AN ASSESSMENT OF THE MAIZE MARKET STRUCTURE, CHANNEL CHOICE AND MARKET PARTICIPATION BY THE SMALLHOLDER MAIZE FARMERS IN ZIMBABWE: A CASE OF MAZOWE DISTRICT

by

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DEDICATION

To *Rumbie, Alicia and Aiden*

DECLARATION 1 - PLAGIARISM

I, VINCENT TINASHE MUNYATI, declare that:

(i) the research reported in this thesis, except where otherwise indicated, is my original research;

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(iii) this thesis does not contain any other persons' data, pictures, graphs or other information, unless specifically acknowledged as being sourced from those persons;

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Vincent Munyati

As the candidate's supervisors, we agree to the submission of this thesis:

Signed: [redacted] **Date:** 22/8/2023

Prof Maxwell Mudhara (Supervisor)

Signed: _____ **Date:** _____

Dr Sinyolo (Co-Supervisor)

DECLARATION 2 - PUBLICATIONS

The following manuscripts (under review) form part of the research presented in this thesis:

Manuscript 1 - Chapter 3

Munyati, V.T., Mudhara, M. and Sinyolo, S. An analysis of the maize marketing structure and its effects on the marketing performance in Zimbabwe: A case of the Mazowe District.

Manuscript 2 - Chapter 4

Munyati, V.T., Mudhara, M. and Sinyolo, S. Determinants of market channel choice by smallholder maize farmers in Zimbabwe: A case of the Mazowe District.

Manuscript 3 - Chapter 5

Munyati, V.T., Mudhara, M. and Sinyolo, S. Factors determining smallholder maize farmers' likelihood and intensity of market participation: A case of the Mazowe District in Zimbabwe.

Author contributions

All the papers were conceived by Munyati, V.T. The data collection, analysis and writing up of the papers were also done by Munyati, V.T, while Mudhara, M. and Sinyolo, S. contributed their valuable supervision, guidance, insights and comments at every stage of their production.

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ABSTRACT

Marketing plays a crucial role in alleviating poverty, as well as in achieving food security and sustainable development goals, especially among smallholder maize farmers. Maize marketing has the potential to improve the resilience of households against food insecurity, which is caused by multiple factors which may be natural factors, socio-economic and institutional factors. Smallholder maize farmers find it difficult to participate in the maize market because of a range of limitations, such as poor transport facilities, information asymmetry and the lack of a market infrastructure, which reduces their motivation to partake and which may be echoed in concealed expenses that make it challenging to enter the markets and productive resources. This study ascertained the factors that determine the likelihood and intensity of smallholder maize farmers participating in the maize markets, and it also assessed the market choices made by the smallholder farmers in the Mazowe District of Zimbabwe and analysed the maize marketing structure and its effects on the maize marketing performance. Questionnaires were used to collect data from 382 smallholder farmers and 27 agro-dealers in the Mazowe District. The study adopted a mixture of tools for data collection, including a questionnaire, observations and discussions. The Heckman Selection Model was used as the main analytical tool to estimate market participation and the intensity of this participation, while the Multinomial Logit Model was used to assess the market choices of the farmers and the Herfindalf-Hirschman Index and Gini coefficients were used to measure the concentration of maize traders in the Mazowe District. Due to the narrow index of the maize marketing options in the country, only three distinct alternatives were isolated, namely, the farm gate, the local market and the Grain Marketing Board (GMB), a government parastatal. The results indicated the significant factors that were associated with the likelihood and intensity of the farmers' market participation, namely, the age of household head, the number of maize buyers at the district level, their extension contacts, membership of a marketing association and the distance to the output market. Contrary to the *apriori* expectations, the distance to the market had a positive and significant impact on their intensity to participate in the maize market. Other factors that significantly influenced the market choice selection of the smallholder farmers were the age of household head, the extension contacts, market information, the distance to the market and the price offered to maize producers at the market. The number of visits by extension workers significantly increased the likelihood that a maize producer would sell his produce at the local market, rather than at the farm gate. The distance to the market significantly influenced the probability of choosing the local market over the farm gate. As the distance to the local market increases, the smallholder farmers in the Mazowe District preferred the farm gate for selling their produce. In this study, the popular marketing channel for the smallholder farmers was the farm gate; although the prices

offered here were often not competitive, the farmers opted for it because of the low transaction costs. The results also indicated that the number of buyers in the maize grain market is too small to make it competitive. The few traders exhibited collusive behaviour with regard to price-setting. The local market channel and G.M.B had a lower Shepherd Marketing Efficiency Index. While both indices were low, when they were compared to the standard in literature, the GMB channel was the least efficient. Most farmers indicated that selling their grain to the GMB involved bureaucracy and late payments, which have negatively affected the marketing efficiency. These late payments have short-circuited the ability of small-scale farmers to generate a cash-flow with which to fund their agriculture activities. The study recommends that there should be mechanisms for developing the capacity of farmers to access marketing information, in order for them to make an informed decision regarding which marketing channel to choose. Governments need to think about how to help smallholder maize farmers to engage better with the existing profitable market channels. Being a member of an association increases the probability of a farmer selling to more lucrative markets. Farmer groups have the advantage of bulking and hence increasing the economies of scale. There is need for farmers to invest more in collective action. It is also easier and cheaper for traders to enforce quality and grade requirements by reaching farmers groups, rather than individual farmers.

Keywords: Heckman selection model, Market Participation, Smallholder farmer, Farm gate

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ACRONYMS AND ABBREVIATIONS

CR	-	Concentration Ratio
FAO	-	Food and Agriculture Organisation for the United Nations
FTCs	-	Fixed Transactional Costs
GDP	-	Gross Domestic Product
GMB	-	Grain Marketing Board
HHI	-	Herfindalf-Hirschman Index
HCI	-	Household Commercialisation Index
MNL	-	Multinomial Logistic
OLS	-	Ordinary Least Squares
PTCs	-	Proportional Transaction Costs
SSA	-	Sub-Saharan Africa
SCP	-	Structure-Conduct-Performance
TCs	-	Transaction Costs
US$	-	United States Dollar
Zimstat-		Zimbabwe National Statistics Agency
Zimvac-		Zimbabwe Vulnerability Assessment Committee

CHAPTER 1

INTRODUCTION

1.1 Background

Although industrialisation remains the primary goal of political and economic planners throughout the developing world, the last decade has seen a strong resurgence of interest in, and a concern for, smallholder agriculture. Most African countries cannot afford to ignore smallholder agriculture, as higher proportions of their population are involved in these activities (Larson *et al.*, 2016), and there appear to be few immediate prospects for rural industrialisation or other non-farm growth engines. Smallholder agriculture is likely to remain the major source of rural growth and livelihood improvement for some time, as it plays a positive role in employment creation, human welfare and political stability in sub-Saharan Africa.

Smallholder farmers generally have low incomes and a lack of capital, and attempts to market their products, especially food staples such as maize, is hampered by poor infrastructure and communication problems, which are compounded by the geographical dispersion of the farmers, inadequate support services and weak institutions (Jebesa, 2019). Barrett *et al.* (2008) observed that the small proportion of sales of staple crops among rural smallholders is a common pattern in southern Africa, and Barrett *et al.* (2008) argue that both the lack of asset endowment, information asymmetry and the cost of commerce or trading, especially in remote areas, strongly affect their market participation.

