MIDLANDS STATE UNIVERSITY

DETERMINATES OF SMALLHOLDER SMALL GRAIN (*sorghum, pearl millet and rapoko*) FARMER MARKET PARTICIPATION AND CHOICE OF MARKETING OUTLETS. A CASE OF MARANDA, WARD 9, MWENEZI, MASVINGO PROVINCE.

BY

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A research project submitted in partial fulfillment of the requirements of a Bachelor Science Honours Degree in Agricultural Economics and Development

Department of Agricultural Economics and Development

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Midland State University

June 2018

CERTIFICATION OF DISSERTATION

The under designed certify that they have read and recommended for submission to the department of Agricultural Economics and Development ,in partial fulfillment of the requirements for the Bachelor of Science Honours Degree in Agricultural Economics and Development , areas research project by Makotose Taidaishe L entitled :

DETERMINATES OF SMALLHOLDER SMALL GRAIN (*sorghum, millet and rapoko*) FARMER MARKET PARTICIPATION AND CHOICE OF MARKETING OUTLETS. A CASE OF MARANDA, WARD 9, MWENEZI, MASVINGO PROVINCE.

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Coordinator (Mr S.Masunda)

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DEDICATION

To my grandmother Vongai Magret Chayamiti and my dear parents in heaven Ottilia Chayamiti and Tichaona Makotose.

ABSTRACT

Markets are crucial for agricultural growth and transformation. Following the persistent climatic changes in Zimbabwe farmers in Agro ecological region III, IV and V have been encouraged to grow small grains as a diversification coping strategy. Smallholder famer's access to profitable markets is vital so as to improve commercialization of small grain (sorghum, millet, rapoko) farming in Zimbabwe. This study therefore seeks to determine the factors influencing small grain smallholder farmers marketing outlets, choice of marketing outlets and the impact of post-harvest management on market participation in Maranda, district, ward 9 Mwenezi .The cross sectional data were collected from a sample of 94 households using the snowballing sampling technique. STATA 11 statistical package was used to analyze data. Descriptive statistics on the characteristics of small holder farmers were done and it was found that the results showed that the 69.15% females were the major participants in small grain marketing outlets compared to their counter parts. Multinomial logistic regression model was used to determine the factors influencing small grain small holder farmers marketing outlet choice using .Marginal effects were then used to interpret data. The study found out that sources of price information and also the payment procedures have a significant effect to the marketing outlets farmers do not prefer to sell their output at GMB, because they have got the wrong information from the co farmers who are the major source of information .Post harvest management do have a significant effect on market participation because farmers have poor storage infrastructure and also the storage costs exceeds the production costs. At the end the farmers end up selling their grains early after harvest with aims to reduce storage costs. There is need to profile farmers on the basis of production, spatial location and education level and encourage them to participant in marketing profitable marketing outlets.

Keywords: Small grains, Multinomial logit model, Market participation

ACKNOWLEDGEMENTS

The success of this study has been deeply complemented by the efforts of my supervisor Mr C Nyamutowa for his support, patience and guidance, skills and expertise to take it from an idea to a full research report. I greatly appreciate his unconditional support to the success of this study.

Special thanks to Thelma Makwande ,Stabile Mbedzi and to my classmates for the help they rendered directly or indirectly in making this research a success.

There are other people who helped me with ideas and resources so that this research becomes a success, not mentioning you by name does not mean lack of appreciation. My undying gratitude and profound appreciation to you.

Lastly and above all, to God be the glory for all the guidance.

Table of Contents

MIDLANDS STATE UNIVERSITY 1
CERTIFICATION OF DISSERTATION 2
DEDICATION 3
ABSTRACT 4
ACKNOWLEDGEMENTS 5
List of Appendix 8
LIST OF FIGURES 9
CHAPTER ONE : INTRODUCTION 12
1.1 Background of the study 12
1.2 Problem statement 16
1.3 Objectives 16
1.4 Research questions 17
1.5 Justification of the study 17
1.6 Organization of the study 18
CHAPTER 2 :LITERATURE REVIEW 19
2.1 Introduction 19
2.2 DEFINITION OF TERMS 19
2.3 THEORETICAL CONCEPTS 21
2.3.1 Different Markets for selling crops in Zimbabwe 22
2.3.2 Comparative advantage theory 23
2.3.3 Nee's theory of market transition 23
2.3.5 Utility maximization theory 24
2.3.6 Grain Production Trends in Zimbabwe 25
2.3.7 Importance of sorghum and millet to household food security 26
2.3.8 Market Development for sorghum and millet 26
2.4 Empirical Review 27
2.5 Insights from the Literature 30
2.6 Conclusion 31
CHAPTER THREE: RESEARCH METHODOLOGY 32
3.1 Introduction 32
3.2Research Design 32
3.3 Conceptual framework 33
3.4 Study area 34
3.5 Sampling and Data Collection method 35
3.6 Analytical framework 36

3.8 Justification of variables 40
3.9 Diagnostic Tests 44
Model Specification 44
Heteroscedasticity 44
CHAPTER FOUR: RESULTS AND DISCUSSION 44
4.1 Introduction 44
4.2 To determine the factors that influence participation of smallholder farmers in different small grain marketing outlets 50
4.3 To evaluate the impacts of post-harvest losses on market participation 54
4.4 Conclusion 59
CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS 60
5.1 Introduction 60
5.2 Summary 60
5.3 Recommendations 61
5.5 Areas of Further Study 61
Refrence list 64

List of Appendix

Appendix 1 Questionnaire 66
Appendix 2: marginal effects after the Multinomial logit 71
Appendix 3: Descriptive statistics 72
Appendix 4:Off farm income sources 72
Appendix 5:Sex of household responded 72
Appendix 6: Sources for agricultural information 73
Appendix 7: farmer occupation type 73
Appendix 8 distance to the markets 73
Appendix 9: Gender of the respondents 73
Appendix 10:Multinomial logistic regression outcome 74
Appendix 11 74
Appendix 12:Marginal effects regression 74
Appendix 13:Diagnostic Tests 77

LIST OF FIGURES

Figure 1: Contribution of Agriculture to Zimbabwe 21
Figure 2: Types of Markets for crops selling in Zimbabwe 22
Figure 3: Average household cereal production by province 25
Figure 4:Conceptual framework 34
Figure 5 :Gender of the market participation 46
Figure 6: Market outlets response according to educational level 48
Figure 7: Source of Marketing Information 49
Figure 8: Grain storage facilities used by the small holder farmers 55

LIST OF TABLES

Table 1:Objectives 36
Table 2: Descriptive statistics on small holder farmer's characteristics 45
Table 3:Off farm employment 46
Table 4:Occupation of the market participant 47
Table 5: Market outlets and the number of participant's 47
Table 6 :Distance from farm to marketing outlet GMB 49
Table 7: Different stages of post-harvest small grain losses 56
Table 8: Cost benefit analysis 57
Table 9: Test for model specification 58
Table 10:test for heteroscedasticity 58

LIST OF ABREVIATIONS AND ACRONYMS

AMA	AGRICULTURAL MARKERTING AUTHORITY
CARE	CO OPERATIVE FOR ASSISTANCE AND RELIEF EVERY WHERE
FAO	FOOD AND AGRICULTURE ORGANISTION
GMB	GRAIN MARKERTING BOARD
MNL	MULTINOMIAL LOGIT
SADAC	SOURTHERN AFRICAN DEVELOPMENT COMMUNITY
ZIMVAC	ZIMBABWE VULNERABILITY ASSESMENT REPORT

CHAPTER ONE : INTRODUCTION

1.1 Background of the study

Markets are significant for economic growth and sustainable development of a given country, but emphases in development policies in agrarian countries have usually been placed on increasing agricultural production to serve as a base for rural development. In the absence of well-functioning markets, agricultural production can experience several drawbacks (Belay, 2009).

Agriculture is dominated by the smallholder farming sector, with more than one million smallholder farmers and less than five thousand large scale farmers Masanganise ,(2002). The sector is characterized by high smallholder participation and represents a source of livelihood to about 80% of the population (World Bank, 2008). Thus, the sector has a considerable impact on rural incomes, poverty reduction and food security.

According to FAO (2008), findings large parts of the SADC are semi-arid, with erratic rainfall and nutrient poor soils. While maize is the major staple that is grown in this region as a whole, sorghum and millet were found to be important crops in these driest regions where rural farm households have limited production capacity and lowest incomes FAO,(2008). Sorghum and millet being drought tolerant have a strong adaptive advantage and lower risk of failure than other cereals in such environments. In Zimbabwe, like other countries in the SADC region, production of the main staple maize continues to dominate in its semi-arid areas.

Small grains (sorghum, rapoko, finger millet) are ranked second as staple cereal crops after maize in Zimbabwe. They play a vital role in food and nutrition security .Their drought tolerant nature make them able to thrive in marginal areas for thus being an answer to gain food security in this current environment of climate change and variability. According to Nsingo (2015) he pointed out that, farmers in drought prone areas of Masvingo, parts of Midlands, Matabele land North and South Provinces that are unlikely to realize any meaningful yields due to the forecasted very low rains this season. As such farmers are encouraged to shift their attention from cropping maize to drought tolerant small grains like sorghum, millet and rapoko.

In Zimbabwe, particularly Masvingo province located under the agro ecological farming region four has a good potential in cereal small grain(pearl millet, sorghum and rapoko) production for which smallholder farming have diversified from staple food subsistence production into more market oriented and higher value commodities though they have limited knowledge on marketing these grain crops. There has been limited study with regard to the performance of cereal small grain market and challenges of the market.

Small grains have been commercialized to a smaller extent and some farmers are selling their produce to GMB ,who later sell this to the brewing companies like Delta ,Ingwebo and other milling companies like Unifoods and other stock feed producers like Capital foods .According to (Dube 2008) ,he pointed out that in an interview he conducted farmers pointed out that sometimes GMB refuses to buy their grains pointing that they need to produce more if they want to sell their produce making the grains to be a challenge to sell on national level .

There is need to readdress the attitudes of the small holder farmers .Farmers should change their behavior from selling surplus to being market oriented. This will help in the decision being taken by farmer in selling his or her produce. This idea of being seller of surplus is leading to farmers selling to private buyers who give them very little money of exchange of consumables at un reasonable rates, for example a bucket of sorghum for two kilograms of sugar. Most small holder operations are ordained with the family as the center of planning, decision-making and implementation. The marketing decisions are taken by the farmers in terms of whether to sell or not to sell and the quantity to be taken to the market. These decisions determine their market participation. Policies for commercial transformation of smallholder agriculture are often aimed at promoting household market participation Gebremedhin and Jaleta (2013). Salami et al. (2010) states that improved market participation is a key precondition for transformation of the agriculture sector from subsistence to commercial production

When the small holder farmers acknowledged the strong backing from the Government of Zimbabwe an improvement in the production of small grains such as sorghum, millet, rapoko has been noticed. These have been on the decline as farmers experienced challenges in securing commercial buyers, also experiencing post-harvest losses. Chabikwa (2015), alluded that significant improvements are still needed in the production of small grains with priority being establishment of a post-harvest market system. However, the general trend in most

southern African countries is that most agricultural produce is lost soon after production largely because of poor post-harvest handling and failure to access the formal markets Phiri and Otieno (2008). This trend is attributed to several factors and barriers in agricultural commodity marketing that discourage smallholder farmers from participating in formal markets. These factors range from household characteristics for instance low education levels, labor shortages, inadequate government services, high transaction costs and lack of physical infrastructure Jagwe et al., (2010).

According to IFAD (2003), market participation can be an effective route for rural smallholder farmers to move out of abject poverty and increase income. Studies show that market participation by smallholder farmers in developing countries is very low Barret (2008). This scenario has slowed down agriculture driven economic growth and exacerbated poverty levels. As such farmers cannot benefit from the welfare gains and income growth associated with market participation. However, for agriculture to meaningfully contribute to economic growth, smallholder farmers have to commercialize their farming activities to produce marketable surpluses Jagwe et al.,(2010).

The trade theory postulates that if households participate in markets by selling surplus of what they produce on a comparative advantage, they are set to benefit not only from the direct welfare gains but also from opportunities that emerge from economies of large-scale production Siziba et al. (2011). Indeed, they will also benefit from technological change effects from the improved flow of ideas from trade-based interactions Barrett (2008).

Consequently, there will be improved factor productivity. Despite the stream of benefits that are inherent with market participation, evidence from studies in southern Africa shows that smallholder farmers' participation in agricultural output markets is low due to high market transaction costs, information asymmetries, and institutional constraints among other constraints. Barret (2008) argues that inducing market participation through trade and price based market interventions does not provide the sufficient conditions to induce improved participation. In addition to these policies, households need to have access to productive assets, adequate private and public investment, institutional and physical infrastructure to access remunerative markets Siziba et al. (2011). As noted by Barret (2008) such smallholder farmers with access to production, private and public sector goods, properly functioning

institutions and well developed physical infrastructure actively participate in markets contrary to their counterparts.

