional ways of farming. Some farmers mentioned high prices of production inputs e.g. fertilizers demoralised them from participating in the formal markets because this would result in inconsistency in production. When asked for possible solutions to solve these problems, farmers gave a number of suggestions which are shown in Table 4.9. About 52.5% of sampled farmers suggested input subsidies as the best strategy to improve market participation in the formal markets. 46.3% of sampled farmers believed that, if the government was to subsidise them with transport to the market, their participation in the formal markets would be improved. Improvement of farm infrastructure e.g. water sources and provision of land were also mentioned as the strategies for improving market participation. During the interviews farmers indicated that it is difficult to supply a larger market while planted on a very small farm. About 30% of the sampled farmers indicated that if they were to be provided with larger farmers, participation in the formal market will be increased in the smallholder sector. Only 2% of the sampled farmers believed that formation of cooperatives can improve market participation in the formal markets.

Table 4.9: Smallholder farmers' suggestions on improving market participation

Suggestion	Farmer percentage (%)
Farmer support services	
Training	23.8
Input subsidies	52.5
Transport subsidies to the market	46.3
Provision of land by government	30
Improvement in infrastructure (e.g. water sources)	30
Frequent extension visits and support	8.8
Access to credit	10
Formation of cooperatives	2.5
Market factors	
Build fresh produce depot/market locally	27.5
An increase in the market price received by farmers	8.8
Provision of market information especially with prices on a regular basis	7.5
Government assistance to enter the market	17.5

4.8 Summary

This chapter has presented the descriptive results for the socio-economic and commodity marketing factors among the smallholder farmers in Polokwane Local Municipality where 80 smallholder vegetable farmers were sampled. From the descriptive analysis results most farmers about 51.3% had secondary education and with only 5 percent of sampled farmers with no education. Most farmers in the survey fell in the age group 46-55 years. Very few farmers fell in the age group 18-35 years (only 1.3%), indicating that most youth did not take part in agricultural activities. Women who participated in the survey outnumbered men, 56% and 44% female and male respectively. The results also indicated that most smallholder farmers in Polokwane Local Municipality used land area of less than 4 hectares with only 2.5% of sampled farmers who used land area of 150 hectares plus.

The most popular vegetable crops that were planted were spinach, beetroots, tomatoes and cabbage. Most of the surveyed farmers mention input subsidy, transport subsidy, training and provision of land as the best strategies that can be used to improve smallholder market participation in the formal market. This chapter described the sample characteristics, and showed the distribution of key variables in the

study. Chi-square tests were also used to illustrate the presence of a relationship between some key variables. The next chapter analyses the relationship of the key dependent variables with the independent variables to establish causality through regression analysis.

CHAPTER 5

FACTORS DETERMINING PARTICIPATION AND UTILISATION OF FORMAL MARKETS BY SMALLHOLDER VEGETABLE FARMERS

5.1 Introduction

The previous chapter laid foundation for the analysis chapter by giving an overview of basic farmer and farm characteristics that were hypothesised to be affecting market participation and utilisation of formal vegetable markets in Polokwane Local Municipality. This chapter empirically tests significance of farmer and farm characteristics that are hypothesised to have the largest potential to influence smallholder vegetable farmers' decision to sell vegetables in the formal markets and also tests significance of the hypothesised characteristics that determine the level or value of vegetables sold in the formal markets. This chapter seek to present the empirical results of the models that were formulated. Model specification and hypothesised variables with expected signs used in this chapter are defined in chapter 3 of the study.

This study used logit and OLS separately and then the Heckman Selection Model which combines the two models. The logit model was used to estimate the socio-economic factors that influenced farmers' decision to participate in the formal markets and the OLS was used to estimate the socio-economic factors that influenced the value of vegetables marketed in the formal markets. The Heckman Selection Model was also estimated to test significance of the variables hypothesised to have a relationship with the dependent variables used in the study. The empirical results are presented in tabular form and interpreted individually and a summary of the result is made at the end of this chapter based on Heckman Selection Model. Summarised results of empirical models are presented in tabular form showing estimated coefficients, standard errors and p-values.

5.2 Results of empirical models

5.2.1 Logistic regression results

Fifteen (15) hypothesised socio-economic characteristics of smallholder vegetable farmers to have the largest potential to influence farmers' decision to sell vegetables in the formal markets were empirically tested. As indicated in Table 5.1 some predictor variables influence market participation decisions significantly and in some cases, the signs of the estimated coefficients are in line with the expected relationships. The Pseudo R^2 is 58%, and it is an acceptable level, implying that the model's estimates fit the data. And the LR Statistic is 59% with a p-value of 0.000 indicating that all the explanatory variables have a significant influence on farmers, decision to participate in the formal vegetable markets.

Only eight (8) of the fifteen (15) hypothesised variables explaining the decision of farmers to sell vegetables in the formal markets were significantly associated with market participation. Namely; gender of household head (GENDHH), highest level of education (HHLVED), household size (HHLDSZ), farmer occupation (FOCP), farmer group (FMRGRP), non-farm income (NONFARM), tenure security (TENRSR), and distance to the market (DSTMKT). The following factors; gender of household head, household size, non-farm income, tenure security and distance to the market have a significant negative influence on smallholder farmers' decision to sell vegetables in the formal markets.

Table 5.1: Logistic regression estimates of market participation

Variable	Coefficient	Standard error	Significance
GENDHH	-1.801*	1.078	0.095
AGEHH	-0.732	0.512	0.153
HHLVED	1.803**	0.877	0.040
HHLDSZ	-0.487**	0.205	0.017
LNDOWP	0.477	1.367	0.727
FMSZ	0.099	0.201	0.322
FOCP	5.202**	2.129	0.015
FMRGRP	4.351**	1.740	0.012
FMEX	-0.030	0.0632	0.633
NONFARM	-3.569**	1.662	0.032
TENRSR	-2.168*	1.154	0.060
LABR	-0.000	0.092	1.000
TRNEQP	-0.093	1.089	0.932
STATRD	1.637	1.117	0.143
DSTMKT	-2.621*	1.457	0.072
Constant	4.354	2.967	0.142
Log likelihood	-20.858248		
LR Statistic	59%		
Probability(LR Statistic)	0.000		
Pseudo R ²	58%		
N	80		

Note: ***, **, and * are significant at 1%, 5%, and 10% significant levels, respectively.

5.2.2 Ordinary least squares (OLS) results

OLS regression model was used to estimate significant factors that influenced the value of vegetables marketed in the formal markets by smallholder farmers in Polokwane Local Municipality. The results are summarised in Table 5.2. The adjusted R-square is 75%. The F-statistic is 6.45 and is significant with a p-value of 0.0018. The p-value of the F-statistic indicates that the overall model is significant and the explanatory variables have a significant influence on the value of vegetables marketed in the formal markets.

Out of the fourteen (14) hypothesised variables that were included in the analysis, only eight (8) of them are significant. The following factors have a significant positive influence on the value of vegetables marketed in the formal markets; high level of education (at least secondary education), an increase in the number of labour employed on the farm and an increase in the number of hectares used. Other variables that were significant but negatively associated with the value of vegetables marketed in formal markets are gender of household head, membership of a farmer group, farming experience of the farmer and access to extension services.