During the 1980s, the recognition of the potential of markets being engines of economic development and structural transformation gave rise to a market-led paradigm of agricultural development (Reardon and Timmer, 2006), which was accompanied by the widespread promotion of market liberalisation policy agendas in Sub-Saharan Africa (SSA) and other low-income regions. Major reforms, like improving the market infrastructure by providing more, and better, markets and making it easier for farmers to access them, is deemed to be necessary for increasing the level and intensity of commercialisation, especially in developing countries. The majority of smallholders are in remote areas with poor transport facilities and a poor market infrastructure, which contributes to the high transaction costs faced by these farmers when trying to access the high-value markets.

As the agricultural sector in the country transforms towards commercialisation, the smallholder farmers and intermediaries require systems that are responsive to their needs, namely, access to markets, market information, market intelligence and effective farmer organisations. Although the marketing chains are changing, smallholder farmers in Zimbabwe are not yet able to meet the requirements of the high-end markets, and hence, the traditional markets still play a crucial role in the agricultural marketing system in Zimbabwe. Markets offer households the opportunity to specialise according to their comparative advantages, thereby realising welfare gains from marketing their produce (Gebrehiwot *et al.,* 2018). However, the participation of smallholder farmers in these high-value markets still remains a major challenge in Zimbabwe.

Promoting market-orientation among agricultural producers in developing countries, particularly among smallholder farmers, is pivotal for the development of effective agribusiness value chains that can supply adequate food. Such a move involves improving the production and marketing processes for, and the capacity of, income-generating processes among resource-poor farmers (Otieno *et al.,* 2009). In developing countries, smallholder farmers find it difficult to participate in markets because of a range of constraints and barriers that reduce the incentives for their participation, which may be reflected in the hidden transactional costs that make access to markets and productive assets difficult. Transaction costs, i.e. the observable(variable) and non-observable (fixed) costs associated with the exchange, are the embodiment of the access barriers that prevent the market participation of resource-poor smallholder farmers (Gebrehiwot *et al.,* 2018). Smallholder farmers commonly incur fixed costs when they make the decision to trade in an agricultural market. Such costs are known, irrespective of the transaction volume, and they affect the decision on how much produce to supply to the market. Fixed and variable transaction costs impact market participation, whereas supply decisions that are conditional on market participation only depend on variable transaction costs. Transaction costs reflect the character of the market but are mainly embedded in the household characteristics and their economic environment (Musara *et al.,* 2018). It is the bundle of transaction costs that farmers face which determines their market participation and the intensity with which they participate in a given marketing system. Interactions between the unique features of food system participation and other household- and location-specific characteristics can further exacerbate the transaction costs. Sadoulet and de Janyry (1995) highlighted the fact that farmers will not enter markets when the value of participating is outweighed by the costs of undertaking the transaction.

Mmbando *et al.* (2015) noted that transaction costs are the key reason for the failure of smallholder farmers participating in the markets. These costs include the cost of searching for trading partners,

as well as the cost of bargaining, monitoring, enforcement, and eventually, transferring the product to its destination. The intensification of agricultural production systems and increased commercialisation must be built upon the establishment of efficient and well-functioning markets and trade systems that keep the transaction costs low, that minimise the risks and that share information with all the actors, particularly those living in areas of marginal productivity, where there is a weak infrastructure (World Bank, 2008). Therefore, this study focused on the effects of the structure of the maize market on the market participation of smallholder farmers in Zimbabwe.

1.2 Problem Statement

Countries that have been successful in reducing rural poverty have utilised and shaped the markets to provide the right conditions, in order to allow people to increase their income. Smallholder farmers find it difficult to participate in markets because of a range of constraints that reduce their incentives for participation, which may be reflected in hidden costs that make access to the markets difficult. Smallholder maize farmers find it difficult to participate in the maize market because of a range of limitations, such as poor transport facilities, information asymmetry and the lack of a market infrastructure, which reduces their motivation to partake and which may be echoed in concealed expenses that make it challenging to enter the markets and productive resources. The low market participation by the smallholder farmers has resulted in low incomes from farming, poverty and the households being food insecure.

In this regard, smallholder farmers are required to participate in the market in order to improve their production and produce a marketable surplus. The development of policies to enhance market participation and rural incomes will require policymakers to understand the factors that influence the market participation of smallholder farmers and the factors that they consider when they select a particular market. Despite the rapidly-growing number of research studies in the literature that have empirically investigated the factors that influence the market participation of smallholder farmers in developing countries (Alene *et al.,* 2008; Biénabe *et al.,* 2011; Barrett *et al.,* 2012; Mather *et al.,* 2013; Mmbando *et al.,* 2015; Olutumise, 2020; Andrareigie *et al.,* 2021; Hoq *et al.,* 2021; Ndlovu *et al.,* 2021), few studies (Mango *et al.,* 2018; Musara *et al.,* 2018) have focused on the market participation of smallholder farmers in Zimbabwe. A few studies in Zimbabwe have analysed the market participation of smallholder maize farmers in the country and the intensity of their participation, but they have focused on the market participation of crops such as sorghum (Musara *et al.,* 2018) or groundnuts (Mango *et al.,* 2018). Hence, this study intends to extend the literature on the smallholder maize farmers' choice of markets.

A farmer's decision to participate in the agricultural markets is one of the most important determinants of a household's welfare (Barrett, 2008; World Bank, 2008). In sub-Saharan Africa, specifically in Zimbabwe, quantitative evidence of the relationship between smallholder market participation and household welfare is limited. This study is important, from a policy perspective, as little is understood about the factors that influence smallholder market participation. Since maize is strategic crop, compared to tobacco and soyabeans, the lack of participation and coordination among stakeholders along the maize value chain remains an important, but missing, ingredient in the discourse on agribusiness development.

This study is important from a policy perspective, as little is understood about the factors that influence smallholder market participation and the intensity of their participation in the maize market, particularly the role of the transaction costs, institutions and household demographics. Understanding the factors that influence their market participation and the level of their participation will assist policymakers to develop the necessary strategies to improve market participation and household income, since some of the policies such as S.I 145 of 2019 failed to yield the desired results. Understanding the factors that influence the market participation of smallholder farmers, as well as the structure and performance of the maize market, will assist policymakers to develop strategies required to improve market participation, household income and the welfare of smallholder farmers in Zimbabwe

1.3 Research Objectives

The main objective of this study was to determine the maize market structure, assess the participation of the smallholder maize farmers in the output markets and the maize marketing channel choice decision by the smallholder maize farmers.

Specific Objectives

The specific objectives of this thesis were:

a. to determine the maize market structure and its performance;
b. to determine the factors influencing smallholder farmers' decision to participate in the maize market;
c. to determine the intensity of participation in maize markets by the smallholder maize farmers; and

d. to determine the factors that influence the smallholder maize farmers' choice of marketing outlets.