Therefore, understanding smallholder marketing of sorghum is important for increased participation which may lead to increased farmer incomes, ensure food security and ultimately reduced poverty. One of the limiting constraints faced by smallholder farmers is linked to poor market access Makhura, (2001). In rural areas, farmers lack sufficient means to overcome the costs of entering the market due to high transaction costs Barrett (2008) Komarek (2010). Poor infrastructure and weak institutions cause transaction costs to rise, which considerably alter production and market-participation decisions. The majority of smallholder farmers are located in remote areas with poor transport and market infrastructures, contributing to the high transaction costs they are already facing. In addition, they lack reliable market information as well as information on potential exchange partners Ouma et al., (2010). Furthermore, in many instances, the poor do not possess the level of assets required to protect themselves from market, natural, political and social shocks Handley et al., (2009). According to Barret (2008), private asset accumulation, public infrastructure and services are the prerequisites that smallholders need to escape from subsistence production and produce marketable surplus.

This study aims to establish factors affecting small holder farmer to participate in the small grain market, the choice of marketing outlets and the impacts of post-harvest practices . The results of this study are essential in contributing to the existing body of knowledge on small grain market participation which is limited locally as most previous research concentrated on biophysical aspects of sorghum production to ensure food security.

1.2 Problem statement

The participation of smallholder farmers in the marketing of output and purchasing of input in developing countries is insignificant, particularly in the output market. There are no clear markets for small grain producers in Zimbabwe, hence the farmers decide to produce small grains at a small scale compared to maize and that the producer price for small grains is too low relative to the labor requirements. This is supported by Mukeredzi (2017) he pointed out that, small holder farmers are obtaining a better yield from the small grains but they are no markets for them to sell their produce. Small holder farmers decision to produce either for consumption ,sale or to participate in a market by selling off what remains after consumption depends on many factors other than the price of the commodity.

Small holder farmers are constrained with problems including those of poor infrastructure, inadequate access to markets, and lack of marketing information. Small grain farmers who reside in rural areas do not get their produce to the market at the right time, considerable post-harvest losses will occur. Therefore it is very important that such another factors are explored to know of their effect on market participation. Consequently, it was not clear of the available marketing outlets offered better prices for the farmers' output. It is, expected that a profit maximizing producer will use a marketing outlet that maximizes profits and subsequently improves on their welfare.

The lack of information concerning the extent of market participation by smallholder farmers in Zimbabwe on small grain marketing, and their choice of marketing outlets was the basis of the study. This study attempted to fill these knowledge gaps in small grain marketing .

1.3 Objectives

The overall objective of the study was to investigate smallholder farmer participation in small grain marketing through the different marketing outlets in Zimbabwe.

The specific objectives are to:

i. To characterize the smallholder small grain farmers participating in the different marketing outlets.
ii. Determine the factors that influence participation of smallholder farmers in different small grain marketing outlets.
iii. Evaluate the effects of postharvest storage on market participation.

1.4 Research questions

1. What are the characteristics of the smallholder small grain farmers participating in different grain marketing outlets?
2. What are the factors influencing smallholder farmer participation in small grain in different marketing outlets?
3. What are effects of postharvest storage on market participation?

1.5 Justification of the study

Factors affecting small holder farmer participation and choice of marketing outlets can be used as a measure of the level of commercialization among the farming households. Commercialization is an important aspect of smallholder farming since it acts as a form of rural employment and source of income to the farming households. The generation of income helps alleviate poverty levels and thus improved livelihood. The choice of marketing outlets by the individual farmers helps them in exploring the options from which they derive maximum satisfaction

.

Smallholder farmers participation 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. (2001) and Makhura (2001)

An understanding on the factors affecting smallholder farmer market participation will help the stakeholders to effectively establish efficient policies extension projects and programs that would promote commercialization. Identifying price differentials between

the various marketing outlets helps inform farmers on profitable outlets to market their small grains and improve small grain farming in drought prone areas so as to cope up with climatic changes, and ensure food security.

1.6 Organization of the study

The study will be comprised of five chapters including an appendix section .The first chapter offers a brief background to the study, statement of the problem, aims and objectives and justification of the study.

The second chapter comprises of the literature review in which the key terms are defined the conceptual framework ,theoretical framework and empirical review on market participation ,welfare effects and impacts of post-harvest management practices on the participation of small holder farmers in small grain marketing.

The third chapter gives an overview of the study area including where it is situated and the main agricultural activities. The chapter explains the sampling procedure, data collection procedure and the variables collected. The methodology is also presented, it further clarifies on the method of data analysis, pointing out the reasons for choosing such analytical methods.

Chapter four presents results of the research and the interpretation. Finally, chapter five presents the conclusions, summary and recommendations that were drawn from the research.

CHAPTER 2 :LITERATURE REVIEW

2.1 Introduction

This chapter reviews theoretical and empirical literature relating to smallholder market participation, choice of marketing outlets, post-harvest management practices effects on market participation. The chapter starts by offering some definitional aspects of terms of the study. An exact understanding of these terms is important in explaining smallholder farmer's market participation, marketing outlets and post-harvest management practices effects on market participation in the study area.

2.2 DEFINITION OF TERMS

Marketing is defined as an activity ,set of institutions and processes for creating, communicating ,delivering and exchanging offerings that have value for customers, clients ,partners and society at large American Marketing Association (2008) . Marketing is the social process by which individuals and organizations obtain what they need and want through creating and exchanging values with others Kotler and Armstrong (2010)**.**

Market participation refers to any market related activity which promotes sale of produce. William et al. (2008), defines market participation in terms of sales as fraction of total output, for the sum of all agricultural crop production .In the household which includes annuals and perennials, locally processed and industrial crops, fruits and agroforestry. Sales index would be zero for a household that sells nothing, and could be greater than unity for households that add value to their crop production through further processing or storage. According to Ehui

(2002) market participation was defined as any related activity which promotes sale of produce.

Smallholder farmer is one who practises agriculture at small-scale practicing pastoralism, fishing, forestry and or crop production at land less than 10 hectares. Production is mainly for own consumption with very little to sell and production is anchored on family labour (FAO, 2013). According to the Women In Informal Employment (2017), a smallholder farmer is one who does not own or have full control of the land and is not well resourced. They usually form the informal sector of the economy. In most instances smallholder farmers rely on family labour and are the most vulnerable in the value chain.

2.3 THEORETICAL CONCEPTS

Agriculture plays an important role in the development of the Zimbabwean economy though its impact on the overall economic growth, households' income generation and food security according to Malabo and Zitsanza (2001).It was further supported by Maiyaki (2010),he alluded that agricultural sector is significantly contributing to the economy as the population largely depends on it either directly or indirectly for their livelihoods. Figure 1 gives a detailed picture of the contribution of agriculture to the economy.

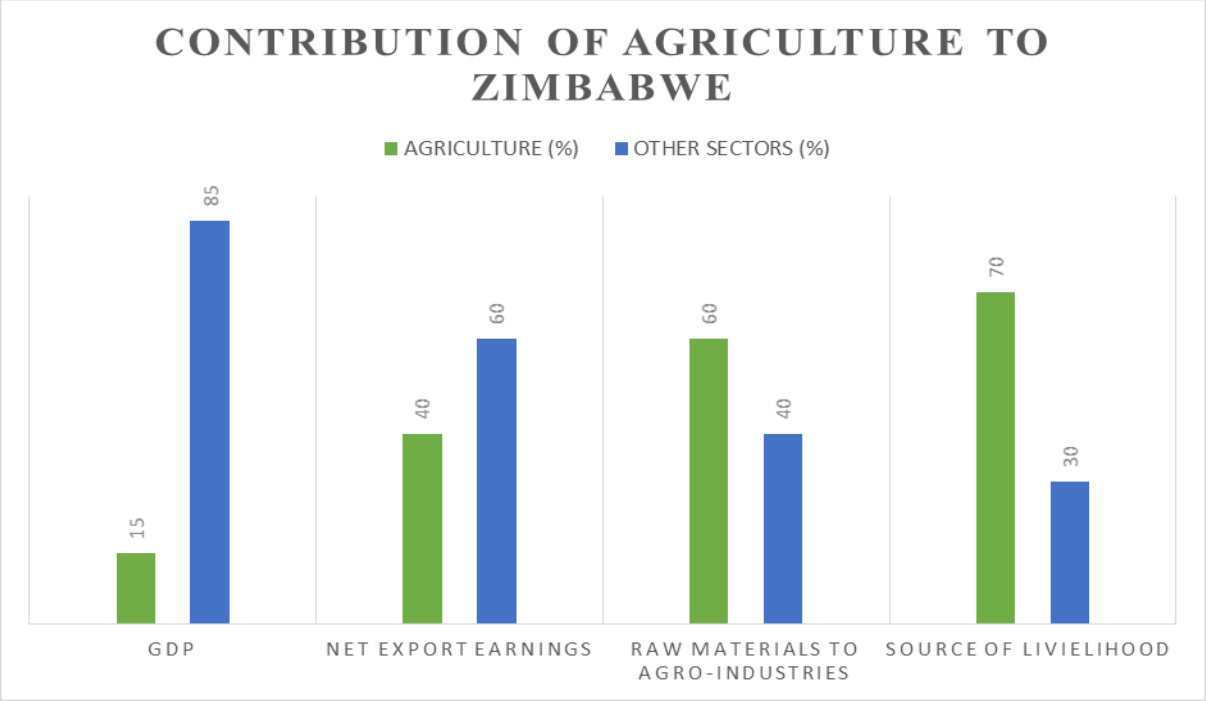


Figure 1: Contribution of Agriculture to Zimbabwe

Source: Zimbabwe Agricultural Framework - April 2012

2.3.1 Different Markets for selling crops in Zimbabwe

In Zimbabwe there are seven types of common markets were crops are sold. Crops are sold by farmers to other households, private trade, GMB, Auction floors, Local Millers, Distant markets, contracting companies. Most of the crops are being sold to other household in the area or in the district, with sorghum grain and pearl millet being the highest grains which are being traded 81% and 82% of the sales are done within the region. Most households sold crops to other households in the area and private traders, about 5% of wards had households which sold maize to the GMB while 2% had sold sorghum to GM (ZIMVAC,2017).Below is figure 2 illustrating the ZIMVAC 2017 report .

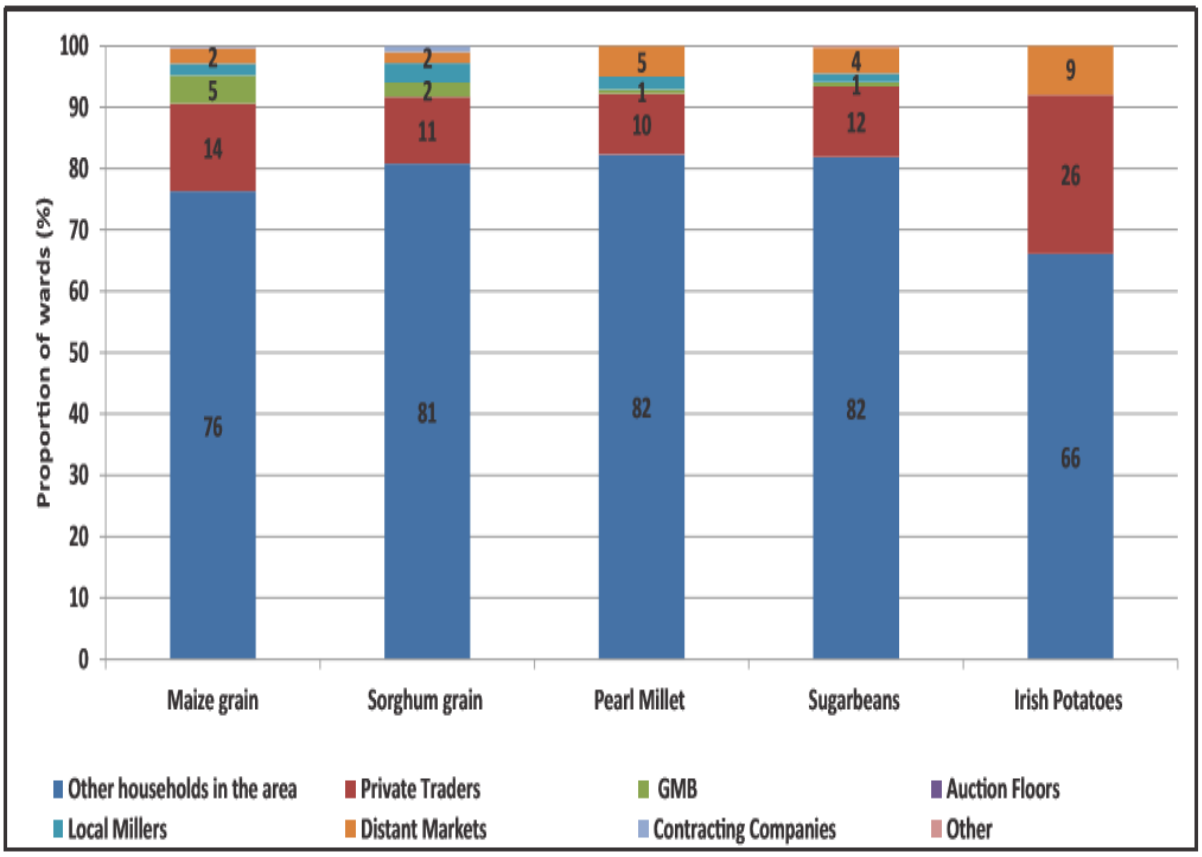


Figure 2: Types of Markets for crops selling in Zimbabwe

Source: ZIMVAC Rural Livelihoods Assessment Report 2017

2.3.2 Comparative advantage theory

The theoretical foundations of why farm households decide to participate in agricultural markets can be found in the trade theory as postulated by David Ricardo in his classical theory of Comparative Advantage of 1817. According to the theory farmers are essentially driven to enter into trade so that they can enjoy a diverse consumption bundle. They can exploit welfare gains from trading by concentrating in the production of goods they have comparative advantage, and exchange for those they have no comparative advantage. This trade theory though it explains the primary motive for farmers to participate in markets, it does not comprehensively identify factors affecting market participation.