Table 5.2: OLS regression estimates of value of vegetables marketed

Variable	Coefficient	Standard error	Significance
GENDHH	-151.097**	62.929	0.035
AGEHH	-25.979	34.797	0.474
HHLVED	133.950*	66.244	0.068
HHLDSZ	3.110	17.230	0.859
FMRGRP	-181.577*	84.733	0.055
FMEX	-10.769**	4.458	0.034
NONFARM	-122.383	82.890	0.168
LABR	8.505**	3.425	0.031
TRNEQP	-90.558	108.841	0.423
HAUSED	81.252***	13.491	0.000
CSTTRN	0.169	0.159	0.310
EXTSERV	-283.239**	101.390	0.018
FAMACTV	112.327	109.803	0.328
AVGDST	-2.963	2.989	0.168
Constant	485.432	238.235	0.066
Adj R-squared	75%		
R-squared	89%		
F- statistic	6.45		
Probability(F-statistic)	0.0018		
N	26		

Note: ***, **, and * are significant at 1%, 5%, and 10% significant levels, respectively.

5.2.3 Heckman selection model results

Heckman selection model also called type II Tobit or regression with sample selection is consisted of the selection and the outcome equations. The selection equation was estimated using the entire sample with the dependent being recorded to “1” for all non limit observations and the observations of limit “0” were considered unobserved in the outcome equation, thus the outcome equation was estimated given that a farmer has decided to participate in the formal market. Results are presented in Table 5.3. The parameter ρ (rho) is the correlation coefficient between the residuals of the selection equation and the outcome equation. The value of ρ ($\rho=1$) is however significantly different from zero, indicating that the residuals of both equations are related, so there is sample selection problem in the model specification and OLS cannot be used as an estimator for positive value of vegetables sold.

Wald test indicates the correlation is very significant. The Heckman's technique is thus more appropriate to avoid bias than OLS.

Only two variables; highest level of education of a household head and farmer occupation were positively and significantly associated with smallholder farmers' decision to participate in formal vegetable markets in the selection stage of Heckman selection model. This implies that farmers who had a higher level of education (at least secondary education) and were full time farmers had a better chance of participating in the formal markets than those who did not. There were three explanatory variables being negatively and significantly associated with market participation, namely household size, tenure security and distance to the market. The above mentioned socio-factors had a negative influence on farmers' decision to sell vegetables in the formal markets.

In the outcome stage or the conditional stage (only observed observations), nine (9) of the fourteen (14) explanatory variables that were fitted in the model were significant. The socio-economic factors that had an effect on the value of vegetables sold in the formal markets included gender of household head, highest level of education, member of a farmer group, farming experience, access to non-farm income, labour employed on the farm, hectares used, cost of transport per delivery to the market and access to extension service. Out of the nine significant variables only four variables were positively associated with the value of vegetables marketed in the formal markets; those variables are highest level of household head, labour employed on the farm, hectares used and cost of transport per delivery to the market.

Table 5.3 Summary of Heckman Selection Model estimates

Explanatory variables	Selection phase (Market participation)			Outcome phase (Value of vegetables)		
	Coefficient	Standard error	Significance	Coefficient	Standard error	Significance
GENDHH	-0.857	0.698	0.220	-153.907***	38.988	0.000
AGEHH	-0.501	0.349	0.152	-24.592	22.755	0.280
HHLVED	1.423***	0.447	0.001	135.885***	40.581	0.001
HHLDSZ	-0.161*	0.097	0.098	-7.450	10.090	0.461
LNDOWP	0.264	0.796	0.741			
FMSZ	0.003	0.012	0.797			
FOCP	2.357**	1.126	0.036			
FMRGRP	1.643	1.066	0.123	-119.186**	53.274	0.025
FMEX	-0.011	0.055	0.837	-10.475***	3.004	0.000
NONFARM	-1.455	0.907	0.109	-165.712***	53.44	0.002
TENRSR	-1.288*	0.670	0.055			
LABR	0.013	0.065	0.842	8.632***	2.297	0.000
TRNEQP	-0.106	0.662	0.872	-43.582	63.167	0.490
STATRD	0.816	0.702	0.245			
DSTMKT	-1.207**	0.598	0.044			
HAUSED				78.211***	9.075	0.000
CSTTRN				0.184*	0.103	0.073
EXTSERV				-272.834***	55.992	0.000
FAMACTV				65.805	64.365	0.307
AVGDST				-2.695	-1.62	0.106
Constant	1.658	1.338	0.215	486.229***	153.861	0.002
Log likelihood	-162.4281					
N	80					
N unobserved	54					
N observed	26					
Wald chi-square	261.15					
Probability(Wald chi-square)	0.000					
rho	1					

Note: ***, **, and * are significant at 1%, 5%, and 10% significant levels, respectively.

5.3 Factors influencing farmers' decision to participate in formal vegetable markets

The previous section discussed the statistical relations between the explanatory variables and the dependent variable. It can be concluded that the statistically significant variables influenced farmers' decision to participate in formal markets. Highest level of education of household head (HHLVED), farmers' occupation (FOCP), household size (HHLDSZ), access to tenure security (TENRSR) and distance to the market (DSTMKT) significantly influenced the decision to participate in formal markets by smallholder farmers.

5.3.1 Level of education of household head

Highest level of education of household head (HHLVED) is positively and significantly associated with participation in the formal markets. This positive and significant relationship was expected. Therefore this is supported by previous studies i.e. several studies have found a direct relationship between the level of education and successful performance in farming (Montshwe *et al.*, 2005; Bizimana *et al.*, 2004; Mintzberg, 1989, and Mohammed and Ortmann, 2005). Human capital, represented by the household head's formal education (at least secondary level) is posited to increase a household's understanding of market dynamics and therefore improve decisions about the amount of output sold, *inter alia* (Makhura *et al.*, 2001).

Education is one of the fundamental factors that can enable a farmer to easily understand basic farm and financial management, agricultural marketing principles, and the ability to create business networks. In other words, education level has the ability to improve the competitiveness of the farmer in order to generate farm income. A higher level of education is associated with more knowledge and more access to information. In most instances, farmers with secondary education can easily understand the dynamics of farming for business purposes and can be easily trained, unlike the ones with primary education only, unless otherwise. Low levels of education hinder smallholder farmers to respond to new business opportunities or improved methods of doing farm business and production and, as a result, this negatively affects participation in the formal markets. Therefore, highest level of education of household heads influence smallholder farmers' decision to sell vegetables in the formal markets positively.

5.3.2 Farmer occupation

The variable farmer occupation (FOCP) was included in the analysis since some households heads may view farming as a tradition and not as a business and then tend to focus on other non farm activities. This variable tries to explain the amount of time and attention given to farming than other non-farm activities. Results from the analysis presented a positive and significant relationship between

farmer occupation and market participation. From this significant relationship, farmers whose major occupation was farming participated in formal vegetable markets.

5.3.3 Household size

Household size significantly affects households' decision to sell vegetables in formal markets negatively. This negative and significant relationship was expected. A negative sign means that a larger household is labor-inefficient and produces less output but consumes a higher proportion, leaving smaller and decreasing proportions for sale (Alene *et al.*, 2008). According to Dlova *et al.*, (2004), farmers with bigger families were less successful than those with smaller family sizes. This situation is explained by the fact that the increased use of the family income to feed, clothe and educate a larger number of children may leave limited funds for meeting farming expenditures because of the high household expenditures. This may influence farmers/households to keep vegetables for consumption at the household and not sell any of the produce.