1.4 Research Questions

a. What is the maize market structure like and how is it performing?
b. What are the factors influencing smallholder farmers' decision to participate in the maize market?
c. What is the intensity of participation in maize markets by the smallholder maize farmers?
d. What are the factors that influence the smallholder maize farmers' choice of marketing outlets?

1.5 Justification for the Study

This study will provide additional knowledge on how to develop viable and compatible production and marketing strategies for smallholder farmers. An in-depth analysis of the structure and efficiency of the maize market in Zimbabwe could provide a better understanding of the type of market structure that the market participants are exposed to, as well as the overall performance of the market, which will hence contribute to the achievement of the government's strategy of availing accurate and useful agricultural data. The information is vital for policymakers to address the different challenges faced by smallholder maize producers and traders in the country. By highlighting the critical areas in which the market may be failing, the findings of this study will also benefit the producers and traders in the study area. Potential investors will also benefit from the findings, as they will gain knowledge of whether to invest in the production or trading of maize.

Policy dialogue and interventions in Zimbabwe's agricultural sector have tended to centre more on variables such as attracting foreign investment, input subsidies, research and extensions services, rather than on the regulatory arrangement of the maize markets and production. It is important to take a broader view of how market channels may be critical for setting Zimbabwe on the path of increasing food security and reducing poverty, which has proven to be elusive, despite the significant efforts that have been made to resettle farmers.

1.6 Organisation of the Thesis

The thesis is divided into six chapters. The first chapter covers the introduction, the problem statement, objectives, research questions and the justification of the study. Chapter Two reviews the literature on maize production by smallholder farmers and it also articulates an empirical review of

the marketing efficiency, market participation and market channel choices of smallholder farmers. Chapter Three examines the structure and performance of the maize markets in the Mazowe District of Zimbabwe, and Chapter Four examines the market channel selection of smallholder maize farmers in this same District. The last analytical chapter is Chapter Five, which examines the factors that determine the likelihood and intensity of the market participation of smallholder maize farmers. Chapter Six concludes the study with a summary of the findings, as well as policy recommendations.

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CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

Agricultural marketing plays an important role, not only in stimulating production and consumption, but also in accelerating the pace of economic development. Although the marketing of agricultural produce remains an important tool for increasing the farmers' income and alleviating poverty, Kherallah and Kirsten (2001) noted that farmers experience barriers; for example, an insufficient and inadequate physical infrastructure, a lack of marketing knowledge, a lack of basic knowledge, as well as a lack of organisational support and institutional barriers in marketing. These barriers will then affect farmers' market participation and the intensity of their participation. This chapter reviews the literature regarding the determinants of market participation among maize farmers, the importance of participating in markets, the transaction costs and the econometric approach in modelling their market participation.

2.1 Definition of Terms

2.1.1 Smallholder farmers

Smallholder farmers are rural producers who farm using mainly family labour and for whom the farm provides the principal source of income (Munongo and Shallone, 2010). Smallholder farmers are characterised by family-focused motives, such as favouring the stability of the farm household system, using mainly family labour for production, using part of the produce for family consumption (Masvongo, 2013) and selling the surplus produce. Smallholder agriculture has been traditionally based on a wide range of rainfed, seasonal food crops for a balanced household nutrition and for risk aversion (Masvongo, 2013). Smallholder farming is the hallmark of agriculture in Zimbabwe, and yet the intensity and density of poverty still remains very high, even though farmers exercise intensive agricultural practices and continuously seek to adapt to the constraints and opportunities, as part of their survival strategy (FAO, 2010). Most smallholder farmers are extremely poor; overall, the highest incidence of households living with their families below the poverty datum line is associated with those of smallholder farmers.

The economic viability and contribution of smallholder farmers to a diversified landscape and culture are threatened by the competitive pressure of globalisation and its integration into common

economic areas. Their fate is either to disappear and become purely self-subsistent producers, or to grow into larger units that can compete with large industrialised farms (FAO 2015). Smallholder farmers depend on rainfall and seasonal cropping, which focuses on complementing the food and consumption needs of their households with little capital investment.

2.1.2 Market participation

Market participation involves farmers being able to buy inputs from the input market, or being able to sell their outputs on the output market. The discrete choice of participation refers to whether farmers engage in selling activities, regardless of the quantity sold and the point of sale. According to Jagwe (2011), the intensity of market participation is defined as the quantity of output sold by a farmer from his total production, or the quantity of input a farmer can purchase in the input market. This definition is supported by that of Andraregie *et al.* (2021), who defined market participation as the ability of an individual to participate in a market efficiently and effectively. In the context of this study, it is the transition of farmers from subsistence farming to a market-engagement mode, where an increasing number of inputs are purchased, and outputs are sold to traders. In this study, market participation is considered from the viewpoint of the quantity of the output sold by farmers in the maize market.

2.1.3 Transaction costs

Transaction costs refer to the costs that are incurred when looking for a trading partner, negotiating with the partner, making a contract and enforcing it. These could be in terms of the money spent, or the opportunity cost of the time spent. The decision to participate in the market is not only influenced by the prices, but there are several other factors that are part of the farming household and the environment in which the maize farmers operate. In developing countries, smallholder farmers live in remote areas with a poor infrastructure and they often fail to participate in the markets due to the high transaction costs involved (Goetz, 1992; Makhura *et al.,* 2001). Key *et al.* (2000) stressed that the transaction costs are, in some cases, so high that the markets can be said to be missing, while in other cases, farmers may choose not to participate in the markets, in order to minimise their transaction costs.

Kirsten and Vink (2005) defined transaction costs as the costs associated with searching for a trading partner with whom to exchange one's goods, the cost of screening and bargaining with the partner and then the cost of enforcing the contract that is made with the trading partner. They also observed that the transaction costs are captured as the opportunity costs faced by individuals in the process of exchanging property rights. Makhura *et al.* (2001) stressed that transactions costs also

include the costs associated with reorganising the household labour and other resources, in order to produce a marketable surplus.

2.2 Overview of the Maize Sub-Sector in Zimbabwe

Maize is a strategic crop in Zimbabwe, as it ensures food security and serves as a raw material for agro-industrial processes. Worldwide, the maize sector has experienced many changes over the past two decades, in terms of production, utilisation and market arrangements. These changes have been driven by a host of factors, ranging from rapid innovations in seed and production know-how, changes in domestic policies, international trade and, more recently, the sudden surge in the demand for biofuels.

An estimated 2.3 million Metric Tons (MT) of maize are consumed annually in Zimbabwe, which contributes 14% of the country's agricultural Gross Domestic Product (ZIMVAC 2020). According to the ZIMVAC Report (2020), maize is grown by over 90% of the 1.3 million farming households across the country and the crop is grown on over 60% of the total annual cropped area in Zimbabwe.

Before the implementation of the 'fast-track' land reform programme, Zimbabwe was producing enough grain and exporting the excess to other neighboring countries, such as Zambia and Mozambique (Mudimu, 2020), but this scenario changed after its implementation. Zimbabwe has been producing a maize output that ranges between 400 000 tons and 1.5 million tons of maize, which is below its annual consumption requirements of 2.3 million tons (Mutambara, 2016). This level of production means that Zimbabwe has to import the deficit to feed its population. This poor sectorial performance is mainly attributable to the disruptions caused by the 'fast-track' land reform programme, the lack of subsequent recovery calls in the form of agricultural strategies, as well as the lack of policies to complement land reform (Kapuya *et al.,* 2010; Mushunje *et al.,* 2012 and Mutambara *et al.,* 2016).