2.3.3 Nee's theory of market transition

One sound theory explaining the small holder farmer's market participation behavior is Nee's (1989) theory of market transition, from redistribution to markets economy in state socialism. The theory tries to show the economic reforms from state redistribution economy to market like economy. It is understood to be the fundamental thinking of market participation of small holder farmers emphasizing on providing necessary market services at market place so as to empower small holder farmers Nee (1989) used three ***thesis*** to explain the effect of the transition to transitive markets on the distribution of rewards in state socialism which tends to empower farmer to have direct decision in marketing process. These include market power thesis, incentive thesis and market opportunity thesis.

The market power thesis argues that as markets replace redistributive mechanisms in the allocation and distribution of goods, there is a shift in the sources of power from the redistributive sector to the marketplace. This means, improving market infrastructures and facilities can attract farmers.

The market incentive thesis argues that markets provide more incentives than do redistributive economies. First, markets provide powerful incentives to direct producers through both positive and negative sanctions; these include grading, packaging, transportation, weighing and market information**.**

The market opportunity thesis argues that because of changes in the structure of opportunities entrepreneurship has become a new way for mobility for peasant farmers.

2.3.4 The Concept of Market Participation

The concept of market participation has been defined and interpreted in different ways. Based on the work of Barret (2008), two basic interpretations can be established .He emphasizes that households can participate in the market either as sellers or buyers. Both decisions to enter in to the market as neither as a seller nor as a buyer is motivated by the theory of optimization where the household seeks to maximise utility subject to the cash budget and the available non-tradeable resources.

Key et al. (2000), and Holloway et al. (2005) supports the above as they also conclude that market participation is a two stage phenomenon ,in the first stage households either to be ,and then in the second stage ,net buyers ,net sellers or to be autarchic in the market for that commodity in the second stage ,net buyers and net sellers determine the extent of market participation. The similarity of this view to Barrett's is in the second stage. Therefore market participation has a demand side; households participating as buyers, and a supply side; households participating as sellers.

2.3.5 Utility maximization theory

The decision on the proportion of output to sell and the proportion to retain depends on the expected level of satisfaction derived from selling the output. This decision can be influenced by the socio-economic characteristics of the producer. Those who use small grains for home consumption as a staple crop and have large household size may opt to sell less in the market and retain more for home consumption. Those who participate in the market have to utilize marketing outlets that maximize their profits or expected utility such as convenience and relations. According to Pryanishnikov and Katarina (2003), households seek to maximize utility through the consumption of various agricultural commodities, for which it may produce some to consume, or trade in order to obtain those it cannot produce. Therefore farm households may engage in a supplier side type of market participation, by selling of surplus

that remains after consumption. But also, they may choose to participate on the demand side, in which case they would largely purchase commodities that they cannot produce.

2.3.6 Grain Production Trends in Zimbabwe

In Zimbabwe grains such as maize, wheat and small grains (millet, sorghum and rapoko)are most considered because they are the main staple food and contribute over 70 per cent calorie requirements Jayne et al 2006). According to ZIMVAC (2017) report , nationally there was a 266% increase in average household cereal production, 280% increase in average household maize production and 157% increase in average household small grains production from the 2015/2016 compared to the 2016/2017 cropping season. The average household production was highest in Mashonaland West 739.2 kg and the least in Matabeleland South with 174.5 kg. Masvingo had the highest increase from 42.3 kg to 356.7 kg and Mashonaland West had the least from 397.6 kg to 739.2 kg. Most households use improper facilities to store their grain, there is need to foster good post-harvest management to minimize potential high post-harvest losses. Below is figure 3 illustrating the above statement.

Province	Maize (kg)			Small grains (kg)		
	2014/2015	2015/2016	2016/2017	2014/2015	2015/2016	2016/2017
Manicaland	292.4	108.6	335.1	24.8	4.9	30.9
Mash Central	525.8	136.2	517.5	32.8	7.7	45.9
Mash East	367.0	124.1	378.7	15.1	2.9	23.7
Mash West	462.2	397.6	739.2	5.4	6.2	1.1
Mat North	142.8	48.1	240.5	127.1	57.1	88.1
Mat South	74.6	22.8	174.5	15.3	19.1	68.4
Midlands	292.7	132.3	522.9	10.1	11.4	29.0
Masvingo	136.4	42.3	356.7	14.7	21.9	86.1
National	**293.5**	**126.5**	**480.9**	**29.5**	**16.4**	**42.2**

Figure 3: Average household cereal production by province

2.3.7 Importance of sorghum and millet to household food security

According to FAO (2008), small grains are the answer to chronic food shortages to rural communities who reside in semi-arid regions especially of the sub Saharan region .This was further supported by Taylor (2003), sorghum and millet are virtually important cereals for the maintenance of food security in Africa.

In a study conducted by Almira and Rusike (2005) they revealed that new sorghum and millet varieties can reduce the probability of zero yields. Therefore they and make a significant contribution to household food security in drought areas.

Regardless of this, Taylor (2003) pointed out that sorghum and millets are still under researched compared to other cereals. In this view he suggests that with proper research sorghum and millets could play a more role and will offer better long term food security than maize, this is because sorghum ,pearl millet are indigenous African cereals ,unlike wheat and maize adopted from the Subtropical agronomic conditions.

2.3.8 Market Development for sorghum and millet

Zimbabwe's grain marketing system transformed dramatically in the 1990s from a government controlled system in which all cereal grain prices are determined by market forces. All agricultural produce marketing was regulated through the Agricultural Marketing Authority (AMA) until 1994.

The Grain Marketing Board (GMB) was the sole buyer of all grain before market deregulation in 1991. The government embarked on liberalization programmes due to the general failure of parastatal marketing boards and donor pressure. This market evolution resulted in many players getting involved in the marketing of sorghum and millet (though in smaller quantities relative to maize) and all other crops.

Smallholder farmers, however, have always been disadvantaged even with any marketing system which operated. The situation has worsened given that now prices of agricultural

commodities are market determined. The exception is the GMB, which still sets floor prices for commodities which it used to buy and sell. Despite some agricultural producers getting high prices for their commodities, smallholder farmers are still getting low returns especially for sorghum and millets (FAO, 1995; CARE International, 2001,Rohrbach, 2003). Thus, there is need to empower these farmers and train them in better marketing strategies to realize what they actually deserve, in terms of prices

Following this further FAO (1995) reported that Zimbabwe's formal market handle less than 10 per cent of total sorghum and millet production. In addition, FAO (1995) also noted that most of the sorghum and millets produced in Zimbabwe is consumed by the producing households, or sold in the informal markets, mainly for traditional beer brewing.

However, in Zimbabwe the price of maize in the informal markets is cheaper than that of sorghum and millets (FAO, 1995). Hence, in terms of market potential there is good reason to expand production of sorghum and millets in Zimbabwe's rural areas in view of the price differences.

2.4 Empirical Review

Several econometric models have been applied in the empirical studies of market participation .These studies typically adopt a two-step analytical approach, though some studies do adopt the one step approach.

The household commercialization index was used to estimate the levels of smallholder farmers in the Upper West Region of Ghana in a study done by Musah (2013) .The household index was used to estimate the levels of participation and also the two step analytical method known as the double hurdle model was used to estimate both marker participation and intensity of participation. The Garret ranking technique was used to rank the constraints to marketing .The results indicated that about twenty four percent and fifty three percent of maize and ground nut are sold I the region within a production year, which implied that there was low and moderate commercialization indices for maize and ground and respectively .According to Musah (2013) he found that farmer socioeconomic characteristic's such as age ,gender ,education, household, size ,private asserts such as farm size ,output ,experience

,public assets variables such as credit, extension contact ,price and transaction cost variables such as market information and point of sale, significantly influenced the probability and intensity of market participation behavior in the region.

In a study examining the factors that influenced the intensity of market participation among the small holder famers in Kenya, (Omiti, Otieno , Nyanamba, & Mccullogh, 2009) used the truncated regression model for their analysis. Their results showed that farmers in the peri urban areas sold higher proportions of their output than those in the rural areas. It was found that distance from farm to point of sale is a major constraint in the intensity of market participation.

Zamasiya et al, (2014) in a study to examine the determinates of soybean market participation by smallholder farmers in Zimbabwe .He used a sample of 187 smallholder farmers from Guruve, were he employed the Hackman's Probit model. His study findings show that the use of inoculants and improved soybean seed varieties are significantly correlated with farmer's market participation, ownership of radios has a positive effect on the household decision to participate in markets. Further results also shown that male headed households are less likely than female headed to participate in the soybean markets because legumes are seen as women crops.

According to the study done by Okoye et al. (2016) on the effect of transaction costs on market participation among smallholder cassava farmers in central Madagascar .He found out that the coefficients for membership with decision to participate in the market and which is significant at 1% level and road condition to the nearest own is good at 10% level. The coefficients for age ,distance to the nearest town and distance from the farm to the market have an indirect relationship with decision to participate in the market and which is significant at 5,10 and 1 % respectively .These results also show that the coefficients for personal means of transportation and marketing experience have a direct relationship with decision to sell cassava off farm and at 10 and 1% level of significance respectively, while distance to the nearest town and distance from the market had an indirect relationship with the decision to sell off farm at 5% significance level of significance each and cost of transportation at 1% level .

In a study that was undertaken in Rwanda to access the factors that influence market participation and extent among bean growers by (Mbitsemunda ,Karangwa, 2017).the extent of market participation was analyzed using Tobit model. The results indicated that factors that positively and significantly influence the probability of farmers to participate in output market were bean quality produced ,market experience and access to credit while factors that negatively and significantly influenced market participation decisions include distance to nearest market age and access to off farm activities. Tobit results also revealed that factors that were found to have positive statistical significant impact on the extent of market participation were quantity produced, marketing experience and selling price.

Turaa et al (2016),in his study to identify factors affecting market participation and intensity of marketed surplus of teff .he found out that market participation of small holder farmers was significantly affected by access to credit perception of farmers on lagged market price of teff, family size, agroecology, farm size and ownership of transport equipment. The intensity of marketed supply was significantly influenced by family size, agroecology, distance to the nearest market .farm size, perception of current price, income from other farming and off farm activity and livestock holding.

Osamin, Hossain (2015) undertook a study to evaluate the important factors that influence smallholder farmers decision to participate in Bangladesh and .to examine the relationship between the small holder farmers decision to participate in the market and also the factors that affect these farmers decisions Probit regression model was used. The findings of the study indicated that there is moderate level of market participation by households who decide to participate in the market with 57% sales of their produced crops.it was alluded that farm size ,household size ,household labor ,income from livestock and farm income are the main factors that affect the smallholders farmer decision to participate in the output market .

Asfaw et al. (2012) did a study on smallholder market and rural poverty in Tanzania, and found that there is a statistically significant impact of maize and pigeon pea market participation in improving household welfare and poverty reduction in Tanzania. Similarly examines the impact of pigeon pea market participation in Kenya. Results shown that market participants have significantly higher food security status than non-participants.

Sikawa and Mugisha (2010) analysed the factors influencing south-western Uganda dairy farmers' choice of the milk marketing channel. The study categorized milk market choices in to a binary outcome of formal and informal market channels. Using a Heckman probit model

was age of the dairy farmer, membership in cooperative, form of payment, volume of milk produced, level of education of the dairy farmer and marketing costs were found to influence the choice of milk marketing channel choice.

Ohen et al. (2014) conducted a study on the determinants of market participation by smallholder cucumber farmers in Nigeria in his study probit regression model was used .the results from the regression revealed that distance to the market, market participation, market information and quantity harvested were significantly and are the important factors affecting the ability of the smallholder farmers to participate in output market.

In a study under taken by Honja et al.(2017) which aimed at identifying of factors affecting market outlet choice of the smallholder mango producers in Ethiopia. Multivariate probit model was used in their study. Their results revealed obtained from multivariate probit model indicated that variables such as family size, distance to the market, quantity of mango produced, price offered, access to market information and access to non- farm income determined the decision of choice of wholesaler, collector, retailer and consumer market outlets at different significance level. Therefore, variables affecting the choice of wholesaler and consumer market outlet should be promoted and farm gate and retail price intervention is quite important to maximize the economic benefit of farmers.

2.5 Insights from the Literature

It is evident that small grain smallholder farmer market participation is of greater importance as far as agriculture and climate change adaptation is concerned. However much has not been done at local level to determine the factors affecting small grain small holder farmer market participation, choice of marketing outlets. Lack of information on marketing and high transaction costs negatively impact the smallholder farmer market participation and choice of marketing outlets.

Since the research is determining the factors affecting small grain smallholder farmer market participation and choice of marketing outlets, multinomial logistic regression model is used.