5.3.4 Access to tenure security

According to Ortmann and Machete, (2003), in smallholder agriculture, insecurity of land tenure and free rider problems associated with communal land ownership, are widely considered to be obstacles to agricultural development. Tenure security (TENRSR) was significantly and negatively associated with market participation and this negative and significant relationship was not expected.

5.3.5 Distance to the market

There is a negative and significant relationship between distance to the market and farmers' decision to sell vegetables in formal markets. This result is in line with the *priori* expectations. Key *et al.*, (2000) and Makhura *et al.*, (2001) found that distance to the market negatively influences both the decision to participate in markets and the proportion of output sold. In Botswana, Makhura (2001), Mahabile *et al.*, (2002) and Nkhori (2004) noted that even if farmers are in areas with good road linkages, the distance from the markets tends to influence transaction costs, therefore farmers who are further away from the markets may decide not to participate in the market because of the costs of transport.

5.4 Factors determining the value of vegetables marketed in formal vegetable markets

Based on the statistical relationship between the explanatory variables and the dependent variable discussed under results of empirical model, the following variable influenced the value of vegetables marketed in the formal markets by smallholder farmers; gender of household head (GENDHH), highest level of education of household head (HHLVED), member of a farmer group (FMRGRP), farming experience (FMEX), access to non-farm income (NONFARM), farm labour (LABR), hectares used (HAUSED), cost of transport (CSTTRN) and access to extension services (EXTSERV).

5.4.1 Gender of household head

The relationship estimated was in line with the expected relationship. Gender of household head being female was significantly and negatively associated with the value of vegetables marketed in formal markets. This relationship tallied with the relationship that was found by Makhura (2001), between gender of household head and the level of maize sales though the relationship was not significant. In addition, males are expected to sell more as they are able to have better access to information as they go to public places where information pertaining markets is discussed than women (Musemwa *et al.*, 2008).

In most instances, the household head is responsible for the coordination of all household activities and the means to generate income. According to Bembridge (1984), a profile of best farmer characteristics was found and significantly more of the best farmer heads of households were men who were managing the farm. This is also true according to Dlova *et al.*, (2004), who found that it was expected because males are physically capable of coping with the manual demands of farming practices.

5.4.2 Level of education of household head

Highest level of education of household head was highly and positively associated with the value of vegetables marketed in formal markets and this results tally with the expected relationship. According to Nkhori (2004), education increases the ability of farmers to use their resources efficiently and the locative effect of education enhances farmers' ability to obtain, analyse and interpret information. The more the farmer is educated the more the more the farmer sells his produce to the market. Moyo, (2010), found that the likelihood of farmers with at least secondary education sold most grain. Cunningham *et al.*, (2008), found that men are likely to sell more grain early in the season when prices are still high, while women prefer to store more output for household self-sufficiency.

5.4.3 Member of a farmer group

Either a negative or a positive relationship was expected between farmer group membership and the value of vegetables sold in the formal markets. A negative relationship could arise because members may sell vegetables in one basket affecting the value of a farmer who produce a surplus if the members agree to contribute a certain amount of vegetables to sell to the market. For a positive relationship is that if one farmer cannot meet required market quantity can combine with other group members and sell in one basket. It was found that member of a farmer group is negatively and significantly associated with the value of vegetables sold in formal markets. According to Randela (2005), farmer organisations are important means of linking producers with markets, where an individual producer cannot individually

enjoy economies of scale, therefore we conclude that marketing vegetables in a group reduces the value of vegetables that can be market by a single farmer in the formal markets.

5.4.4 Farming experience

In a study that included all the farm enterprises by Makhura, in 2001, the older farmers were found to be more likely to participate in horticultural market, but tended to sell significantly less as compared to younger farmers (Makhura, 2001). Our finding in this study that older farmers with more farming experience sold less in formal markets concur with Makhura 's findings.

5.4.5 Access to non-farm income

It was expected that access to non-farm income could affect the value of vegetables sold in formal markets negatively. These *a priori* expectations are in line with the estimated relationship. Access to non-farm income is negatively and significantly associated with the value of vegetables sold in formal markets. Alene *et al.*, (2008) also noted that non-farm income contributes to more marketed output if the non-farm income is invested in farm technology and other farm improvements. If this is not the case, marketed farm output drops if non-farm income triggers off-farm diversification.

5.4.6 Farm labour

A positive and significant relationship was found between value of vegetables marketed in formal market and the number of workers employed (labour) on the farm. The implication of the relationship is that an increase labour result in an increase in the value of vegetables sold in formal markets. This is supported by research carried out at Nkandla in KwaZulu-Natal where labour shortages and skills have been cited as one of the major reasons for low return in agriculture (Taylor and Cairns, 2001).

5.4.7 Hectares used

The results show a relationship between variables that is in line with the expected one. The variable hectares of land used to plant vegetables, is positively and significantly associated with the value of vegetables marketed in the formal markets. This implies that the size of land used to plant crops increases the value of crops marketed. Makhura (2001) found that an increase in the arable land will lead to an increase in maize sales by R52.

5.4.8 Cost of transport

It was found that the cost of transport to the market was significantly and positively associated with the value of vegetables sold in formal markets. Relating this to the laws of demand, farmers who paid less for transport vegetables to the market would tend to transport more vegetables to the market than those

who paid more for transport, therefore a lower transport costs to the market increase the value of vegetables sold in formal markets. This tally with Musemwa *et al.*, (2008) saying cattle sales are high if transport costs are low as farmers will be able even to sell in faraway markets as transactional costs will be low.

5.4.9 Access to extension service

According to Machethe (2004), extension services play an important role in empowering farmers with farming techniques, skills and knowledge. A positive and significant relationship between access to extension service and the value of vegetables sold was expected but results from regression presented a negative and significant relationship. In studies by Jeché (1999) and Moloji (2008), the extension services had the similar results. This negative relationship could have resulted because of a number of visits by extension officers to the farmers since the number of trips was not considered in the study. According to Moloji (2008), the impact of extension services provided by extension officers might not relate best to the needs of farmers. We can conclude that unspecialised extension support can result in farmers not becoming efficient as a result of extension support. In addition Jari (2009), found that farmers with access to government extension services explained that the extension workers are not consistent and some of them rarely visit their villages. Further investigation shows that the extension workers are biased towards farmer cooperatives, because farmers belonging to cooperatives mentioned that they received excellent extension services.

5.5 Comparison of the analytical models used

Regression results based on two approaches were presented i.e. the Heckman's estimation model and the separated OLS and logit regression models. In the separated analysis, market participation was treated as a dichotomous (binary) dependant variable and used in the logit model. It had two possible outcomes, which are either the farmer is participating in the formal market or not. This procedure produces prediction equations in which the regression coefficients measure the predictive capability of the independent variables (Dallal, 2001). The logit results showed that eight of the fifteen hypothesised explanatory variables that were included in the analysis were statistically significant. The logit model was used to estimate factors that influence farmers' decision to sell vegetables in the formal markets. According to Makhura (2001), although it is interesting to know factors that influence the level of sales, at the same time, there is a need for a model that is a hybrid between the logit or probit and the OLS. The appropriate tool for such is the tobit model that uses maximum likelihood regression estimation (Tobin, 1958, Gujarati, 1995). A tobit model answers both of the following questions: (i) What factors influence the probability of selling? This question is answered by logit and probit. And (ii) What factors

determine the level or magnitude of sales? This question is not answered by logit and probit models, but by OLS. Therefore this motivated the application of Heckman selection model in the study.