Kapuya *et al.* (2010) modelled the impacts of the 'fast-track' land reform policy on maize production in Zimbabwe by constructing a partial equilibrium model that depicts what could have happened if no further policy shifts had taken place after the year 2000. The results of the model indicated that the commercial area harvested was 39% less than what could have been harvested in 2001, and that it declined by 80.57% in 2007. Kapuya *et al.* (2010) revealed that the total maize production was 61.85% and 43.88% less than what could have been produced in the 2002 and 2005 droughts, respectively, which implies that the droughts would have been less severe if the 'fast track' land reform programme had not been implemented.

Mutambara *et al.* (2016) stated that, although the El Nino effect and drought-related conditions have had an impact on maize production in Zimbabwe, these weather-related factors are common across the region. The same factors have not prevented other neighboring countries, like Malawi, Zambia and South Africa, from performing relatively better in terms of their agricultural performance. Mutambara *et al.* (2016) reiterated that the region's average maize yield is about 2.5 tons/hectare, compared to Zimbabwe's yield of less than 1 MT.

2.3 Maize production in Zimbabwe

Maize is a strategic crop in the country's economy, as it ensures food security and serves as a raw material for agro-industrial processes. The annual maize requirement in the country is 2.3 million metric tons and, from a food security perspective, the country requires approximately 1.8 million tons of maize annually. It is the staple crop and accounts for over 50% of the calorie consumption of an average household in the country. In terms of production, maize is grown by over 90% of the 1.3 million farming households across the country. The crop is grown on over 60% of the total annual cropped area, and 90% of the total area under cereal is occupied by maize (ZIMVAC 2020).

Maize production is slowly declining in Zimbabwe because of a few problems in the sector. For example, the per capita maize production is slowly declining because of a significant decline in the yield per hectare over time. In the 1990s, the smallholder maize yield was around 1.5 tons/ha; however, it dropped to about 0.7 tons/ha after the year 2000 (Agritex, 2015). Smallholder farmers are the major producers of maize in the country, accounting for over 60% of the total maize output, as the major sector shifted to more lucrative cash crops, such as tobacco and soya beans.

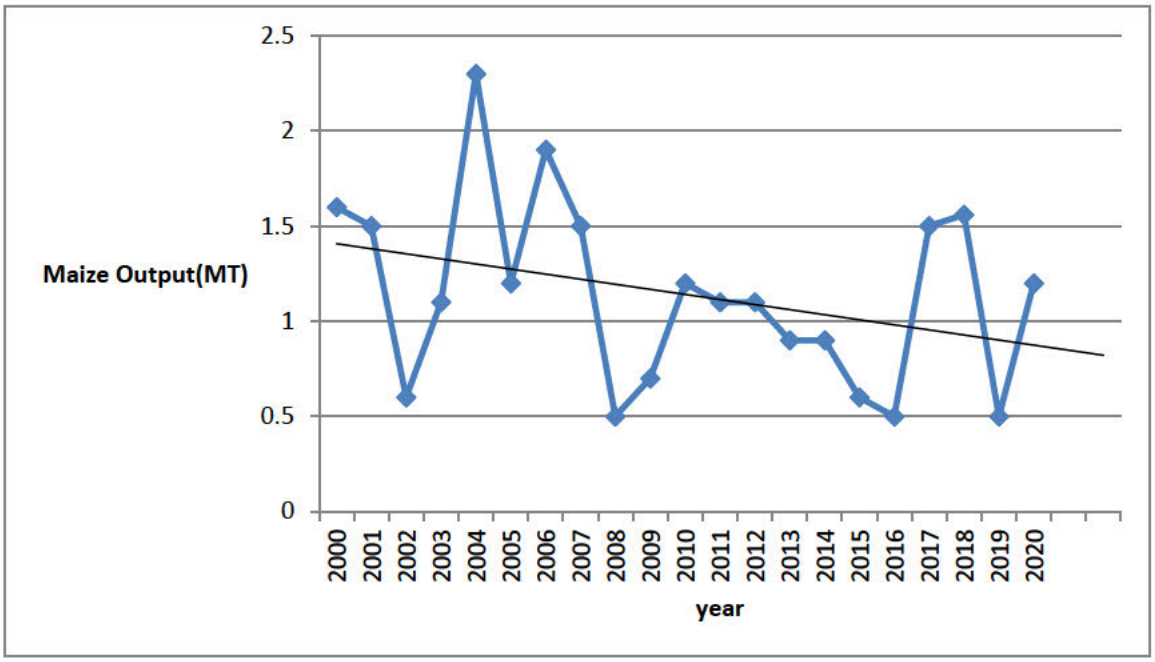

Figure 2.1 Maize production trends
FAOSTATS (2021)

The linear trend line in Figure 2.1 confirms the continuous decline in the average output of maize in the country. Productivity in maize production was high which, to some extent, explains why Zimbabwe was regarded as the 'bread basket' of southern Africa at one point. However, due to various factors that have continued to hit the Zimbabwean agricultural sector hard, such as climate change, macro-economic challenges, disease and pest attacks, as well as other government policies, the maize productivity has been declining. From early 2000 to the present, the productivity has continued to decline, as shown in Figure 2.1. The reason for the declining productivity, especially in the smallholder sector, is the lack of productive resources by the new group of smallholder farmers, while the many changes in the maize marketing policy, since 1980, have had an impact on the productivity of maize in Zimbabwe.

2.4 Zimbabwe Maize Trade

Maize is the most valuable cereal and basic food crop in Southern Africa, accounting for more than 35% of total caloric intake from cereals across the Southern Africa Region. Maize accounts for much higher percentages among the rural, poorer population. In addition to direct human consumption, it is also a leading input into animal feed and an intermediate product for industrial use as components of other food products or oil. As such, maize not only plays a critical role in the food security of the region, but also as the dominant driver of the systems in support of agriculture as a whole, it provides the volume to make services necessary for efficient grain trade. However, several countries are usually in net maize deficit. Countries such as Mozambique, Namibia, Zimbabwe, Angola and Botswana are usually in net maize deficit. The food deficits/surpluses within the region are often balanced by international and regional trade and long term storage. Zimbabwe has been the main export destination of maize from South Africa and Zambia. The importation of maize in Zimbabwe takes place via state trading government monopolies

Zimbabwe recorded an increased deficit in maize production from 2009 to 2020, leading to the country's increased dependence on maize importation from neighbouring countries such as Zambia and South Arica (Food and Agricultural Organisation Statistics [FAOSTAT] 2020). This reduced output in maize production followed a general decline in agricultural output since the Fast-Track Land Reform Programme (FTLRP) which was implemented from 2000 to 2006 (Zikhali 2008; Chilunjika & Uwizeyimana 2015).