The study uses variables like age, gender, level of education, farm size, household size, marketing outlets and distance to the market from similar studies.

2.6 Conclusion

This chapter defined terms used in the study so as to paint an exact picture of what the study entails. It gave a framework of the underlying theory of the study as well as the empirical review. In the last section, the researcher drew insights from available literature. The sampling and data collection methods obtained from literature are presented in the following section.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter begins with the account of the research design, conceptual frame work .The description of the study area that is, location, climate, and an overview of the district where the study was conducted is outlined. The last section of this chapter unpacks the methodologies employed for both qualitative and quantitative data and the statistical analyses used.

3.2Research Design

In this study, the researcher used both qualitative and quantitative research approaches. The researcher adopted a case study design. Case study design is more of a choice of what to study. According to Creswell (2007), a case study involves an exploration of a "bounded system" (bounded by time, context or place), or a single or multiple case, over a period of time through detailed, in-depth data collection involving multiple sources of information.

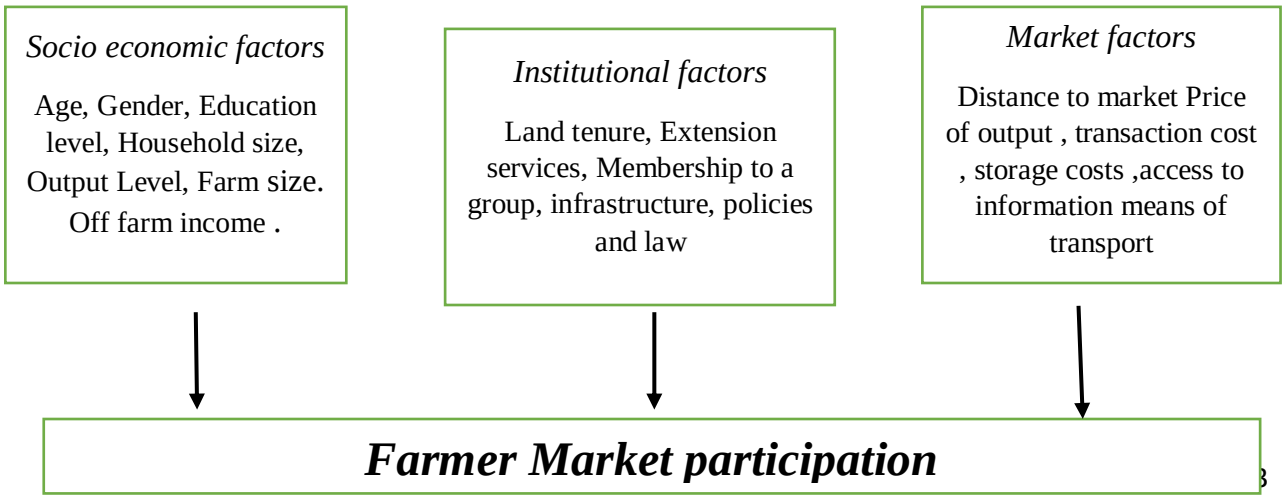
A case study research method assists an empirical inquiry that investigates a contemporary phenomenon within its real life context when the boundaries between and context are not clearly evident and in which multiple sources of evidence are used Kathryn (2014). These designs ensured that the data collected would meet the research objectives and more importantly, the information needed for the factors affecting small holder farmer market participation, choice of marketing outlets and the impact of post-harvest management on market participation.

The study is both qualitative and quantitative in nature and it takes the notion of a descriptive research design. Data was collected using self-administered questionnaires and focus group discussions. A multiple linear regression model was used to measure the third objective

whilst the first and second objectives were analysed using descriptive statistics generated using STATA 11.

3.3 Conceptual framework

Farmers' market participation and choice of market outlets is affected by a number of variables which may consequently depend on the nature of the individual farmer's characteristics. The conceptualization of this study is given in figure 1. It identifies factors that influence farmer's decision to participate and choice of marketing outlets, effects of market participation and market outlet on the farmer's welfare and also the impacts of post-harvest management practices on market participation .The study conceptualizes that farmer's participation is influenced by socio-economic and institutional factors. Socio-economic factors include; household size, land size, age and gender of the household head, education level, household's wealth and occupation. Institutional factors include; extension services, access to credit from institutions, group membership. These factors also influence household's extent of participation. The choice of marketing outlet is mainly influenced by the market factors which include; distance to the market, prices of output, Information availability, farmer's transaction cost.



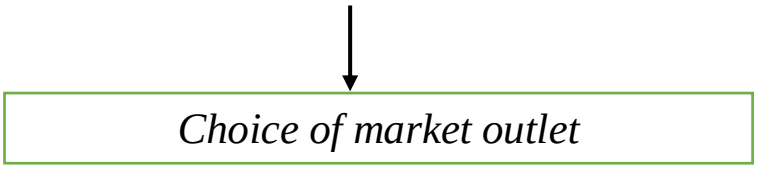


Figure 4:Conceptual framework for smallholder farmer market participation and choice of marketing outlet

3.4 Study area

Mwenezi district lies in the Masvingo provinces in the southern Zimbabwe .It is 16 kilometres of the south of Masvingo town .It shares the boarders with the Beitbridge district to the northwest, Chivi district to the north and Chiredzi district to the east and northeast, this is illustrated by the map below .Mwenezi lies under the natural region IV. Natural Region IV is an extensive livestock production area with some drought tolerant crops such as sorghum, millet and rapoko. Farmers also grow some short season maize varieties Mungandani et al, (2012).

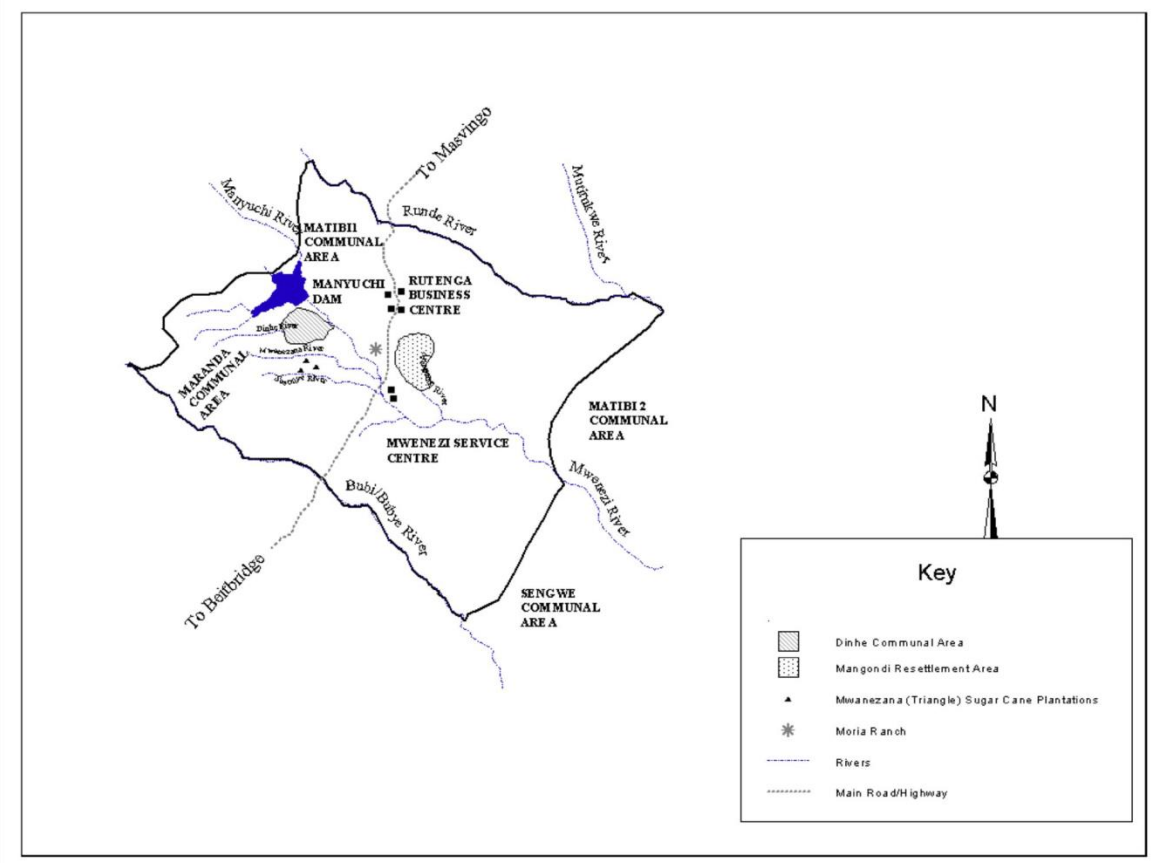


Figure 5: Maranda communal area map

Source: Manganga (2007)

3.5 Sampling and Data Collection method

A sample comprises of elements or a subset of the population considered for actual inclusion in the case study , it can be viewed as a subset of measurements drawn from a population in which we are interested in which we are interested Creswell (2013).

Snowballing sample technique was used to carry out the survey. This sampling method involves purposive selection of particular units of the survey, hence making it easier for the researcher to collect data for the small grain market participants only.

The snowballing sampling technique was used for all the ten villages in the ward, selecting a proportional 10% sample size for each of the ten villages .According to

Neumann, (2012), a sample of at least 10% of the total population is enough to give a true representation of the total area to avoid bias . Data was collected using questionnaires, key informant interviews with farmers.

3.6 Analytical framework

Data obtained was edited, coded, cleaned to ensure consistency, uniformity, and accuracy, and then entered into computer software for analysis. STATA 11 computer program was used to process the data.

Table 1: Objectives of the study

Objectives	**Research Questions**	**Method of Analysis**
To the smallholder small grain farmers participating	What are the characteristics of the smallholder small	Descriptive statistics such as graphs, means and

in the different marketing outlets.	grain farmers participating in different marketing outlets?	percentages.
Determine the factors that influence participation of smallholder farmers in different small grain marketing outlets.	What are the factors influencing smallholder farmer participation in small grain different marketing outlets?	Multinomial logistic regression model.
Evaluate the effects of postharvest storage on market participation.	What are effects of postharvest storage on market participation?	Descriptive statistics, graphs and cost benefit analysis.

Model specification

In analyzing farmers' choice of marketing outlets, Multinomial Logit model (MNL) has been used. The model predicts how changes in the independent variables translate into the probability of observing a particular categorical outcome. Therefore, using data from relevant independent variables, Gujarati (1992) explained that MNL regression predicts the probability of occurrence and not essentially attainment of a numerical value for a dependent variable.

Binary logistic regression can also be used to model choice. In the binary logistic regression, the dependent variable has only two categories unlike ML model which allows for more than two categories of the dependent variable. Since this study presumed more

than two categories of small grain marketing outlets, MNL model outweighs the binary logistic regression which is limited to a maximum of two choices.

Compared to the log-linear regression, MNL model does not estimate the changes in the predictor variables by a constant amount. In MNL regression, as the value of an explanatory variable gets smaller the change in the predictor variables approaches zero at a slower rate and therefore the explanatory variables with more likelihood of determining a given choice gets the greater weight. Binary logistic regression and the log-linear regressions are therefore not more appropriate for the study and thus MNL model was used.

In this case, an individual is assumed to have preferences defined over a set of alternatives. The choice variable (dependent variable) has more than two unranked options while the independent variables can consist of attributes of the alternatives and characteristics of the respondent e.g., age, education, income. McFadden (1974) first introduced the multinomial logit model to explain the choice of transportation modes of urban commuters with the random utility model. The model was preferred since it permits the analysis of decision across more than two categories in the dependent variable therefore making it possible to determine choice probabilities of different channels.

The Multinomial Logit model is given below:

$$Pij = \beta 0 + \beta 1X1 + B2\,X2 + \beta nXn + ei$$

It takes values 0,1,2,3 each representing market outlet (farm gate, GMB, Roadside ,Around the village) X are factors affecting marketing outlet ,β are parameters to be estimatd and ε is the randomixed error term.With $j$as the alternatives choices,probability of chosing outlet j is given by,

$$Prob(Yi = j) = \frac{e_z}{\sum_{k=0}^{j} ez_k}$$

Where Zj is choice and Zk is alternative choice that could be chosen (Greene,2000).The model estimates are used to determine the probability of choice of a market outlet j given the factors that affect the choice Xi.With a number of alternative choice log odds ratio is computed as

$$In\left(\frac{Pij}{Pik}\right) = \alpha + \sum Xi(\beta j - \beta k) + e$$

Pij and Pik are probabilities that a farmer will choose a given outlet and alternative outlet respectively .$In\ (\frac{Pij}{Pik})$ is a natural log of probability of choice j relative to probability choice k,α is a constant ,β is a matrix of parameters that reflect the impact of changes in X on probability of choosing a given outlet ,$e$is the error term that is independent and normally distrubeted with a mean zero .Marginal effects of the attributes or choice are determined by getting the differential of probability or choice and it is given by

$$\delta = \frac{\partial Pi}{\partial Xi} = pi(\beta j - \sum_{k=0}^{j} Pk\ \beta k) = Pi(\beta j - \beta)$$

Every sub-sector of β enters every marginal effects both through probabilities and through weighted average .Table 2 shows the variables to be used in multinomial logit .