Conclusion on the variables influencing smallholder farmer's decision to participate in formal vegetable markets and variables determining the value of vegetables marketed in formal vegetable markets were made based on Heckman selection model. Heckman selection model was selected for the study because firstly a farmer should decide whether or not to sell vegetables in formal markets, and secondly, the factors determining the value of vegetables marketed are estimated, conditional on a farmer having decided to sell vegetables in formal markets. In reality not all smallholder farmers participate in formal markets thus some farmers may prefer to participate in a particular market and some may be excluded by characteristic factor (e.g. level of education) and market conditions. Therefore Heckman selection model was suggested.

Results of outcome stage of Heckman selection model were in line with the OLS results except that there were two variables (access to non-farm income and cost of transport to the market) which significantly affected the value of vegetables marketed in the formal markets but were not presented in OLS regression results. The research hypotheses are as follows (i) There are no socio-economic factors that influence smallholder farmers' decision to sell vegetables in the formal vegetable markets and (ii) There are no socio-economic factors that determine the value of vegetables marketed by smallholder farmers in formal vegetable markets. In conclusion, the empirical results implies that there are socio-economic factors such as highest level of education of household head that influence smallholder farmers, decision to participate in formal markets and there are some socio-economic factors such as household size determining the value of vegetables marketed in the formal markets, therefore, the two null hypotheses are rejected.

5.6 Summary

Based on the results of this study, several suggestions can be made on how subsistence and emerging farmers can be actively involved in produce for formal marketing. Generally, the findings suggest that an adjustment in each one of the significant variables can significantly influence the probability of market participation in formal markets and also increase the value of vegetables sold in these markets.

CHAPTER 6

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

The main farming enterprise in Limpopo Province is the production of vegetables. Vegetable production has higher returns than most other cash crops and is suitable for production on the currently declining farm sizes in varying agro-ecological zones (Minot and Ngigi, 2003). Farmers in Polokwane local municipality produced vegetables including beetroot, carrots, spinach, tomatoes, cabbage and butternut, and they mainly sold in informal local markets, through speculating and hawking. Some sold to hawkers, who sold fresh produce from stalls in small markets and on the streets. Although there are a number of fresh produce markets operating successfully in Polokwane, very few smallholder farmers supplied vegetables to these major markets such as Goseame Fresh Produce Market. This research focused on providing information relevant to vegetable marketing in the province by identifying and analysing those farm characteristics (e.g. farm size, distance to the market) and farmer characteristics (e.g. gender, age of the farmer) influencing smallholder farmers' decision to participate and utilise formal vegetable markets.

The overall objective of the study was to examine farm and farmer characteristics of smallholder vegetable farmers that influence their decision to participate and utilise formal markets. Specific objectives were the following; (i) to identify socio-economic factors that influence smallholder farmers' decision to sell vegetables in formal vegetable markets and (ii) to identify socio-economic factors that determines the quantity of vegetables marketed by smallholder farmers in formal vegetable markets.

6.2 Research summary

This section provides a summary of some of the important sections included in the study, and they include literature review, methodology and study results.

From literature, According to Mayson (2003), smallholder farmers producing surpluses often do not have access to markets at whatever scale they are producing. The extent to which market access for smallholder farmers has improved with market liberalisation varies across crops and countries (Dorward *et al.*, 1998). Although new opportunities might have emerged for some farmers, formal markets are difficult to access because of the challenges that smallholder farmers face (Boughton *et al.*, 2006). Even in more accessible areas, smallholder farmers require more assurance that they will be able to sell what is produced and obtain a reasonable price (Dorward and Kydd, 2003). Literature indicated that smallholder farmers face a range of barriers that hamper improved market access and market

participation (Boughton *et al*, 2006; Haggablade *et al*, 2004; Maltsoğlu and Tanyeri-Abur, 2005; Machethe, 2004; Makhura *et al*, 2001).

This research was conducted in Polokwane Local Municipality which is located within the Capricorn District in the Limpopo Province, covering a surface area of 3775 km² and accounts for 3% of the Province's total surface area of ±124 000 km². This research used a combination of primary and secondary data. Secondary data was collected in 2009 by Limpopo Department of Agriculture (LDA) in Polokwane Local Municipality from the settlements surrounding the Polokwane city, by interviewing 80 farmers using a structured questionnaire. The questionnaire covered farm and farmer characteristics e.g. age of farmers. A supplementary questionnaire was developed to collect additional information that was required for analysis from the 80 farmers.

In data analysis, STATA (2010) was used to analyze data and descriptive statistics including means, frequencies, and standard deviations were calculated. This research followed Heckman selection models involving two-step estimation models. The first stage was estimated with logit model and the second stage was estimated with OLS and then the Heckman selection model which combined the two models.

From the Heckman selection model regression' selection stage results, only two variables; highest level of education of a farmer and farmer occupation were positively and significantly associated with smallholder farmers' decision to participate in the formal vegetable markets. The result of selection stage of Heckman selection model suggests that highest level of education of a farmer positively influenced his decision to participate in the formal market together with main farmer occupation being farming. There were three explanatory variables being negatively and significantly associated with market participation, namely household size, tenure security and distance to the market.

In the outcome stage or the conditional stage (only observed observations) of Heckman selection model results, nine (9) of the fourteen (14) explanatory variables that were fitted in the model were significant. The significant variables included gender of household head, highest level of education, member of a farmer group, farming experience, access to non-farm income, labour employed on the farm, hectares used, cost of transport per delivery to the market and access to extension service.

6.3 Conclusions

This research intended to answer the following questions: (i) what are the socio-economic factors that distinguish farmers who participate in formal markets from those who do not? And (ii) what are the socio-economic factors that influence the quantity of vegetables that a farmer brings to the market?

Therefore, highest level of education (passed grade 12) and farmer occupation (farming main occupation) distinguished farmers who participated in the formal markets from those who did not participate in such markets. Increased household size, tenure security and longer distances travelled (over 15 km) to the market distinguished non-participants from participants in the formal markets. Highest level of education of household heads, labour employed on the farm, hectares used to grow vegetables and cost of transport to the market positively influenced the value of vegetables sold implying an increase in the value of vegetables sold in formal markets. It also found that gender of household being female, membership in a farmer group, farming experience of farmers, access to non-farm income and access to extension service negatively affected the value of vegetables sold in the formal markets, this imply that this factors decrease the value of vegetables marketed in formal markets.

6.4 Policy implications and recommendations

Considering socio-economic or farm and farmer characteristics of subsistence and emerging farmers in Polokwane Local Municipality revealed by empirical results, several policy implications can be drawn from the results of the study. The implications apply to farmers' organization, farmers, extension organizations, financial institutions and policy-makers. This study suggest ways in which market participation in formal markets by subsistence and emerging farmers can be improved and the value of vegetables marketed in formal markets be increased.