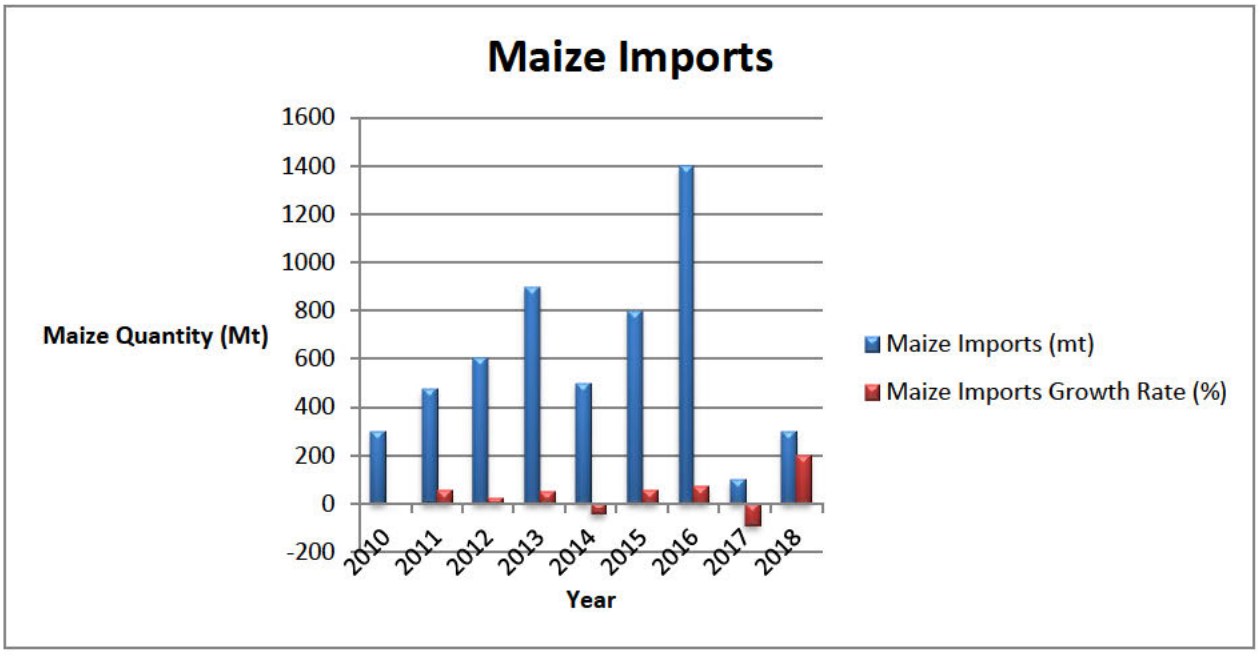

Figure 2.2 Zimbabwe Maize Imports

Source: Index Mundi (2019).

From Fig 2.2 it can be noted that Zimbabwe has been importing maize from the neighbouring countries since 2010. There has been a steady growth rate in the amount of maize that Zimbabwe has been importing from its trading partners. From Fig 2.2 it can be noted that the growth rate of maize imports was negative in 2017 meaning that Zimbabwe produced enough grain to feed itself.

2.5 Smallholder Farmer Participation in Agricultural Markets

Like most developing countries, Zimbabwe's farming sector is dominated mostly by smallholder farmers, as well as many small-scale traders and producers in the agricultural market, who do not have the adequate capacity to participate effectively in the market. Literature reviews suggest that increased farmer participation in the formal markets will improve their income and rural employment (Ngangweni, 2000). This means that farming in the rural areas acts as a form of employment and assists with income generation, thus improving rural livelihoods. Makhura (2001) highlighted the fact that producer participation in marketing allows for the farmers to transition from subsistence farming to commercial farming. Commercialisation is essential, as the increased production improves the welfare of farmers, and because activities, such as processing, transportation and selling, can be done on a large scale, employment can be provided.

Market participation plays a critical role in meeting the overall goals of food security, poverty alleviation and sustainable agriculture, mostly among smallholder farmers in developing countries (Musara *et al.,* 2018). Market participation has led to rural development, for example, rural electrification and other related development activities. Most farmers who participate in the markets

tend to be more food secure than those who do not participate, because the income that they obtain from output sales enables them to purchase food and other household requirements. Asfaw *et al.* (2010) highlighted the fact that economic liberalisation has given smallholder farmers the opportunity to diversify their products and to take their surplus to nearest markets.

2.6 Marketing Efficiency of Smallholder Farmers

An efficient maize marketing process must transmit the benefits of any resource that is used in the marketing service to the producers, in the form of a reduction in the labour costs, the purchase price of inputs, transport costs and selling price, as well to consumers, in the form of a reduction in the producer price of maize. An increased marketing efficiency facilitates the more efficient movement of maize output from the farmers to the consumers, and this could result in large gains for producers.

A study conducted by Senguttuvan (2015) in India showed that more efficient agricultural marketing generates economy-wide gains in the outputs and wages, it raises the agricultural producer prices, it reduces the consumer food prices and increases private consumption, particularly by low-income households. These gains could help to offset some of the medium-term adjustment costs for some commodity markets and households that are associated with reducing agricultural subsidies and tariffs (Senguttuvan, 2015).

Agricultural marketing efficiency can be studied by using different approaches, such as price spread, a data envelope analysis and an analysis of the functioning of the market using a structured conduct performance framework. For instance, Dastagiri *et al*. (2010) estimated the marketing efficiency of horticultural commodities in different supply chains in India, by using the marketing margin analysis method. The results of the study showed that the marketing of horticultural crops was efficient and the most preferred market channel was the producer-to-consumer channel. Dastagiri *et al*. (2013) also conducted a study to determine the Indian vegetable production trends, the marketing efficiency and the export competitiveness. Dastagiri *et al*. (2013) used the marketing margin method, in which the marketing efficiencies were calculated by following the market channels. The study showed similar results to the previous research and revealed that the majority of the horticultural commodity markets are operating efficiently. The highest marketing efficiency ratio was found in the producer-to-consumer channel. The study was conducted in various states and the marketing efficiency figure ranged from 46% to 100%.

In Nepal, a similar study was conducted by Dilli *et al.* (2015) and similar results were obtained. The study showed that the highest marketing efficiency, with a magnitude of 7.24, was observed in the producer-consumer channel and that this was the most preferred marketing channel used for marketing maize seed in Nepal. A similar study on the efficiency of vegetable marketing in Nigeria was conducted by Uche *et al*. (2016). The marketing margin analysis method was also used, and the study showed that vegetable marketing was efficient, as indicated by the positive net margin.

The Structure-Conduct-Performance (SCP) model has been used by a number of researchers to assess the marketing efficiency of agricultural products; for example, Giroh *et al.* (2010), Tiku *et al. (*2012) and Nwalem *et al*. (2016). The results of these studies showed a high marketing efficiency of the products investigated. For instance, Giroh *et al.* (2010) noted that the marketing margin and efficiency for the farm-gate marketing of natural rubber were 44% and 122%, respectively. The rate of return was also high. The Gini Coefficient analysis showed that the market was concentrated (0.256) and that there was the possibility of non-competitive behaviour and equality in the earnings of the marketers. Nwalem *et al. (*2016) analysed the structure-conduct-performance of sesame seed farmers by using the Marketing Efficiency Index. It revealed that sesame farmers are economically efficient, with a Marketing Efficiency (ME) of 4.20, and that the sesame business is competitive.