Multinomial logit model

$$choice\ of\ markerting\ outlet\ (Pij) = \beta 0 + \beta 1age + \beta 2gender + \beta 3educ + \beta 4yield + \beta 5pricing + \beta 6priceinfor + \beta 7marketdist + \beta 8exteserv + \beta 9\ storagefal + \beta grading + \varepsilon i$$

Where

Pij represents the choice of small grains marketing outlet used by the farmers i.e (farmgate,GMB,Roadside ,Around the village)

MC represents the choice of the small grains market outlet used by the farmer

(Farm gate, GMB, road side, around the village.)

β0, β1…. are coefficients associated with each explanatory variable

εi is the error term

To evaluate the effects of post-harvest management on market participation .Farmers store small grains for food and sale and losses are incurred in both cases. It was hypothesized that small grains farmers would only store small grains if and only if their storage benefits outweighed their costs or future prices rose enough to cover storage costs. In deciding how

long to store in the post-harvest season, the benefits from storage must be balanced with the storage costs.

$$\sum_{t-1}^{t-n} S = \sum_{t-1}^{t-n} (pf - pc)$$

Where

S represents monthly small grain storage cost (which included estimated grain losses, dusting costs including labour)

t represents time

i represents farmer

,Pf for future monthly prices at which small grains are sold and Pc for current monthly price at which small grains are stored.

3.8 Justification of variables

The variables in the model are selected based on the economic theory, previous literature in the study areas.

Household size

The size of the household represents the productive and consumption unit of the household Makhura (2001).According to Lapar, Holloway and Ehuni (2003) work it was hypothesized that lager households have lower levels of market participation because they have higher consumption needs and hence use most of their produce for consumption rather than selling.

Age

Age can be associated with the farming experience of the farmer Omiti et. al.(2009).older farmers are likely to have more experience than the younger ones. However Randela (2008) alluded that older farmers may engage in farming as a livelihood rather than as a business, may be less educated and less receptive to new ideas.

Access to information

The cost of obtaining information has been confirmed to be one of the fundamental transaction costs faced by farmers Sherpard (1997).Farmers can access useful information through the radio, extension ,farmer groups cooperatives or even other farmers. Due to limitations, only farmers who accessed information through famer groups were measured in this study. Farmers who access information are expected to participate more in the market because they are more likely to acquire useful market information that can help them sell more.

Farm Output

Based on the economic theory and the empirical evidence from previous literature, the total output has a positive effect on market participation Omiti et al. (2009) and Barrett (2008). This study also makes the a prior expectation that farmers with higher farm outputs have more marketable surplus than those with lower outputs, and are therefore more likely to participate in the market.

Farm size

Farm size is the total size of fragmented plots with different sizes.it was determined by summing the fragmented plot size into plots and converting them to hectares. This study expected both positively and negatively farmers decision to produce small grains.

Access to extension services

According to Kaliba et al (2000), extension service is a good indicator of a farmer's knowledge of agricultural information. This suggests that farmers tend to produce a particular crop based on the knowledge that they have on that specific crop. Therefore, it was expected that availability of extension services would influence farmer crop choice decision. In that view, the decision to produce and sell small grains was expected to be positively influenced by availability of extension services.

Number of buyers

Although not included in previous studies, this study includes number of buyers, i.e., the number of buyers the farmer sold to, as one of the variables with a potential impact on market participation. It is hypothesized that farmers who sold to more buyers sold more than those who sold to a fewer number of buyers. This variable is particularly important in this

study because the buyer type variable is only capturing the major buyer from among the different buyers that the farmer sold to.

Price

High output price is an incentive for sellers to supply more in the market Alene et al. (2008). This is one of the basics of economic theory. The law of supply states that "when the price of a good rises, and everything else remains the same, the quantity of the good supplied will rise and vice versa." Nicholson and Snyder (2008).

Crop yields

According to Kurukulasuriya and Mendelsohn (2007), expected crop yield is a very important factor to farmers when deciding on which crops to produce. Hence, it was expected that crop yields would have a positive or negative effect towards small grain production. Crop yields were measured in tonnes for the total output produced from finger millet, sorghum and maize

Table 2 :Variables used in the multinomial logit.

Variable Code	**Variable**	**Description**	**Expected Relationship to**

	full identity		**the dependent**
Gender	Gender of house hold	Categorical +Dummy	+/-
Age	Age of household	Continuous	+/-
HHsize	Household size	Continuous	+/-
Educ	Level of education	Continuous	+/-
EXT	Extension services	Categorical	+/-
PRICING	Selling price	Dummy	+/-
PriceInfor	Source of price information	Categorical	+
Yield	Small grain yield	Dummy	+/-
Distmkt	Distance to market	Dummy	-
Grading	Grading	Categorical	+
Grainsto	Grain storage facility	Categorical	-

3.9 Diagnostic Tests

Model Specification

The RAMSEY reset test was used to test for model specification. The null hypothesis states that there are no omitted variables. The threshold using 95% confidence interval is that in order to reject the null hypothesis, p-value has to be below 0.05.

Heteroscedasticity

Heteroscedasticity was tested using the Breusch Pagan test. Heteroscedasticity is evident when Prob>Chi2 is less than 0.05. In the event that there is Heteroscedasticity, it can be rectified using the robust regression or the white's standard errors.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the results that were obtained using various models in testing the objectives of the study. It uses the methods of analysis that are given in Chapter Three. In the last section it also tries to discuss these results with reference to literature.

Small holder farmer's market characteristics in relation to marketing outlets

Table 2: Descriptive statistics on small holder farmer's characteristics

Variable	Observation no	Mean	Std. Dev.	Min	Max
Age (years)	94	31.81915	9.806694	14	76
HHsize (Numberof people)	94	6.021277	2.328369	2	13
Educ (years)	94	8.62766	4.801398	0	17
Farmsize (hactares)	94	4.191489	0.8201311	2	5

Table 2 shows the summary statistics in which 94 observations were made. Basing on the results in the table above the mean age of farmers was 31, 81 years .the average house hold size for scheme was approximately six people, with a maximum of 13 and a minimum of 2 members per household. It has been found that large household size negatively It has been found that large household size negatively influences the extent of farmers market participation (Mwema et al., 2013) as more of the farm produce will be held for home consumption.

In terms of education level of the households, the average number of years taken in school by the household head was 8.94 which is approximately secondary level, from the observations some of the market participants did not have access to education.

.

Land holdings was an average of 4, 06 hectare's implying that the observed were smallholder farmers with a minimum of 2 hectare's . According to (FAO, 2013)Smallholder farmer is one who practices agriculture at small-scale practicing pastoralism, fishing, forestry and/or crop production at land less than 10 hectares.

Gender and market participation

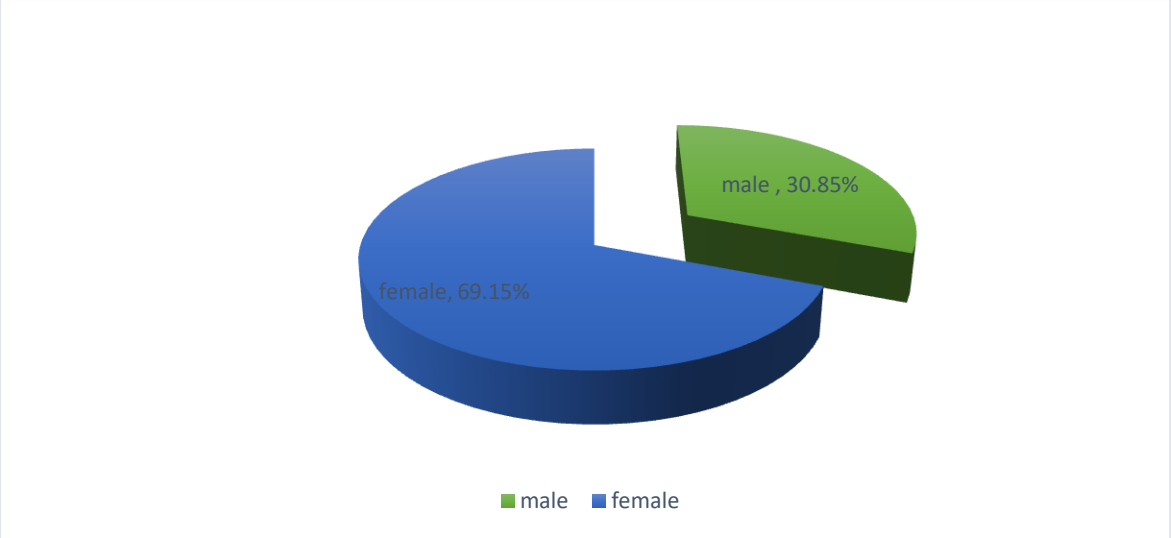


Figure 6 :Gender of the market participation

In terms of gender distribution, as shown in figure 4, majority of market participants were 69, 15% females ,whilst 30,85 % were male .In rural areas most of the women are left heading their families whilst the male counterparts migrant to near towns and to neighboring countries for employment. In Zimbabwe females are active in market participation generally.

Table 3:Off farm employment

do you have another source of income other than farming	**Frequency**	**Percent**

Yes	60	63.83%
No	34	36.17%
Total	94	100

Of all the farmers in the farmers observed 63, 83 % had another source of income from either full time or part time employment or pension. With 36.17% depending on farming only as their source of income.

Table 4:Occupation of the market participant

Farmers occupation	**Frequency**	**Percent**
Farmer	30	31.91
farming and other business	30	31.91
farming and employed	29	30.85
farming and pensioner	5	5.32
Total	94	100

Table 4 indicates the occupation of the farmers who participant in small grain farming .31.91% of the respondents depend on farming only with a similar percentage depending on farming and other business. Minority of the farmers 5.32%, received pension as another source of income.

Table 5: Market outlets and the number of participant's

Types of markets and participants	**Frequency**	**Percent %**
farm gate	46	48.94

around the village	23	24.47
road side	11	11.7
GMB	14	14.89
Total	94	100

Four markets were reviewed in this study which were selling small grains at farm gate, around the village, road side and GMB. It was observed that 48, 94% sell their crops at farm gate with 14, 89% of the market participants selling their crops at their crops at GMB .This is illustrated in the table above.

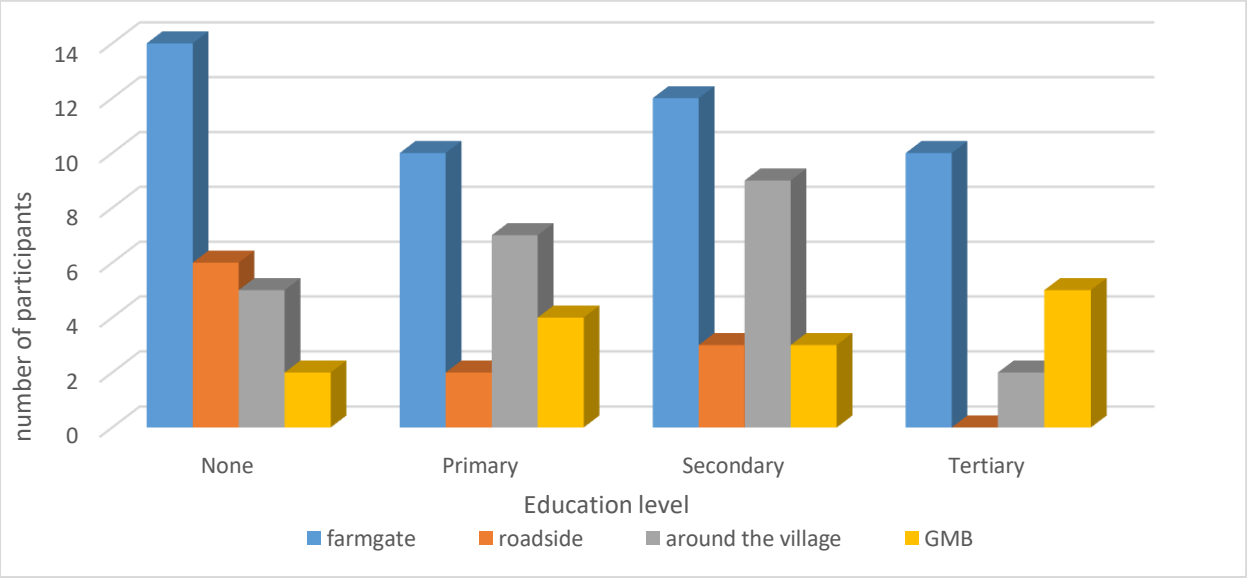


Figure 5: Market outlets response according to educational level

Small holder farmers who are not educated do sell their produce at the farm gate, compared to those who attained tertiary education who do appreciate that, selling their produce at GMB is profitable compared to selling at the road side. It is evident that the market participants who sold at GMB had higher level of education those compared to those who did attain education at all. With enhanced education, market participant has the ability to perceive ,interpret and assimilate marketing information that can lead to informed choice of markets with high level of returns.

Those who did not attain education are the main participants at the roadside marketing outlet. Education levels affect market information interpretation and hence, market participation level of farmers (Jari, 2009).