- **Capacitate farmers**

It has been found in this study that highest level of education of farmers positively influenced both the decision to participate in the market and the value of vegetables sold in formal markets. Majority of smallholder farmers who participated in the formal markets have passed grade 12 and above and this is an indication that education played a great role in market participation, therefore there is a need for farmers to be trained. It was also found that gender of household head been female was negatively associated with the value of vegetables marketed in the formal markets and this shows that there is still the need to emphasise women empowerment programmes. Furthermore farmers are continuously confronted with new technology. Various training techniques can be applied for farmers who are illiterate. Farmers will have to acquire new technological and administrative skills and receive training and extension to keep up with changes.

- **Provision of land for farming**

Farm sizes and access to land in general play an important role in farm income; and successful participation of emerging farmers in commercial agricultural markets. The results of the study clearly indicated the need for increased land for farming. In addition, tenure security in which farmers had user rights and didn't own the land they farmed on negatively influenced their decision to participate in the formal markets. It was also highlighted in this study that labour employed on the farm increased the value of vegetables marketed in the formal markets. According to Moloji (2008), the size of the farm enterprise is directly related with employment of labour. If the farm size is big and the household labour is not able to handle the farming activities, the employment of labour is necessary for income generation.

- **Formation of depots and markets closer to the farmers**

From the empirical results in this study, most smallholder farmers did not participate in the formal markets because they are located far away from the markets. Longer distance to the markets is one of the major reasons why farmers sold fewer vegetables in formal markets. Therefore, formation of depots and markets closer to the farmers will be a solution to this problem and more farmers will come to the market and sell their vegetable crops.

- **Encourage formation of farmer groups or organisations**

Farmer Organisations such as National African Farmers Union provide a wide range of services such as financial services, training, advisory services, skill development, and represent their member's interest in expressing demand for service. Therefore, farmer organisations can be a solution to all market related problems encountered by smallholder farmers in remote areas. This study recommends that the department of agriculture together with extension officers and some government parastatals together mobilise farmers and encourage them to form farmer group with their support.

- **Increased number of extension visits to farmers and specialised service**

Limited number of extension visits results in insufficient attention given to the provision of the support services to the smallholder farmers. From the results drawn from the study, access to extension services negatively affected the value of vegetables marketed and could have resulted because of limited number of visits as farmers indicated during the survey. Furthermore, the extension officers should specialise in certain fields within the agricultural industry, i.e., livestock extension officer, crop production extension officer, marketing extension officer etc.

According to Moloji (2008), the current system whereby the extension officers are expected to be jack of all trade and to serve a large number of farmers does not do justice to the agricultural industry,

especially to the emerging farmers. The support to emerging farmers must be provided collectively in relation to production facilities; technical skills; credit access; marketing and marketing information; leadership capacity building; infrastructure support and so on. This study recommends the provision of specialised agricultural marketing extension services to advice smallholder farmers with better market knowledge than a jack of all trade system of extension service and increase the number of visits taken to the rural farmers.

- **Encourage commercialisation of smallholder agriculture in rural areas**

Commercial agriculture offers economies of scale (Van Zyl, 1995). According to Jayne *et al.*, 1995, commercial orientation of smallholder agriculture leads to a gradual decline in real food prices due to increased competition and lower costs in food marketing and processing. Commercially oriented farmers are better off than farmers who are producing for consumption. In this study it was also found that a larger household size discouraged farmers from participating in the formal markets. Access to non-farm income also discouraged commercialisation of smallholder agriculture. During the interviews with farmers, some farmers indicated that one of the reasons they are not participating in the market is because they have a problem with market entry and they gave a suggestion that the department of agriculture should help them enter the market. This study recommends that extension officers and any other possible parties should secure pre marketing contracts for smallholder farmers especially for vegetable crops since they have a limited shelf life.

- **Summary**

For all the significant factors identified by this study and other similar studies as determinants of market participation should be targeted in policy formulation process. Policies formulated based on such factors can help improve the process of commercialising rural or smallholder agriculture.

6.5 Areas for further research

This study only focused on farm and farmer characteristics that influenced farmers' decision to sell vegetables in formal markets and characteristics that determined the value of vegetable crops marketed in such markets therefore, this study leaves a gap for research. Thus, there is a need for further research on the influence of other factors, such as economic and political factors, and their influence on smallholder farmers' decision to participate in formal markets and agricultural marketing in general. This study used a smaller sample size of 80 smallholder farmers, therefore a similar study can be conducted with a larger sample size to identify more factors since the result of this study focused on farmers in Polokwane Local Municipality.

REFERENCES

- ALENE, D.A., MANYONG, V.M., OMANYA, G., MIGNOUNA, H.D., BOKANGA, M. and G.D. ODHIAMBO. 2008. Smallholder marketed surplus and input use under transactions costs: Maize supply and Fertilizer Demand in Kenya. *Food Policy* 32:318-328.
- AMEMIYA, T. 1985. *Advanced Econometrics*, Cambridge: Harvard University Press, chapter 10.
- ARGAWAL, B. 1994. *A field of one's Own*, Cambridge University Press: ARGAWAL, B. (1997). Bargaining and Gender Relations: Within and Beyond the household. *Feminist Economics* 3(1):1-51.
- ARGAWAL, B. 1997. Bargaining and Gender Relations: Within and Beyond the household. *Feminist Economics* 3(1):1-51.
- BABBIE, E. R. 1973. *Survey Research Methods*. Wadsworth, Belmont.
- BARRETT, C.B. 2008. Smallholder market participation: Concepts and evidence from Eastern and Southern Africa. *Food policy* 33(4):299-317.
- BALOYI, J.K. 2010. An analysis of constraints facing smallholder farmers in the Agribusiness value chain: A case study of farmers in the Limpopo Province. M Inst Agrar. Department of Agricultural Economics, Extension and Rural Development. Pretoria: University of Pretoria.
- BELLEMARE, M.F. and C. BARRET. 2006. An Ordered Tobit Model of market Participation: Evidence from Kenya and Ethiopia. *American Journal of agricultural Economics* 88(2):324-337.
- BEMBRIDGE, T.J. 1984. A System Approach Study of Agricultural development problems in Transkei. Unpublished PhD thesis, University of Stellenbosch, Stellenbosch.
- BIENABE, E., CORONEL, C., LE COQ, J. and L. LIAGRE. 2004. Linking smallholder farmers to markets: Lessons learned from literature review and analytical review of selected projects. Study Report, Final draft, March 2004. CIRAM and IRAM. World Bank.
- BIZIMANA, C., NIEUWOUDT, W.L., and S.R.D. FERRER. 2004. Farm Size, Land Fragmentation and Economic Efficiency in Southern Rwanda. *Agrekon* 43(2).
- BOUGHTON, D., MATHER, D., BARRETT, C.B. BENFICA, R., ABDULA, D., TSCHIRLEY, D. and B. CUNGUARA. 2006. Market Participation by Rural Households in a Low-Income Country: An

Asset-Based Approach Applied to Mozambique. Department of Agricultural Economics, Michigan State University. 50 pp.

CHAUKE, P.K., and S.A. ONI. 2004. The productivity and income generating ability of the land redistribution for agricultural development (LRAD) projects in Limpopo Province of South Africa. Paper presented at AEASA conference on the 21st to 23rd at Somerset West in Western Cape.

COULTER, J. and G. ONUMAH. 2000. Enhancing Rural Livelihoods Through Improved Agricultural Commodity Marketing in Africa: Role of Warehouse Receipt Systems, in Wye (ed.) 74th EAAE Seminar on Livelihoods and Rural Poverty: Technology Policy and Institutions.