Nzima *et al.* (2014) and Garba (2015) analysed the structure-conduct-performance of agricultural products in Malawi and Nigeria, respectively. These two studies, however, showed the marketing inefficiency of these agricultural products. Nzima *et al*. (2014) assessed the efficiency of the structure-conduct-performance of the groundnut markets in northern and central Malawi. The researchers used time-series price data to examine the spatially-distinct groundnut market. The results showed that this market is weakly integrated and only has a few sellers. The study therefore recommended the need to transform the institutions into organised groundnut seed systems, in order to ensure the supply of high-quality seed to farmers. This involved strengthening the market-oriented extension services, improving the roads to the production areas, improving and obtaining affordable technologies for production and value addition, having vibrant farmers' organisations, as well as improving the generation and dissemination of market information to farmers.

Garba *et al*. (2015) obtained the same results as Nzima *et al*. (2014), although in a different setting. The research work specifically analysed the structure and performance of the Shea butter market and the constraints associated with the marketing of it within the sampled districts. The data were analysed by using descriptive statistics, the Gini Coefficient (Lorenz curve), the marketing efficiency and the marketing margin. The results showed an equal distribution of Shea butter amongst the three categories of the market participants (the rural buyers, wholesalers and retailers),

with Gini coefficient values of 0.077, 0.083 and 0.12, respectively. The study also recommended correcting the institutions, as the Shea butter farmers lack a standard butter measurement, there is poor access to credit; there are poor storage facilities and means of transportation, as well as low and unstable market prices.

Although agricultural marketing efficiency can be studied by using different approaches, such as analysing the marketing margin at various stages of the movement of a farm product from the farmer to the consumer (price spread), by using the data envelopment analysis and an analysis of the functioning of the market and using structure conduct performance framework, the crux of matter is that agricultural marketing should be efficient. An efficient agricultural marketing system (including efficient pricing) is desirable, as it leads to the maximum welfare from the given amount of output that has been marketed. When the markets are efficient, shortages and surpluses will not exist in different areas of the country at the same time or at different times of the year in the same area.

2.7 Empirical Review of Market Participation by Smallholder Farmers

Numerous studies have evaluated the market participation of smallholder farmers and the intensity of their participation in the markets. For instance, studies by Sreekumar *et al. (*2012), Arinoloye *et al. (*2014), Musah *et al. (*2014), Mmbando *et al.* (2015), Burke *et al.* (2015), Adepoju *et al.* (2015), Olwande *et al.* (2015), Achandi (2016), Esther *et al. (*2016), Shewaye (2016), Qin and Vania (2018), Musara *et al.* (2018), Owusu and Iscan (2020), Andaregie *et al.* (2021) and Wakaba *et al.* (2022) and evaluated the determinants of market participation by smallholder farmers by using different models in different countries.

Arinoloye *et al.* (2014) analysed the Beninise smallholder farmer's selection of high-value markets, such as export- and processing-oriented markets in the pineapple supply chain. In the study, four marketing channels were selected, namely, the rural, urban, export and processing-oriented markets. The major difference, compared to the other studies, was that the Multivariate Probit model was used as the analytical tool, with the selection of a certain market by the farmer being the dependent variable. In the study by Arinoloye *et al.* (2014), the choice of farmer *j* to transact in market *j* ($Y_{ij}^{A} = 1$) or not ($Y_{ij}^{A} = 0$) was used. A similar study was carried out by Sreekumar *et al.* (2012) by using a similar approach. A multinomial logistic regression was used by Sreekumar *et al.* (2012) to determine the market participation and marketing efficiency assessment in agribusiness; their justification for using this model was that it allowed them to analyse the data where participants are

faced with more than two choices, as supported by Gujarati (2005). In the study by Sreekumar *et al.* (2012), farmers were faced with three choices: formal market participation, informal markets participation and non-market participation.

Musah *et al.* (2014) investigated the farmers' characteristics, private assets, public assets and transactional cost variables that influence the probability and intensity of participating in the market by smallholder maize farmers in the Upper West region of Ghana. They used the Household Commercialisation Index (HCI) to estimate the level of market participation and the Double Hurdle Model to estimate the factors influencing both market participation and the intensity of participation. The Household Commercialisation Index proposed by Govereh *et al.* (1999) was used and it was modified to estimate the level of the maize commercialisation index only and specified as:

$$HCI = \frac{Gross\ value\ of\ maize\ sell}{Gross\ value\ of\ all\ maize\ production}$$

In the context of market participation, the study by Mmbando *et al.* (2015) made improvements upon the conventional binary model. The Heckman two stage Model was used in their study to analyse the determinants of the smallholder farmers' participation in the maize and pigeon pea markets in Tanzania. According to the Heckman two stage model, market participation depended on both the fixed and variable transaction costs, and it was also used in a study by Shewaye *et al.* (2016). The following Heckman model was used:

$$\lambda_j = \frac{\emptyset\left(\frac{\beta' X_j}{\sigma}\right)}{\Phi\left(\frac{\beta' X_j}{\sigma}\right)} \qquad (2.1)$$

In the equation 2.1, λ_j represents the Inverse Mills Ratio for the maize market "j". β represents the vector of parameters and X is the vector of variables. When the Inverse Mills Ratio is incorporated into the OLS in the second step of the Heckman model, the resulting model is:

$$Y_j = \beta' X + \sigma\rho\lambda_j + \varepsilon_j \qquad (2.2)$$

Where Y_j represents the log value of the maize sales for each "j" maize market level. In this model, β also represents the vector of parameters and X is the vector of variables. The Inverse Mills Ratio is represented by λ_j and $\sigma\rho$ measures the significance for the Inverse Mills Ratio. As opposed to the

Probit Model, the parameters of the OLS model can be directly interpreted, based on the coefficient values of Shewaye *et al.* (2016).

Andrareigie *et al.* (2021) conducted a study to identify the factors influencing the decision of haricot bean smallholder farmers in North-west Ethiopia to participate in the market. Survey data were collected from 312 smallholder farmers and these were analysed by using Heckman's Two-step Econometric model that estimates the Probit model in the first step and the regression model, with the parameters estimated by using the Ordinary Least Squares (OLS) method in the second step. The educational status, non-farm income from non-farm employment, the number of extension contacts, the gender, the improved seed use, chemical fertiliser, as well as the farmers' perception of land degradation, were the significant variables affecting the market participation decision of smallholder farmers. Andrareigie *et al.* (2021) noted that the haricot bean output supplied to the market was influenced by age, experience, livestock holding, non-farm income, extension contacts, gender, market access, as well as membership with a marketing association.

Ola and Menapace (2020) reported that access to extension services, credit and an additional source of income, as well as gender, are more relevant in Africa than in South America and Asia, whereas membership in collective groups and access to irrigation facilities are important in Asia, when determining participation in modern agricultural value chains and high-value markets. Megerssa *et al.* (2020) reported that the age of household head, the household family size, the educational level of household head, the labour market, market information, as well as the distance from the marketplace, were statistically significant factors influencing market participation among smallholder vegetable producers. Andaregie and Astatkie (2020) also noted that access to the produce market and the experience of the farmer significantly influenced the market participation of smallholder farmers.