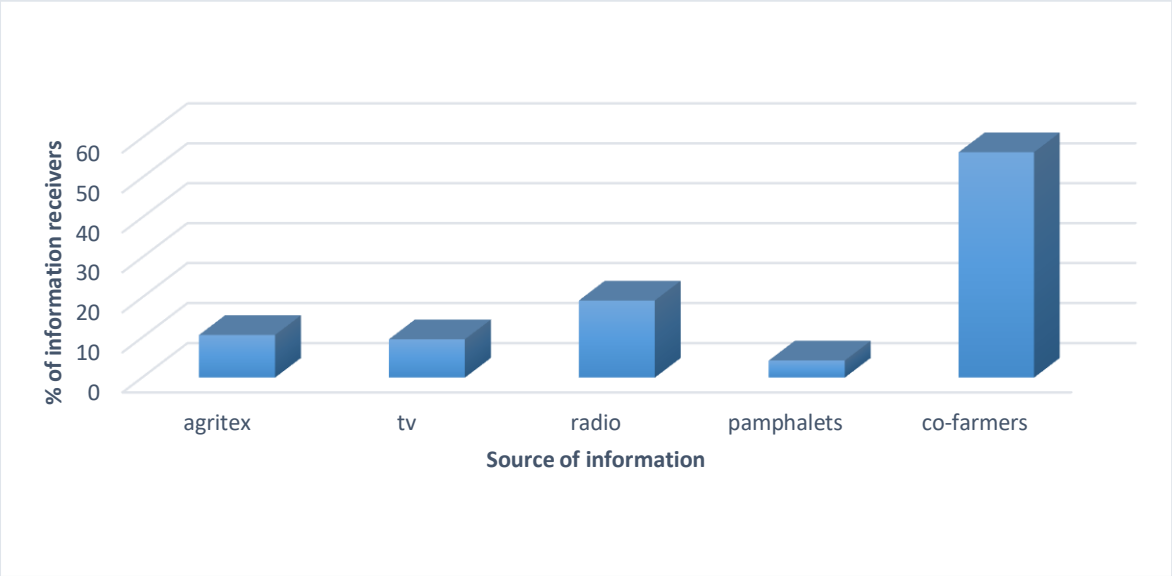


Figure 6: Source of Marketing Information

Market information irrespective of the source empowers farmers with the knowledge of emerging marketing opportunities and market prices. Market information irrespective of the source empowers farmers with the knowledge of emerging marketing opportunities and market prices all the small holder farmers do have access to information from various sources prior to marketing their produce. The major source of information was56.38 % from the co farmers. Radio and TV 19.5%and 9.57 % consecutively.10.64 % of the farmers received their information from the Agritex officers, Pamphlets contributed a minima role as a source of market information.

Table 6 :Distance from farm to marketing outlet GMB

Distance to the marketing outlet	**Frequency**	**Percent %**

0-20 km	28	29.79
20-40 km	40	42.55
60-80 km	26	27.66
Total	94	100

Tables 6 illustrated the distance travelled to sell crops at GMB. Distance does affecting the choice of marketing outlet .it is generally views that the longer the distance the higher the transportation cost. From the research distance to market had a significant influence on the market participation. 42% of the respondents have to travel a distance of about 20-40 km there by limiting their participation to sell small grains at GMB. Farmers alluded that it is cheaper for them to sell their grains at the farm gate since they don't experience any transportation costs.

4.2 To determine the factors that influence participation of smallholder farmers in different small grain marketing outlets.

Marginal effects results

	farmgate		roadside		GMB		Around the village	
explanatory variables	dy/dx	P-value	dy/dx	P-value	dy/dx	P-value	dy/dx	P-value
Gender	0.231	0.017	-0.039	0.477	-0.011	0.285	-0.182	0.024
Age	0.002	0.635	-0.003	0.171	0.000	0.756	0.001	0.782
Household size	0.010	0.602	0.004	0.592	-0.001	0.404	-0.012	0.473
Education	-0.031	0.001	-0.001	0.807	0.000	0.999	0.032	0.000
Extension services	-0.069	0.063	-0.044	0.032	-0.010	0.211	0.123	0.000
Prices	-0.079	0.058	0.101	0.000	0.016	0.213	-0.037	0.278
Price Information	-0.130	0.000	0.062	0.002	0.009	0.172	0.059	0.018
Small grain yield	0.148	0.002	0.024	0.292	0.001	0.856	-0.173	0.000
Market distance	0.173	0.000	0.011	0.666	-0.010	0.237	-0.174	0.000
Grading	-0.082	0.264	0.086	0.048	-0.026	0.16	0.023	0.721
Grainstorage facilities	0.104	0.092	-0.010	0.770	-0.004	0.407	-0.089	0.097

Number of observtions 94

The Chi-square value of -212,153 showed that likelihood ratio statistics are highly significant ($P < 0.000$) suggesting that the model had strong explanatory power. The pseudo-R square was 0.3962 signifying that the explanatory variable explained about 39.62% of the variables in the choice of market outlets. The coefficient estimates indicated the direction of the effect of the independent variables on the dependent variable but not the actual magnitude of the change of probabilities.

To determine the magnitude of change on choice of market outlets with respect to a unit change in an independent variable, the marginal effects were estimated. Table 7 presents the results of the marginal effects of the Multinomial Logit model.

Gender of the household head significantly influenced the sale of small grain at the farm gate with marginal effects of 0.23 .This implies that a household headed by the female are likely to sell their grains at farm gate by 23% than the males with respect to males selling their output to GMB,were grains are sold at $390 per tonne. A possible explanation to this is due to the fact that men are more mobile and aggressive in terms of search for better market prices while women are more confined with family chores. In line with this finding, Boadu et al. (2013) stated that compared to males, females have a lower probability of selling beans to traders and cowpeas to consumers, but they have a higher probability of selling to retailers due to their availability.

Age of the household head significantly influenced the sale of small grains at the farm gate and roadside markets. The marginal effects were 0.002 and -0.003 for farm gate and road side markets respectively. Therefore, a one year increase and negatively influenced the participation of farmers in farm gate and roadside markets. The elderly people are more conservative and would therefore prefer a direct participation rather than participating through an intermediary. This is the reason why they don't prefer to sell their output at GMB were payment transactions are not done directly to the farmer during the selling period.

Years spent in formal education by the household insignificantly influenced the sale of small grains at farm gate and GMB, the marginal effects were -0.031 and 0.000 respectively. However the years spent in formal education does not have any impact the choice of the marketing outlet .Since the farmers sell their output with an aim of disposing their grains so

as to reduce the post-harvest management storage costs which tend to exceed their production cost. Therefore years spent in formal education does not have any impact on the choice of formal market.

Household size it is a continuous variable. The increase in the household size it is usually associated to an increase to the decrease in the amount of output sold by the farmer. In this study it was found out that the number of house hold size has an impact on the choice of marketing outlet. The marginal effects for household size in this study were 0,010 and 0.012 for selling small grains at the farm gate and around the village respectively .An increase in the household size by 0, 02 % would increase their participation for selling grains around the village. This so because most of the small grain market participate do not consume much small grains they are still relaying on maize consumption as their staple food. However, a study conducted by Wolday (1994) showed that household size had significant positive effect on quantity of teff marketed and negative effect on quantity of maize marketed. In this context family size is expected to have positive or negative impact on market participation and volume of sale.

The distance to the small grain marketing outlet significantly determined the probability of farmers participation at the farm gate and at GMB as marketing outlets where it had a negative effect when selling grains at GMB and a positive effect on selling grains at the farm gate the marginal effects were -0.010 and 0.173 respectively. The implication is that as the distance to the GMB increases, the likelihood of selling at the farm gate so as to reduce the transaction costs. With the increase in distance to GMB, the probability that a farmer would sell small grains at the farm gate would increase by 7%. This finding concurs with the findings of Wanjiru et al. (2012) who stated that an increase in distance to the market increases the probability of selling to the local traders and brokers in the case of banana marketing in Muranga County, Kenya.

Price information had a significant influence on the choice of the marketing outlet. An increase in price information can increase the probability of selling small grain output at the farm gate by 29,10%.Price information informs the farmer on prevailing pricing condition .For the farmers pricing condition are not a major challenge but the failure of GMB to pay local farmers is the reason why they opt for selling most of their commodities at the farm gate. The source of the price information increases the chance that a farmer would sell his output at the farm gate ,since majority of the farmers obtained market information from their

co farmers and it is more likely that they shared information on emergent market opportunities which are around the village .Buyer as the source of market information would also influence the outlet of sale and given that the private sector is more aggressive in information delivery could possibly cause the influence on participating in the private outlet. As stated by Zanello et al. (2012), broader information pushes the farmer to sell at the market.

Small grain yield had a significant influence on the choice of marketing outlet .An increase in the weight of small grains by 2,5% increases the probability of selling grains around the village than at selling at farm gate were the farmer is not well informed on the prices of the grains through research .The marginal effect of selling grain at farm gate and around the village were 0.148 and -0.173 respectively. This means that the farmers who had more yields had more opportunities of selling their produce at the farm gate and around the village, since they will be avoiding high transaction costs to sell their crops at GMB were farmers are failing to understand that GMB can buy grains which are less than a tonne. The finding is in line with that of Chalwe (2011), who found more of the beans produced being sold to the private traders at the market places than to other households at farm gate.

Selling price significantly and positively influenced the extent of market participation in on the road side market than participating at GMB, the marginal effects of selling output at roadside were 0,101 where as those of selling at the farm gate -0,079 .The results showed that the ########decrease in the price offered at the farm gate increases the probability of the farmer to by 0.22% to sell his output in at the roadside. Price is the crucial instrument in marketing because lower price is a disincentive to market participation. These study findings are consistent with the economic theory, law of supply, which stipulates that the increase in price of good leads to the increase in quantity supplied Mas-Colell and Green (1995). Goetz (1992) found a positive significant relationship between price and quantity of food grain supplied to market in Sub-Sahara Africa. However in this study it was found out that the small grain farmers are worried mostly on the transaction costs, and also the late payments of grains by GMB thereby lacking confidence to participate in the formal profitable market.

The process of grading the output had a negative effect on participation when selling grain at the farm gate and at the Grain Marketing Board, the marginal effects where -0.082 and -0.026 respectively. The probability of participation by households at farm gate decreased by 8% and at GMB decreased by 2%.Thee major reason for the decrease at the farm gate is that they have poor grading methods they just use a rough rule of thumb that grain should be clean without chaff and grains whereas at GMB they accept farmers grain according to the different

grading grades though the buying price differs with the grade. with other community groups was less by 8%. This means that engaging in other self-help groups is time consuming and limits participation in irrigation activities.

Grain storage facilities at the farm had a significant influence on market outlet choice The probability that farmers will sell their output at farm gate when the prices are high increased by 10% with a probability with a marginal effect of 0.104 .Farmers assume that selling their output later around October, November is profitable than selling grains at profitable. A probability of 0.04% sell their output at GMB.

4.3 To evaluate the impacts of post-harvest losses on market participation

Small grains post-harvest losses start from the field with the birds being another main threat. Farmers harvest small grains using hands to snap off the seed heads or by cutting the seed heads off with a knife, sickle or scythe. Small grains are further chaffed, threshed, winnowed and dusted and are stored before disposal.

Farmers use various methods and types of facilities to store their crops. The traditional grain stores identified in the study areas include dura, grain bags made up of polyethylene and plastic and metal buckets pots and some others. More than 55,32% of the respondents used polyethylene grain bags while 30,85 % used the dura and about 13,83% used the plastic buckets this is presented in figure 7.

The farmers who stored their grain in the dura had challenges with meeting the required grades at the market especially the required moisture content the grains will be having a higher moisture content and also the small grains will be exposed to rodents, hence a significant amount of about 150 to 200 kilogrammes were lost during storage of grains in the dura. Moisture content is one of the most challenging aspect to the farmers for them to sell their crops at the GMB.

Most of the farmers in Maranda district prefer to store their grain in the polyethylene bags before disposal because they safe space and also they are well aerated compared to the grain stored in the dura. Grain stored in the polythene bags was also easy to carry to the market and also it minimised grain losses during the disposal of grain to the market since there was no need for repacking. Grain bag storage is usually expensive since the output should be fumigated after every 2 months with aim to secure the grain quality. However the farmers end up selling most pf their out put to the informal market i.e.(farm gate, around the villages and roadside)

The majority of the farmers who store their grains in the buckets participated in the farm gate and road side markets. The reason they preferred the use of buckets is that they use it as their tool for measurement at the farm gate, road side, and around the village where it is called a *bhangidhi*. Rodents do contribute to a significant loss of the stored grains hence affecting market participation of the farmers since most of the buckets are made of plastic. Some farmers claimed that it was easy for them to carry grain in a bucket to the market than using a grain bags .