COUSINS, B. 2005. There is future for South Africa's Small Farmers. *Article published in the Business Day*, Johannesburg, South Africa, June 14, 2005. 2 pp.

CUNNINGHAM, L.T., BROWN, B.W., ANDERSON, K.B. and E. TOSTAO. 2008. Gender differences in marketing styles. *Agricultural Economics* 38(1):1-7.

DALLAL, G.E. 2001. Logistic Regressions. <http://www.tufts.edu/~gdallal/logistic.htm> Accessed 23 November 2006.

DEPARTMENT OF AGRICULTURE AND LAND AFFAIRS (DALA). 1997. Food Security Policy for South Africa: A Discussion Document. Unpublished report.

DEERE, C.D., DURAN., R.L., MARDON, T., MASTERSON and M. CORREIRA. 2005. Women's Land Rights and Rural Household Incomes in Brazil, Paraguay and Peru. Agriculture and Rural Development Internal Report, World Bank: Washington DC.

DE JANVRY, A., FAFCHAMPS, M. and E. SADOULET. 1991. Peasant household behaviour with missing markets: some paradoxes explained. *The Economic Journal* 101(409):1400-1417, November 1991.

DELGADO, C. 1998. Sources of growth in smallholder agriculture in sub-Saharan Africa: the role of vertical integration of smallholders with processors and marketers of high value-added items. Proceedings of the Inter-Conference Symposium of the International Association of Agricultural Economists, August 10-16. South Africa: Badplaas: p108.

- DELGADO, C.1999. Sources of growth in smallholder agriculture in Sub-Saharan Africa: the role of vertical integration of smallholders with processors and marketers of high value-added items. *Agrekon* 38(3):165-189.
- DEPARTMENT OF AGRICULTURE (DoA). 2003. Response by Mopani District Office to Questionnaire set to Provincial Government, Polokwane.
- DIXON, J., ABUR, A. and WATTERBACH. 2005. Framework for analysing impacts of globalisation on smallholders. www.fao.org/documents/showcdr.asp?url_file=/docrep/007/y5784/y5784e02.htm Accessed 04 December 2005
- DLOVA, M.R., FRASER, G.C.G., and A. BELETE. 2004. Factors affecting the success of farmers in the Hertzog Agricultural Cooperative in the central Eastern Cape. *Fort Hare Papers* 13:21-33.
- DORWARD, A. 1999. A Risk Programming Approach for Analysing Contractual Choice in the Presence of Transaction Costs. *European Review of Agricultural Economics* 26(4):481-492.
- DORWARD, A. and J. KYDD. 2003. Implications of market and coordination failures for rural development in least developed countries. *Journal of International Development* 16(7):951-970.
- DORWARD, A., KYDD, J. and C. POULTON. (eds.) 1998. *Smallholder Cash Crop Production Under Market Liberalisation: a New Institutional Economics Perspective*. CAB International.
- FENWICK, L.J. and M.C. LYNE. 1999. The relative importance of liquidity and other constraints inhibiting the growth of small-scale farming in KwaZulu-Natal. *Development Southern Africa* 16(1):141-155.
- FREEMAN, H.A. and S.S. SILIM. 2001. Commercialization of Smallholder Irrigation: The Case of Horticultural Crops in Semi-Arid Areas of Eastern Kenya, in H Sally and C.L. Abernethy (Eds.) *Private Irrigation in Sub-Saharan Africa: Proceedings of Regional Seminar on Private Sector Participation an Irrigation Expansion in Sub-Saharan Africa, 22-26 October, Accra, Ghana*. IWMI, FAO and CTA.
- GOETZ, S.J. 1992. A Selectivity Model of Household Food Marketing behaviour in Sub-Saharan Africa. *American Journal of Agricultural Economics* 74(2): 444-452.
- GREENE, W. H. 2003. *Econometric Analysis*, Prentice Hall, Upper Saddle River.
- GUJARRATI, D.N. 1995. "Basics Econometrics". 3rd Edition. New York: McGraw Hill Book co.

- HAGGBLADE, S., HAZELL, P. and J. BROWN. 1990. Farm-non farm linkages in rural sub-Saharan Africa. *World Development* 17(8):1173-1201.
- HAGGBLADE, S., HAZELL, P. and I. KIRSTEN. 2004. African agriculture: past performance, future imperatives. In: INTERNATIONAL FOOD POLICYRESEARCH INSTITUTE, 2020 Vision. *Building on successes in African Agriculture*. United States: Washington, DC, pg 33.
- HAZELL, P. 2005. Is agriculture still important for economic development and poverty reduction? From: <http://www.ifpri.org/PUBS/newsletters/IFPRIForum/200509/IF12comment.asp> (Accessed 24 March 2007).
- HECKMAN, J. 1979. Sample Selection Bias as a Specification Error. *Econometrica* 47(1):153-162.
- HEINEMANN, E. 2002. The roles and limitations of producer associations. Paper presented at the European Forum on Rural Development Cooperation. Montpellier, France. 4 September 2002.
- HOSMER, D.W. and S. LEMESHOW. 2000. Applied Logistic Regression (2nd Ed). Wiley Inter science Publication, New York.
- IFAD, 2003. Promoting Market Access for the Rural Poor in order to achieve the Millennium Development Goals. *Discussion Paper*, International Fund for Agricultural Development, Rome.
- IITA. 2001. Linking Farmers to Markets-Overview from ACIAR, P.H. News No. 4 May, IITA.MACGREGOR, R.G. and ABRAMS, L. 1996. Sustainable household egg production to enhance household food security. *South African Journal of Animal Science* 26(3):85-87.
- JARI, B. 2009. Institutional and technical factors influencing agricultural marketing channel choices amongst smallholder and emerging farmers in the Kat river valley. MSc thesis. University of Fort Hare: Alice.
- JAYNE, T.S., MUKUMBU, M., DUNCAN, J., STAATZ, J., HOWARD, J., LUNDBERG, M., ALDRIDGE, K., NAKAPONDA, B., FERRIS, J., KEITA, F. and A.K. SANANKOUA. 1995. Trends in real food prices in six sub-Saharan African countries. Policy Synthesis No. 2, US Agency for International Development (USAID), Washington, DC.