Using a crop commercialisation index (calculated as a share of the value of the potatoes that are produced and marketed) and the Tobit regression model, Wakaba *et al.* (2022) assessed the extent and determinants of commercialisation and market participation among smallholder potato-farming households. The average commercialisation index was 0.4, which implies that only a smaller share of the produced potatoes was marketed. The extent of potato commercialisation varied between the gender, education level, productivity, the size of the potato plots and the farmers' knowledge of production and marketing. The findings also showed that household characteristics (such as gender (being male), age, education of the household head, household income) and transaction costs (such as distance to the market) negatively influenced potato commercialisation. Conversely, the scale of potato production, a knowledge of potato production and marketing, participation in the Farmer

Field Business School (FFBS) and group membership were positively associated with potato commercialisation. Based on the findings, interventions to strengthen the empowerment of women and the institutional arrangements for collective action and extension are encouraged.

Binary logistic regression was used by Dube (2020) to examine the determinants of output market participation in the Masvingo and Manicaland Provinces by using data from a random sample of 479 smallholder farmers. Dube (2020) noted that the age of the head of household, the size of the household, the level of education of the head of household, the household agricultural income, the degree of farm specialisation, access to irrigation, access to draft power, on-demand extension services, the quality of extension support, the distance of the farm from the nearest rural business centre and tenure, were the significant variable affecting the output market participation of smallholder farmers. The gender of the head of the household, the level of education of household members, farming experience, the block-training approach, the level of dependency, the farmer-to-farmer extension approach, as well as household members with off-farm employment, significantly and negatively influence market participation.

Olutumise (2022) examined the determinants of market participation and preference for pepper production in south-west Nigeria, by using the Market Participation Index (MPI), Multinomial Logit (MNL) and Tobit regression. A multistage sampling procedure was used to select 500 respondents, while the data were sourced by using a questionnaire. The results of the MPI indicated that bell pepper was cultivated more (81.9%) for market purposes than cayenne (75.8%), scotch bonnets (68.8%) and bird-eye (36.4%). The results of MNL indicated that education, experience, credit, market information and distance influenced the preference for species cultivation, while education, experience, income, market information and selected species were paramount in determining the level of market participation in the area, using Tobit regression. The results established that production preference has a significant impact on market participation. Olutumise (2022) concluded that the expected structural transformation in agriculture can be achieved through market participation if policies are guided by the farmers' production preferences and an improved economic status with a good market infrastructure.

Adepoju *et al.* (2015) used the Ordinary Least Square (OLS) method to examine the determinants of market participation of pineapple farmers. Interestingly, they noted that in spite of major constraints, such as bad roads, inadequate storage facilities, as well as the low level of government support, almost all of the farmers participated in the market. This could be sustained if market centres are established at strategic locations that are not too far from farms and if loans are made

accessible to the farmers with low interest rates and that require simplified procedures for processing. Intervention strategies for the improved market participation of pineapple farmers should also be guided by the farmer's age, farming experience and marital status.

Hoq *et al.* (2021) examined the determinants of the smallholders' market access that play an important role in improving their welfare by using the Heckman's two-stage model, with exclusion restrictions. Primary data were collected from 300 households from three districts, by taking 100 from each district and applying a multistage random sampling technique. The first stage of the Heckman's two-stage model indicated that members of an organisation, extension contact, access to market information, access to credit, the home-to-market distance, road connectivity, irrigation facilities, the duration of waterlogging, as well as the output price, significantly influenced the market participation of the farmers. The OLS regression, which measured the intensity of their participation, revealed that the family size, the dependency ratio, access to credit and off-farm income, significantly influenced the household's per capita consumption expenditure as a result of market participation.

Ndlovu et *al. (*2021) investigated the factors that influence the level of value chain participation and the implications for smallholder farmers in KwaZulu-Natal, by using the Hurdle model (which was first proposed by Cragg in 1971). Primary data were collected from farming households that were selected, by using the purposive sampling technique. The results of the Hurdle model showed that the age of the respondent, marital status, farm income, household size, cooperative, market information, radio, membership of an organisation, extension officer, as well as formal education, significantly influenced the participation decisions of smallholder farmers in agricultural value chains. The results also showed that off-farm income, marital status, cooperatives, access to credit, access to an irrigation scheme, radio, extension officer, contact with non-government organisations and formal education significantly influenced the level of value chain participation of the smallholder farmers. Ndlovu *et al.* (2021) concluded that the level of endowment in physical, financial and human resources influenced participation. Furthermore, the farmer's connectivity with the external world outside the village improved the outcomes and level of success. It is recommended that a market-led approach to farmer development should be adopted to improve the commercial prospects of farmers, whilst bolstering food security.

Cragg (1971) proposed a two-tiered process, namely the double-hurdle model, which incorporates the relevance of the participation decision to the Tobit model, with the probability of participation and the intensity of participation being determined by a separate process. According to Achandi

(2016), the idea behind the double-hurdle model was to look at an event that may or may not occur. The model was used by Esther *et al.* (2016) in a study on the market participation of rice farmers in Tanzania. The individual decision to participate in maize marketing can be represented by:

$$d_i^* = Z_i^* \alpha + u_i \quad (2.3)$$

Where d_i^* is a latent variable indicating whether or not the individual participates in a market, α is a vector of unobserved parameters to be estimated, Z_i^* is a vector of the observed independent covariates that explains an individual's decision and u_i is an unobserved error term that captures all the other factors. The extent of participation in maize markets is indicated by:

$$y_i^* = X_i' \beta + v_i \quad (2.4)$$

Where $y_i^*$is the amount marketed, X_i' is a vector of covariates that explains this amount, β is a vector of the unobserved parameters to be estimated and v_i is a random variable indicating all other factors from *X*. An individual will participate in marketing if $u_i > -(Z_i^* \alpha)$ with the probability of observing the individual participant in marketing given as $P(u_i > -(Z_i^* \alpha))$. The model gives room for possible differences between the factors that affect participation ($u_i . Z_i^* \alpha$) and those factors that affect the extent of participation ($v_i . X_i' \beta$) (Achandi 2016). The interaction between the two decisions leads to the following estimation for the model:

$$y_i^* = X_i' \beta + v_i \text{ if } y_i^* > 0 \text{ and } d_i^* > 0 \quad (2.5)$$

$y_i = 0$ otherwise

2.8 Empirical Review of Market Structure-Conduct-Performance

Many studies have sought to explain the structure and performance of agricultural markets, both in developed and developing countries. Nzima *et al.* (2014) studied the structure, conduct and performance of groundnut markets in northern and southern Malawi. In their study, they used time-series data, and spatially-distinct groundnuts markets were also examined. The findings showed that the markets were weakly integrated and segmented with a few sellers. The study highlighted the need for organised groundnut seed systems to ensure the supply of high-quality seeds to farmers, namely, strengthened market-oriented extension services, improved roads to production areas, improved and affordable technologies on production and value addition, vibrant farmer organisations, as well as improved market information generation and dissemination to farmers and traders.