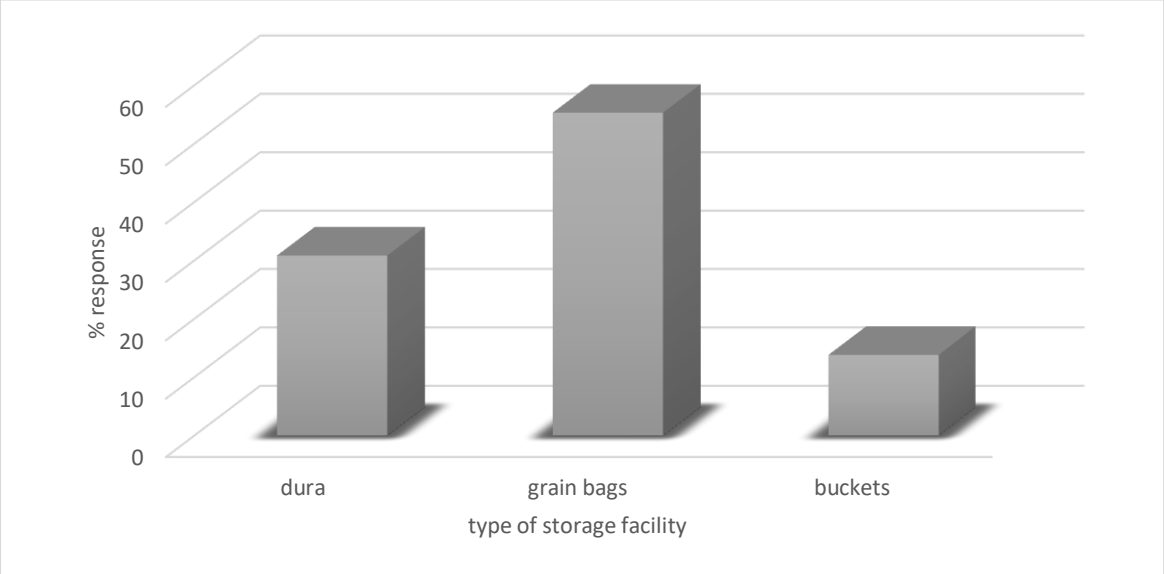


Figure 7: Grain storage facilities used by the small holder farmers

Table 7: Different stages of post-harvest small grain losses

Stage at which losses can occur	**Causes of grain losses**
Pre harvest	Use of non-tolerant varies to disease and weevils
	Susceptible to birds when the grains are in the fields.
	Delayed planting and harvesting
During harvesting	Poor supervision during dehusking
	Poor transportation to the farm house
During threshing	Poor shelling leading to breakages of grains
	Poor threshing practices
Drying and storage	Moisture in storage structures which cause rotting
	Poor storage bags that gives optional air
	Storage pests and fungi
	In adequate space for drying grains
	Susceptible to the high temperatures
	Pest(weevil's ,birds ,rodents)

Table 8: Cost benefit analysis

Month	Price per tonne (USD)	Price change	Storage costs(USD)	Margin(pf-pc)-S	Impact
Jan	180	0	22	158	Loss
Feb	175	-5	20	160	Loss
March	130	-45	23	152	Profit
April	120	-10	22	108	Loss
May	160	40	24	96	Loss
June	210	50	23	137	Loss
July	250	40	22	188	Loss
Aug	270	20	20	230	Loss
Sep	285	15	22	248	Loss
Oct	290	5	20	265	Loss
Nov	280	-10	21	269	Loss
Dec	265	-15	22	258	Loss

It was expected that farmers had greater opportunities of increasing farmers earnings by storing small grains after harvest in order to sell them later when prices are relatively high.it was found that farmers do gin uncertain returns from storage as a result of future prices unpredictability, physical and pest losses of the stored small grains .These factors do affect the farmers market participation decision and the choice of marketing out let the farmers reported that they end up disposing their grains for sale at farm gate ,around the village and at the road side early in May after harvesting when the price are better than storing the grains. However, Table 8 indicates that in the short term, storage did not increase farmer's earnings and there was no opportunity for farmers who stored their grains for more than 3 months after harvest since the losses will end up out weighing the production costs.

Analysis of price showed wide variations between the future selling prices and the storage costs Monthly prices were generally low during the major harvesting period and increase steadily to a peak just before the seasons harvesting period. It is perceived that seasonality in small grain production and inadequate storage particularly at farm level .famers do sell their crops usually in August ,September ,October soon after harvesting when the prices of small grains are high and also to avoid the storage costs .Selling small grains around January, February ,March is less profitable than selling the grains soon after, storage cost are the major challenges.

Diagnostic tests

Table 9: Test for model specification

Ramsey test using powers of the fitted values of Inoutput	
F(3,79)	0.26
Prob > F	0.8557

Probability of 0.08557 is greater than 0.10 and therefore shows that the model is coreectly specified.The null hypothesisis is therefore not rejected as it shows that no variables have been omitted.

Breusch –Pagan Test

Table 10:test for heteroscedasticity

Breusch -Pagan or Cook-Weisberg Test for Heteroscedasticity	
chi2(1)	15.81
Prob > chi2	0.0001

A probability of 0.001 is less than 0.5 and therefore indicating the presence of heteroscendatisity. The problems were rectified using the robust standard errors.

Multicollinearity Test

Multicollinearity refers to the linear relation among two or more variables. It is a data problem which may cause serious difficult with the reliability of the estimates. It is a case of multiple regression in which the predictor variables are themselves highly correlated. The VIF mean was 1.12 which is less than 10% which means that there is no multi-collinearity among the variables

Table 9:VIF Test

VARIABLE	VIF	1/VIF
Educ	1.41	0.709449
Gender	1.37	0.731746
HHsize	1.32	0.760386
PriceInfor	1.28	0.779976
Yeild	1.23	0.811025
Age	1.22	0.822791
Distmkt	1.21	0.829121
Grainsto	1.18	0.847958
EXT	1.18	0.850729
PRICING	1.12	0.893065
Grading	1.09	0.918547
Mean VIF	1.12	1.82233

4.4 Conclusion

Various methods of data analysis to generate results in this section. All the research objectives were measured and a discussion on each outcome was done with reference to previous studies. These results are used in chapter five to draw conclusions and recommendations.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter provides an overview of the study. It draws conclusions from the results obtained in chapter four. From these conclusions, the chapter also gives recommendations based on these findings.

5.2 Summary

Descriptive statistics were used in measuring this objective. 69.15% of the surveyed population were females participating in small grain marketing whilst 30.85% were male.48, 94% of the small grain farmers who participant in small grain marketing sell their crops at the farm gate. Marital status was not significant in explaining the decision to participant in small grain marketing and also the choice of the marketing outlet.

Small holder farmers do incur costs as they try to manage post-harvest losses it was found out that small holder farmers like to sell their commodities when the prices are higher without outweighing the storage cost. Small holder farmers have little knowledge on post-harvest management of small grains .

In this study it was found out that age, gender, household size, grading, total yield sold, extension services, pricing, source of price information does have an impact on market participation. Source of price information and other market characteristics do affect small grain farmer market participation and also the marketing outlets.

5.3 Recommendations

Based on the findings of this study on the determinates affecting smallholder farmer market participation and the choice of the marketing outlets in Maranda ,District, Mwenezi. I recommend that policy makers can improve the sources of information to farmers through the Agricultural extension which is lacking in Maranda District and in Zimbabwe as a whole farmers are not getting enough access to extension services.

Policy marker should also improve the source of information to the farmers through better broadcasting channels in rural areas where the transmition for both tv and radio is not easily accessible .The Zim digital programme should also be considered to areas like Maranda district.

The Rural development fund should also refurbish the roads in Maranda district .Farmers fail to participate in some profitable markets like GMB because of these roads which are bad.The GMB must also provide selling points during the harvesting in Maranda district to avoid high transaction cost as the farmers travel to Rutenga GMB depot.

5.5 Areas of Further Study

This study focused mainly focused on small holder farmer market participation and choice of marketing outlets in Maranda ,Mwenezi District and therefore a similar study can done in Matabeleland where there is small grain production. Furthermore another study can be done on the determinates of smallholder farmer market participation and choice of marketing channels.

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Appendix 1 Questionnaire

Dear Respondent

I am an Agricultural Economics and Development student in the Faculty of Natural resources management at Midlands State University carrying out a research on the factors affecting the participation of smallholder farmers in marketing of small grains and strategies of improving their participation in Masvingo province in partial fulfilment of my BSc honours degree kindly request you to answer the questions below. All responses will be handled confidentially.

Please do not indicate your name on the questionnaire. (**THE ARE NO WRONG OR RIGHT ANSWERS**).The information will be used for academic purposes only.

Thank you

Makotose Taidaishe Lorine

(Please tick where appropriate)

Section 1: Demographic Information

Are you are market participamt Yes ☐ No☐

1. Are you the head of the household? Yes ☐ No ☐

1a.What is the head sex of the respondent? Male ☐ female ☐

2. What is the head of the household? Male☐ Female☐

3. What is the highest education level of the head of the household?

Advanced ☐ tertiary ☐ none ☐ secondary ☐ primary ☐

3a Does your household hire labour? Yes ☐ No ☐

4. State what is this labour? Permanent ☐ Ploughing ☐

5. How do you pay labour? Cash ☐ ecocash ☐ groceries ☐

6. Where do you normally get your agricultural information?

AREX ☐ TV ☐ Radio ☐ Pamphlets ☐ other farmers ☐

Sectin 2, Crop section

6. What are the major four crops grown under each area
……
…….

7. Are you a member of any association? Yes ☐ No ☐

8. If yes, what is the name of the group? Yes ☐ No ☐

9.Do you normally sell your sorghum? Yes ☐ No ☐

10(a). If yes, who usually buys your grain (list all buyers)? ----------
---

10(b) For how long have you been selling sorghum (years)? ----------

11(c) Do you sometimes exchange sorghum for other commodities? Yes ☐ No ☐

12. How much did you sell, each year, for the past four years (kg)?

	Sourghum sold kg		
2013/14 season	2014/15 season	2015/2016season	2016/2017season

13. How long do you have to travel to your most important market/buyer (km/walking time)?

---------- ----------

14. How do you transport your grain to the market?

Individually ☐ Coordinated transport ☐

15.If coordinating with other farmers, how often did you do that in the past 3 years? Never/few times ☐ Usually/Always ☐

16. Would you rate your road access to the market to be poor or good? Poor ☐ Good ☐

17. Do you experience any grain losses when you transport grain to the market?

Yes ☐ No ☐

18. If yes, how would you rate amount of grain lost?

Significant amount ☐ Insignificant amount ☐

18b.What are your storage facilities? Dura ☐ Grain bags ☐ Buckets ☐

18c.When do you sell your grains

Jan-Feb	March-April	May-June	July -Aug	Sept -Oct	Nov-Dec

19. Do you usually know about grain prices before going to the market? Yes ☐ No ☐

20. (a) If yes, where do you get information about prices (list all market information sources)?

---

21. (b) Is the actual price at time of sale usually the same as the one you know?

Yes ☐ No ☐

22. If no, why?----------
---

23. Who determines the selling price? ----------

24.If yes, at what point do you agree with your buyers on the price?

At time of sale ☐ By previous agreement ☐

25. Do you sometimes have to approach the buyer to negotiate prices? Yes☐ No☐

26. Do you usually agree with the buyer on the price of your product? Yes ☐No ☐

27(a) If yes, how many times in the past 3 years have you had to approach the buyer to negotiate prices before selling (complete table below)?

Sorghum sales

	Sourghum sales		
2013/14 season	**2014/15 season**	**2015/2016season**	**2016/2017season**

28. Have there been delays in payments for sold grain? Yes ☐No ☐

29(a) If yes, how many times did you have to approach the buyer for payment in the past 3 years (complete table below)?

	Sourghum sales		
2013/14 season	**2014/15 season**	**2015/2016season**	**2016/2017season**

30 Have there been delays in sales at the market? Yes ☐ No ☐

31 If yes, what was the cause of the delays? ----------
---

32. How long do you normally wait to sell produce in the market?

Very quickly ☐ More than 2 hours ☐

33. How often did you fail to sell/ return home with your grain in the past 3 years?

None ☐ Several times ☐

34. What were the reasons? price too low ☐, too few/no buyers available ☐, grain quality rejected ☐**,** sale postponed ☐, Other (specify)----------

35. Do your buyers recognize quality of grain? Yes ☐ No☐

36. Do your buyers sign out receipts for the grain? Yes ☐ No☐

37. How confident are you in your buyers? Low ☐ High

38. What are the major costs you incur in selling your grain?

Transport ☐, packaging ☐, grain threshing and cleaning ☐, costs while waiting at the market☐ (e.g. food, accommodation, etc), Other (specify)----------

39. Did you have production and/marketing contracts with any company for sorghum in the past 3 years? Yes☐ No☐

40. Have you ever had any production/marketing relationship with processors or commercial buyers of small grains since you started selling grain? Yes ☐ No ☐

41. What marketing problems/challenges do you encounter when you sell your grain?----------
---
---

42. Do you think there is a ready market for sorghum in our country? Yes ☐No☐

43. What do you think can be done to improve production of sorghum?

---

44. What do you think can be done to improve marketing of sorghum?

End

Appendix 2: marginal effects after the Multinomial logit

	farmgate		roadside		GMB		Around the village	
explanatory variables	dy/dx	P-value	dy/dx	P-value	dy/dx	P-value	dy/dx	P-value
Gender	0.231	0.017	-0.039	0.477	-0.011	0.285	-0.182	0.024