- JAYNE, T.S., GOVEREH, J., MWANAUMO, A., NYORO, J.K. and A. CHAPOTO. 2002. "False Promise or False Premise? The Experience of Food and Input Market Reform in Eastern and Southern Africa", *World Development*, 30(111): Elsevier, UK.
- JECHE, P.M. 1999. Impacts of agricultural institutions on household level agriculture performance: A case of dry land and irrigation areas. MSc thesis. University of Zimbabwe: Zimbabwe.
- KALIBWANI, F. 2005. Food Security in Southern Africa: Current Status, Key Policy Processes and Key Players at Regional Level. *Promoting the use of CSOs' evidence in policies for food security: An Action Research Project in Southern Africa*. 42 pp.
- KEY, N., E. SADOULET and A. DE JANVRY. 2000. Transactions Costs and Agricultural Household Supply Response. *American Journal of Agricultural Economics* 82(2):245-59.
- KHERALLAH, M., DELGADO, C., GABRE-MADHIN, E., MINOT, N. and M. JOHNSON. 2000. The road half travelled: Agricultural market reform in sub-Saharan Africa. Food Policy Report, International Food Policy Research Institute (IFPRI), Washington, DC.
- KHERELLAH, M. and J.F. KIRSTEN. 2002. The new institutional economics: Application for agricultural policy research in developing countries. *Agrekon* 41(2):110-132.
- KILLICK, T., KYDD, J. and C. POULTON. 2000. Agricultural Liberalisation, Commercialisation and the Market Access Problem in the Rural Poor and the Wider Economy: The Problem of Market Access, IFAD.
- KIRSTEN, J., PERRET, S. and A. DE LANGE. Undated. Rural Development: Focussing on Small Scale Agriculture in Southern Africa. University of Pretoria, Pretoria.
- KIRSTEN, J.F and K. SARTORIUS. 2002. Linking agribusiness and small-scale farmers in developing countries: is there a new role for contract farming? *Development Southern Africa* 19(4):503-529.
- KIRSTEN J, VAN ZYL J and N. VINK. 1998. The agricultural democratization of South Africa, 1st ed. Cape Town: IPA/ Francolin publishers.
- LATT, E.A. and W.L. NIEUWOUDT. 1988. Identification of plot size effects on commercialization of small – scale agriculture in Kwazulu. *Development Southern Africa* 5(3):371-382.

LIMPOPO DEPARTMENT OF AGRICULTURE. 2011. Geographic information system, Polokwane municipality map. May 2011.

LIMPOPO DEPARTMENT OF AGRICULTURE (LDA). 2008.

Background. <http://www.lda.gov.za/index.php?Entity=Background>. Accessed: 15-01-08

LYNE, M.C. 1996. Transforming developing agriculture; Establishing a basis for growth. *Agrekon* 35(4): 188-192.

MACHETHE, C.L. 2004. Agriculture and poverty in South Africa: can agriculture reduce poverty? Paper delivered at the United Nations Development Programme, Human Science Research Council and Development Bank of Southern Africa Conference on overcoming under-development in South Africa's second economy, 22-26 October. University of Pretoria, South Africa.

MAGINGXA, L.L., ALEMU, Z. and H.D. Van SCHALKWYK. 2005. Factors that influencing market access for smallholder irrigators in South Africa. A paper presented at the 43rd Annual AEASA conference in Polokwane, Limpopo, September 21-23, 2005.

MAHABILE, M., LYNE, M. and A. PANIN. 2002. Factors affecting the productivity of communal and private livestock farmers in Southern Botswana: A descriptive analysis of sample survey results. *Agrekon* 41(4):326-38.

MAKHURA, M.T. 1994. Theoretical and econometric models of commercialization behaviour of households in the developing areas of South Africa. Unpublished MSc thesis. Department of Agricultural Economics. Pennsylvania State University, State College.

MAKHURA, M.T. 2001. Overcoming transaction costs barriers to market participation of smallholder farmers in the Northern Province of South Africa. Unpublished PhD thesis. Department of Agricultural Economics, Extension and Rural Development. Pretoria: University of Pretoria.

MAKHURA, M.T., KIRSTEN, J. and C. DELGADO. 2001. Transaction costs and smallholder participation in the maize market in the Northern Province of South Africa. Paper presented at the Seventh Eastern and Southern Africa Regional Maize Conference, 11-15 February 2002. Department of Agricultural Economics. Pretoria: University of Pretoria.

MAKHURA, M.T., GOODE, F.M. and G.K. COETZEE. 1998. A cluster analysis of commercialisation of farmers in developing rural areas of South Africa. *Development Southern Africa* 15(3):75-80.

- MAKHURA, M. and M. MOKOENA. 2003. Market access for small-scale farmers in South Africa. In: NIEUWOUDT, L. and GROENEWALD, J. (eds.). *The challenge of change*. Pietermaritzburg: University of Natal Press, pg 137-148.
- MALTSOGLU, I. and A. TANYERI-ABUR. 2005. *Transaction costs, institutions and smallholder market integration: potato producers in Peru*. [WWW document].
 URL <http://ideas.repec.org/p/fao/wpaper/0504.html> (Accessed 2007, April 9).
- MATHONZI, T.M. 2000. Effects of market orientation on income and food security of Small-scale irrigation Farmers in South Africa's Northern Province. MSc thesis, University of the North, South Africa.
- MATUNGUL, M.P.M. 2002. Marketing constraints faced by communal farmers in KwaZulu-Natal, South Africa: a case study of transaction costs. Unpublished PhD thesis, Discipline of Agricultural Economics, School of Agricultural Sciences and Agribusiness. Pietermaritzburg: University of Natal.
- MATUNGUL, M.P.M., LYNE, M.C. and G.F. ORTMANN. 2001. Transaction costs and crop marketing in the communal areas of Impendle and Swayimana, KwaZulu-Natal. *Development Southern Africa* 11(3):347-361.
- MAYSON, D. 2003. Evaluating land and agrarian reform in South Africa. Occasional paper series. NO.7: Joint ventures. Cape Town: University of the Western Cape and Surplus People Project.
- McCULLOCH, N. and M. OTA. 2002. Export horticulture and poverty in Kenya. Working Paper No. 174, Institute of Development Studies (IDS), University of Sussex, Brighton.
- MILLENNIUM PROJECT TASK FORCE ON HUNGER. 2004. Halving Hunger by 2015: A Framework for Action. Interim Report. Millennium Project. New York.
- MINISTRY OF AGRICULTURE and LAND AFFAIRS (MALA). 1998. Agricultural policy in South Africa: A Discussion Document. Cape Town. CTP Book Printers.
- MINOT, N. and M. NGIGI. 2003. Are horticultural exports a replicable success story? Evidence from Kenya and Côte d'Ivoire. Paper presented at the InWEnt, IFPRI, NEPAD, CTA Conference on Successes in African Agriculture. 1-3 December, Pretoria, South Africa.

- MINTZBERG, H. 1989. Mintzberg on management: Inside our strange World of Organisations. Collier Maclimann, Inc., Canada.
- MOHAMMED, M.A., and ORTMANN, G.F. 2005. Factors Influencing Adoption of Livestock Insurance by Commercial Dairy Farmers in Three Zobatats of Eritrea. *Agrekon* 44(2): June.
- MOLOI, M.J. 2008. A comparison of socio-economic characteristics that determine the farm income of emerging livestock and horticultural farmers in South Africa. MSc thesis. University of Limpopo: Polokwane.
- MONTSHWE, B.D., JOOSTE, A. and Z.G. ALEMU. 2005. "An Econometric Analysis of Determinants of Market Participation within the South African Small-Scale Cattle Sub Sector". A paper presented at the 43rd AEASA conference, Limpopo Polokwane, September 21-23, 2005.
- MORRISON, J., DORWARD, A., KYDD, J., POULTON, C. and L. SMITH. 2000. Sustainable livelihoods and new institutional economics. Department for International Development Sustainable Livelihoods Programme: Policies, Institutions and Processes. London.
- MOYO, T. 2010. Determinants of participation of smallholder farmers in the marketing of small grains and strategies for improving their participation in the Limpopo River Basin of Zimbabwe. MSc thesis. University of Pretoria: Pretoria.
- MUSEMWA, L., CHAGWIZA, C., SIKUKA, W., FRASER, G., CHIMONYO, M. and N. MZILENI. 2007. Analysis of Cattle Marketing Channels Used by Small Scale Farmers in the Eastern Cape Province, South Africa. *Livestock Research for Rural Development*. 19(9): Article #131
- MUSEMWA, L., MUSHUNJE, A., CHIMONYO, M., FRASER, G., MAPIYE, C. and V. MUCHENJE. 2008. Nguni cattle marketing constraints and opportunities in the communal areas of South Africa: Review. *African Journal of Agricultural Research* 3(4):239-245.
- NATIONAL DEPARTMENT OF AGRICULTURE (NDA). 2002. Agricultural Statistics.
- NATIONAL DEPARTMENT OF AGRICULTURE, (NDA). 2005. Norms and standards for the establishment of agricultural marketing infrastructure. Directorate: Marketing, Pretoria.
- NATIONAL DEPARTMENT OF AGRICULTURE (NDA). 2006. [www.nda.agric.za/docs/ Crops estimates /DEFINITION%20COMM%20 AND %20SUBSISTENCE.Apr06.doc](http://www.nda.agric.za/docs/Crops%20estimates/DEFINITION%20COMM%20AND%20SUBSISTENCE.Apr06.doc).