Age	0.002	0.635	-0.003	0.171	0.000	0.756	0.001	0.782
Household size	0.010	0.602	0.004	0.592	-0.001	0.404	-0.012	0.473
Education	-0.031	0.001	-0.001	0.807	0.000	0.999	0.032	0.000
Extensionservices	-0.069	0.063	-0.044	0.032	-0.010	0.211	0.123	0.000
Prices	-0.079	0.058	0.101	0.000	0.016	0.213	-0.037	0.278
Price Information	-0.130	0.000	0.062	0.002	0.009	0.172	0.059	0.018
Small grain yied	0.148	0.002	0.024	0.292	0.001	0.856	-0.173	0.000
Market distance	0.173	0.000	0.011	0.666	-0.010	0.237	-0.174	0.000
Grading	-0.082	0.264	0.086	0.048	-0.026	0.16	0.023	0.721
Grainstorage facilities	0.104	0.092	-0.010	0.770	-0.004	0.407	-0.089	0.097

Appendix 3: Descriptive statistics

```
. summarize age HHsize Educ Farmsize
```

Variable	Obs	Mean	Std. Dev.	Min	Max
age	94	31.81915	9.806694	14	76
HHsize	94	1.851064	.7753937	1	4
Educ	94	1.957447	.654429	1	3
Farmsize	55	4.254545	.7256716	2	5

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Appendix 4:Off farm income sources

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. tab  SourcesIN
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do you have another source of income other than farming	Freq.	Percent	Cum.
yes	60	63.83	63.83
no	34	36.17	100.00
Total	94	100.00	

Appendix 5:Sex of household responded

what is the sex of the respondent	Freq.	Percent	Cum.
male	29	30.85	30.85
female	65	69.15	100.00
Total	94	100.00	

Appendix 6: Sources for agricultural information

where do you get infor about prices	Freq.	Percent	Cum.
agritex	10	10.64	10.64
tv	9	9.57	20.21
radio	18	19.15	39.36
phamhlets	4	4.26	43.62
others	53	56.38	100.00
Total	94	100.00	

Appendix 7: farmer occupation type

what is your occupation	Freq.	Percent	Cum.
farmer	30	31.91	31.91
farming and other bussiness	30	31.91	63.83
farming and employed	29	30.85	94.68
farming and pensioner	5	5.32	100.00
Total	94	100.00	

Appendix 8 distance to the markets

how far is markerting point from your farm	Freq.	Percent	Cum.
0-20	28	29.79	29.79
20-40	40	42.55	72.34
60-80	26	27.66	100.00
Total	94	100.00	

```
. summarize age HHsize Educ Farmsize
```

Variable	Obs	Mean	Std. Dev.	Min	Max
age	94	31.81915	9.806694	14	76
HHsize	94	6.021277	2.238369	2	13
Educ	94	8.62766	4.801398	0	17
Farmsize	94	4.191489	.8201311	2	5

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.
```

Appendix 9: Gender of the respondents

what is the sex of the respondent	Freq.	Percent	Cum.
male	29	30.85	30.85
female	65	69.15	100.00
Total	94	100.00	

Appendix 10:Multinomial logistic regression outcome

Multinomial logistic regression — Number of obs = 94; LR chi2(33) = 278.45; Prob > chi2 = 0.0000; Log likelihood = -212.15358; Pseudo R2 = 0.3962

Marketout	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
farmgate	(base outcome)					
ARV						
Gender	-1.155014	.4810519	-2.40	0.016	-2.097858	-.2121695
age	.0016918	.019419	0.09	0.931	-.0363689	.0397524
HHsize	-.0701596	.1028806	-0.68	0.495	-.2718018	.1314827
Educ	.1871044	.0528162	3.54	0.000	.0835867	.2906222
EXT	.6535059	.2124302	3.08	0.002	.2371504	1.069861
PRICING	-.0537268	.2168394	-0.25	0.804	-.4787243	.3712707
PriceInfor	.4540287	.1471018	3.09	0.002	.1657144	.7423429
Yeild	-.9925853	.2800646	-3.54	0.000	-1.541502	-.4436689
Distmkt	-1.032972	.2534668	-4.08	0.000	-1.529757	-.5361859
grading	.2214965	.3769173	0.59	0.557	-.5172477	.9602408
Grainsto	-.5503308	.3112051	-1.77	0.077	-1.160282	.0596201
_cons	1.454713	2.068555	0.70	0.482	-2.59958	5.509006
road_side						
Gender	-.8336989	.7784747	-1.07	0.284	-2.359481	.6920836
age	-.0366986	.0273208	-1.34	0.179	-.0902464	.0168491
HHsize	.04009	.1115435	0.36	0.719	-.1785312	.2587113
Educ	.0290217	.0672997	0.43	0.666	-.1028832	.1609267
EXT	-.4671466	.2786902	-1.68	0.094	-1.013369	.0790761
PRICING	1.407821	.2464019	5.71	0.000	.9248821	1.89076
PriceInfor	.98995	.3007557	3.29	0.001	.4004797	1.57942
Yeild	.0981121	.3216764	0.31	0.760	-.532362	.7285863
Distmkt	-.1073515	.3727596	-0.29	0.773	-.8379468	.6232439
grading	1.221455	.5494522	2.22	0.026	.144548	2.298361
Grainsto	-.282223	.5031428	-0.56	0.575	-1.268365	.7039188
_cons	-7.48788	2.996748	-2.50	0.012	-13.3614	-1.614363
GMB						
Gender	-1.667375	.9968922	-1.67	0.094	-3.621248	.2864974
age	.0069078	.0294465	0.23	0.815	-.0508062	.0646218
HHsize	-.1754876	.1517832	-1.16	0.248	-.4729771	.1220019
Educ	.0439133	.109841	0.40	0.689	-.1713711	.2591977
EXT	-1.159556	.4272267	-2.71	0.007	-1.996905	-.3222073
PRICING	2.069087	.3927829	5.27	0.000	1.299247	2.838927
PriceInfor	1.280512	.4281736	2.99	0.003	.4413067	2.119717
Yeild	-.1224848	.5116236	-0.24	0.811	-1.125249	.880279
Distmkt	-1.497533	.5211597	-2.87	0.004	-2.518987	-.4760791
grading	-3.155249	1.049016	-3.01	0.003	-5.211284	-1.099215
Grainsto	-.695896	.5094075	-1.37	0.172	-1.694316	.3025244
_cons	.8197761	3.623305	0.23	0.821	-6.281772	7.921324

Appendix 11

Appendix 12:Marginal effects regression

```
. mfx,predict(p outcome(farmgate))

Marginal effects after mlogit
      y  = Pr(Marketout==farmgate) (predict, p outcome(farmgate))
         =  .69255265
```

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
Gender	.2314561	.09677	2.39	0.017	.041791	.421121	1.74138
age	.0016801	.00354	0.47	0.635	-.005261	.008621	32.1862
HHsize	.0095811	.01836	0.52	0.602	-.026409	.045571	6.2931
Educ	-.0305231	.00893	-3.42	0.001	-.048019	-.013027	7.87931
EXT	-.0686747	.03699	-1.86	0.063	-.141177	.003828	1.65172
PRICING	-.0791268	.0418	-1.89	0.058	-.161049	.002796	1.96552
PriceI~r	-.1301494	.03069	-4.24	0.000	-.190298	-.070001	4.20345
Yeild	.147724	.0483	3.06	0.002	.053048	.2424	1.77586
Distmkt	.172633	.04824	3.58	0.000	.078075	.267191	2.04828
grading	-.0823065	.07372	-1.12	0.264	-.2268	.062187	1.52414
Grainsto	.1035358	.06136	1.69	0.092	-.016721	.223793	1.83793

```
Marginal effects after mlogit
      y  = Pr(Marketout==GMB) (predict, p outcome(GMB))
         =  .00801897
```

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
Gender	-.0106906	.00999	-1.07	0.285	-.030278	.008896	1.74138
age	.0000748	.00024	0.31	0.756	-.000398	.000547	32.1862
HHsize	-.0012963	.00155	-0.83	0.404	-.00434	.001748	6.2931
Educ	-1.28e-06	.00086	-0.00	0.999	-.001689	.001686	7.87931
EXT	-.0100936	.00806	-1.25	0.211	-.025895	.005707	1.65172
PRICING	.0156758	.01259	1.24	0.213	-.009003	.040354	1.96552
PriceI~r	.0087614	.00642	1.37	0.172	-.003814	.021337	4.20345
Yeild	.0007283	.00401	0.18	0.856	-.007122	.008579	1.77586
Distmkt	-.0100098	.00847	-1.18	0.237	-.026615	.006595	2.04828
grading	-.0262549	.0187	-1.40	0.160	-.062911	.010402	1.52414
Grainsto	-.0043815	.00528	-0.83	0.407	-.014736	.005973	1.83793

```
. mfx,predict(p outcome(ARV))

Marginal effects after mlogit
      y  = Pr(Marketout==ARV) (predict, p outcome(ARV))
         =  .22160045
```

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
Gender	-.1818911	.0806	-2.26	0.024	-.339869	-.023913	1.74138
age	.0009125	.0033	0.28	0.782	-.005558	.007383	32.1862
HHsize	-.0124817	.01741	-0.72	0.473	-.046597	.021634	6.2931
Educ	.0316958	.0082	3.86	0.000	.015618	.047774	7.87931
EXT	.1228429	.03196	3.84	0.000	.060193	.185492	1.65172
PRICING	-.0372246	.03428	-1.09	0.278	-.104421	.029972	1.96552
PriceI~r	.0589682	.02502	2.36	0.018	.009924	.108012	4.20345
Yeild	-.1726892	.04507	-3.83	0.000	-.261033	-.084345	1.77586
Distmkt	-.1736685	.04245	-4.09	0.000	-.256865	-.090472	2.04828
grading	.0227476	.06376	0.36	0.721	-.102221	.147716	1.52414
Grainsto	-.0888246	.05355	-1.66	0.097	-.19379	.016141	1.83793

```
. mfx,predict(p outcome(road_side))

Marginal effects after mlogit
      y  = Pr(Marketout==road_side) (predict, p outcome(road_side))
         =  .07782793
```

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
Gender	-.0388744	.05461	-0.71	0.477	-.145915	.068166	1.74138
age	-.0026674	.00195	-1.37	0.171	-.006489	.001154	32.1862
HHsize	.0041968	.00783	0.54	0.592	-.011152	.019545	6.2931
Educ	-.0011714	.00479	-0.24	0.807	-.010558	.008215	7.87931
EXT	-.0440746	.0206	-2.14	0.032	-.084456	-.003693	1.65172
PRICING	.1006756	.02873	3.50	0.000	.044364	.156987	1.96552
PriceI~r	.0624198	.02024	3.08	0.002	.022758	.102082	4.20345
Yeild	.0242368	.023	1.05	0.292	-.020835	.069308	1.77586
Distmkt	.0110453	.02555	0.43	0.666	-.03903	.06112	2.04828
grading	.0858138	.04338	1.98	0.048	.000791	.170837	1.52414
Grainsto	-.0103297	.03528	-0.29	0.770	-.079472	.058813	1.83793

Appendix 13:Diagnostic Tests

```
. use "C:\Users\chiketa\Documents\taida data.sav2.sav final.sav nhasi.dta", clear

. regress Marketout Gender age HHsize Educ Yeild Distmkt PriceInfor EXT PRICING Grainsto grading
```

Source	SS	df	MS	Number of obs =	94
				F(11, 82) =	5.58
Model	48.1298425	11	4.37544023	Prob > F =	0.0000
Residual	64.3488809	82	.78474245	R-squared =	0.4279
				Adj R-squared =	0.3512
Total	112.478723	93	1.20944864	Root MSE =	.88586

Marketout	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Gender	-.1149403	.2312553	-0.50	0.620	-.5749807	.3451002
age	-.0068282	.0103265	-0.66	0.510	-.027371	.0137145
HHsize	-.0339515	.0470623	-0.72	0.473	-.1275734	.0596705
Educ	-.0055895	.022714	-0.25	0.806	-.0507748	.0395959
Yeild	-.0785297	.1187584	-0.66	0.510	-.3147779	.1577186
Distmkt	-.1145138	.1288718	-0.89	0.377	-.3708808	.1418532
PriceInfor	.1609954	.0699148	2.30	0.024	.0219127	.3000782
EXT	-.1214291	.1017451	-1.19	0.236	-.3238326	.0809744
PRICING	.5244476	.0855719	6.13	0.000	.3542178	.6946774
Grainsto	-.2174196	.1535004	-1.42	0.160	-.5227808	.0879416
grading	-.2634157	.1910581	-1.38	0.172	-.6434911	.1166596
_cons	2.250992	.9940404	2.26	0.026	.2735285	4.228455

```
. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of Marketout

         chi2(1)      =    15.81
         Prob > chi2  =   0.0001

. estat ovtest

Ramsey RESET test using powers of the fitted values of Marketout
       Ho:  model has no omitted variables
                  F(3, 79) =      0.26
                  Prob > F =      0.8557

. estat vif
```

Variable	VIF	1/VIF
Educ	1.41	0.709449
Gender	1.37	0.731746
HHsize	1.32	0.760386
PriceInfor	1.28	0.779976
Yeild	1.23	0.811025
age	1.22	0.822791
Distmkt	1.21	0.829121
Grainsto	1.18	0.847958
EXT	1.18	0.850729
PRICING	1.12	0.893065
grading	1.09	0.918547
Mean VIF	1.24	

```
.
```