NEW PARTNERSHIP FOR AFRICA'S DEVELOPMENT, (NEPAD). 2002. Comprehensive Africa agriculture development programme. From:

<http://www.fao.org/docrep/005/y6831e/y6831e00.htm> (Accessed 5 December 2006).

NGQANGWENI, S., and C. DELGADO. 2003. Decision on livestock keeping in the semi arid areas of Limpopo province. Working paper. University of Pretoria. Pretoria.

NKHORI, P.A. 2004. The impact of transaction costs on the choice of cattle markets in Mahalapye district, Botswana. MSc Dissertation, University of Pretoria, RSA.

ORTMANN, G. and MACHETE, C. 2003. Problems and Opportunities in South African agriculture. In: NIEUWOUDT, L. and GROENEWALD, J. (eds). *The challenge of change: Agriculture, Land and the South African Economy*. University of Natal Press. pg 47-62.

POLOKWANE IDP document. 2010. DRAFT INTEGRATED DEVELOPMENT PLAN (2010/2011).

RANDELA, R. 2005. Integration of emerging cotton farmers into the commercial agricultural economy. Unpublished PhD thesis, University of the Free State, Bloemfontein.

REARDON, T. and C.P. TIMMER. 2006. Transformation of markets for agricultural output in developing countries since 1950: How has thinking changed? In: EVENSON RE, PINGALI P and SCHULTZ TP (eds). *Handbook of Agricultural Economics Volume 3. Agricultural development: farmers, farm production and farm markets*. Amsterdam: Elsevier, pg 15-22.

SENYOLO, G.M., MAKHURA, M.N., CHAMINUKA, P. and A. BELETE. 2006. Factors distinguishing low turnover emerging farmers from high turnover emerging farmers in South Africa. Proceedings of the Agricultural Economics Association of South Africa, 16-19 October. South Africa: Pretoria.

STATISTICS SOUTH AFRICA. 2004. Census of Commercial Agriculture 2002. Pretoria: Statistics South Africa.

TAYLOR, N. and R. CAIRNS. 2001. May Farming make a Contribution to Poverty Alleviation in a Deep Rural Area of South Africa (Nkandla, KwaZulu-Natal)? *South African Regional poverty Network Conference: Land Reform and Poverty Alleviation in South Africa*, Pretoria.

TOBIN, J. 1958. Estimation on Relationship for Limited Dependent Variables. *Econometrica* 26: 26-36.

- VAN ROOYEN, C. J., KIRSTEN, J.F., VAN ZYL, J. and N. VINK. 1995. Structural Adjustment, Policy reform and Agricultural performance in South Africa. Working paper 15: USAID Southern African Trade and Structural Adjustment Project, Pretoria.
- VAN ZYL, J. 1995. The farm size efficiency relationship in South African commercial agriculture. *Agrekon* 34 (4):127-137.
- VON BRAUN, J. 1995. Agricultural commercialisation: impacts on income and nutrition and implications for policy. *Food Policy* 20(3):187-202.
- VON BRAUN, J. and E. KENNEDY. (Eds). 1994. Agricultural commercialisation, economic development and nutrition. London: Johns Hopkins University Press. VELLEMA, S, 2000. Technology and control in Philippine contract farming: the cases of asparagus production and maize seed production. *International Journal of the Sociology of Agriculture and Food* 8(1): 25-34.

APPENDICES

Appendix 1: Questionnaire

Farmers in Polokwane local municipality survey

Research on “Participation and utilisation of formal vegetable markets by smallholder farmers in Polokwane Local Municipality”.

Researcher: Kgabo Hector Ramoroka

University of Limpopo (Turfloop campus), Department of Agricultural Economics, SOVENGA,
0727

Farmer name _____

Village/Town _____

Date _____

A. Crop production

1. Which crops did you grow in the 2009/2010 season?

For the four major vegetable crops you grow, please complete the table below.

Crop grown	Area planted(units as given by farmer)	Total production (units as given by farmer)	
		Season 1	Season 2

B. Crop marketing

1. Do you normally sell your vegetable crops? Yes No

1.1 If yes, complete the table below

Crop sold	Where do you sell (list buyers)	Quantity sold (units as given by farmer)		Value of crop per unit (rands)	
		Season 1	Season 1	Season 1	Season 2

2. Do you always find a market for all the goods you produce? Yes No

2.1 If NO, what happens to the unsold produce? (Tick)

Lose to spoilage	Eat (family and friends)	Sell at low prices	Store and sell later	Process it	Other (specify)

3. Does your household normally sell to formal markets such as fresh produce markets (e.g. fruit & veg city, Goseame) and supermarkets (e.g. Pick n Pay, Spar)? Yes No

3.1 If no, why is your household not selling to such markets? _____

3.2 Would you be interested in selling to these formal markets? Yes No

3.3 Why? _____

3.4 If yes indicate the approximate percentage of your produce you sell to these formal markets

Less than 25% 25-50% 51-75% More than 75%

4. Farmers' suggestions for improving marketing of vegetables. List three suggestions in order of importance.

Rank	Suggestion
1	
2	
3	

C. Transportation

1. How is your produce moved to the market? (Tick)

Own transport	Hired (individual)	Hired (group)	Buyer transport	Public transport	Other (specify)

1.1 Type of vehicle used

Vehicle	Truck	Bakie	Tractor	Other(specify)
Tick				

1.2 Indicate the cost associated with each transport type used by your household per delivery/ unit of measure used. (Indicate the cost in the second row below)

Own transport	Hired (individual)	Hired (group)	Buyer transport	Public transport	Other
R	R	R	R	R	R

D. General information on farmers and infrastructure

1. Does your household have access to non-farm income? Yes No

1.1 If yes, which income class does your household fall in per month? (Tick)

<700	700-1500	1500-3000	3000-5000	>5000

2. What type of road do you use to the market? (Tick)

Gravel road only	Tarred road only	Both

2.1 How do you rate the state of the road? (Tick)

Bad	average	Good

3. Where do you get information on markets that you use? _____

4. Where do you get information on prices? _____

5. Are you involved in extension program? Yes No

5.1 If yes, indicate the services you get _____

3.2 If no, why are you not involved in extension program? _____

THANK YOU