Nyoro *et al.* (1999) studied the maize marketing system in Kenya in the post-liberalisation era by using the structure-conduct-performance paradigm. Evidence from this study indicated that maize marketing was characterised by a high level of competition. Maize marketing at most stages within the system had a low degree of market concentration, which indicated that there had been a substantial entry into maize marketing by private traders since liberalisation began in the late 1980s. Fedderke and Szalontai (2003) examined the level of concentration in manufacturing industries in South Africa over the period 1972 to 1996 and found high and, in most markets, rising levels of concentration (as measured by the Gini coefficient).

Aker (2007) assessed the structure, conduct and performance of the Nigerian grain market during normal and drought years, using the Structure, Conduct and Performance (SCP) approach. The results revealed that there was a positive net marketing margin, which suggested that there were unexploited arbitrage opportunities in over 60% of the markets. Calculations of the Concentration Ratio (CR) suggested that Nigeria's market structure was fairly competitive at a national and regional level. Ordofa *et al.* (2021) also used the gross margin, the Concentration Ratio (CR), the regulation of market entry and exit and the market conduct to analyse the SCP of the milk and butter market in Ethiopia. The CR results showed that the top-four milk traders controlled 78.8% and 89.54% of the total volume of milk sold in Ada'a Berga and Holeta, respectively, and 61.29% and 63.46% of the butter sold in Ada'a Berga and Holeta, respectively. The CR of the milk and butter markets was strongly oligopolistic. Education, market transparency and capital, political equality, as well as corruption, were the barriers against entering the milk and butter trade. The conduct analysis results showed that farmers used different market outlets and price setting strategies to sell their dairy products. The result of price setting was not competitive, as 51.67% of the dairy price decisions were decided by the buyers. In milk marketing, the maximum total gross marketing margin of the producer's share was 63.15% in Channel III (the producer, district retailer to the consumers). The maximum producer's share in butter market was in Channel V (the producer, district retailer to the consumers).

Juma *et al.* (2007) used a cross-sectional survey of 148 indigenous livestock farmers to study the marketing system of indigenous small ruminants in Nairobi, using the Structure Conduct Performance approach. The results of the Lorenz curve and the Gini coefficient showed highly-concentrated markets. In a similar study, Haruna *et al.* (2012) assessed the structure, conduct and performance of tomato marketing in Ghana. The deconstructed marketing margins, Gini coefficients, returns on capital employed and the marketing efficiency criterion were used to assess

the efficiency of the tomato marketing system. The results of the survey showed a highly-profitable tomato marketing industry in Ghana.

Enibe *et al*. (2008) used the SCP model to evaluate policy issues in the banana market in the Anambra State of Nigeria. The study employed the Gini coefficient and Lorenz curve to assess the structure of the banana market, which was found to consist of 0.17, 0.31 and 0.21 of producers, wholesalers and retailers, respectively. A Gini coefficient of 0.17 among the producers indicated that there is no single large banana plantation that supplies a major quantity in the market. There was a higher concentration among wholesalers, where more quantities of bananas were controlled by a small group in the market. Retailers were observed to have a lower concentration than wholesalers, which indicated that there was no single group of retailers controlling a large number of bananas being sold in the market. The Lorenz curves of the retailers and producers were therefore closer to the line of equality than that of the wholesalers. Enibe *et al*. (2008) further identified some of the constraints faced by the actors in the banana industry. They found that the middlemen mostly lacked capital and storage facilities, while farmers lacked the capital to increase the production of high-yielding and disease-resistant banana varieties. Enibe *et al*. (2008) used the producer's share of the retail price, the gross marketing margin and the proportion of consumer's income spent on food to assess their market performance. The producer's share was 56% and the marketing margins for the wholesalers and retailers were 16 and 28%, respectively. The study concluded that the producers had a fair share of consumer spending and that traders accrued high profits (at 65% of the total margin), which implied that consumers were subjected to higher prices, as the traders attained more profits.

The Concentration Ratio, the Hirschman–Herfindahl Index, Bain's classification, Gini Coefficient and the Lorenz curve were also used by Thangarasu *et al.* (2021) to ascertain the structure, conduct and performance of the live small-ruminant markets in southern India. Data were collected from 300 market functionaries that were selected through multi-stage random sampling from 30 live animal markets in South India. The market structure of small ruminants was observed to be 'atomistically competitive'. The volume of the business/the number of animals transacted was found to be more or less equal among the market functionaries.

2.9 Empirical Review of Marketing Channel Selection

Numerous studies have been conducted to analyse the factors influencing the market channel selection among smallholder farmers. For instance, Mutura *et al*. (2013), Tesfamariam *et al. (*2015),

Sigei et al. (2015), Umberger *et al.* (2015), Arinloye *et al.* (2015), Mmbando *et al.* (2017), Musara *et al.* (2018), Pham *et al.* (2019), Ndoro *et al.* (2020), Mossie *et al.* (2020), Mgale and Yunxian (2020) and Cheelo and van der Merwe (2021) studied the determinants of the choice of the market channel among smallholder farmers. The researchers used a Multinomial Logit Regression model (MNL) to analyse the factors influencing the choice of marketing channel by smallholder farmers. However, the areas and enterprises in which the research was conducted were different. The researchers found that institutional factors, like access to market price information, as well as transaction costs and contract marketing, influenced the choice of market channel. Socio-economic factors, like vehicle ownership, as well as the levels of education and production, also influenced the market channel selection of smallholder farmers. A recommendation was made to avail market information to the smallholders, so as to reduce the transaction costs.

Mujeyi (2010) used a qualitative approach to study the markets and marketing channels within the newly-resettled areas of Zimbabwe. It was concluded that the most preferred market channel among the resettled farmers was the informal market channel, as opposed to the government formal markets, which are characterised by market failure. The ineffectiveness and inefficiencies of the formal market resulted in new circuits of economic interaction that are not mediated through the state or parastatal authorities. The study recommended institutional support mechanisms which should focus on improving the available institutional innovations, rather than resuscitating 'old systems' with out-dated regulations, value chains and infrastructure, which are not suitable for the resettled farmers.

Sikawa and Mugisha (2010) analysed the factors influencing dairy farmers' choice of the milk marketing channel in south-western Uganda. Their market choices were categorised into a binary outcome of the formal and informal market channels. Using a Heckman Probit model, the age of the dairy farmer, membership in a cooperative, the form of payment, the volume of milk produced, the level of education of the dairy farmer and the marketing costs were found to influence the choice of milk marketing channel. A similar study with similar results was conducted in Zambia by Sunga (2011), who also used the Probit model to analyse relationship between the market choice and factors influencing the channel selection among bean producers, and their influence on bean production. Both Mutura *et al. (*2013) and Sunga (2011) made a similar recommendation, namely, to avail market information to the farmer, as this plays an important role in selecting remunerative markets. Mburu *et al.* (2007) stated that information access to market prices and interventions, such as government extension agents, serves as a key determinant for the smallholder farmers choice of market channel**.**

Similar studies that evaluated the determinants of smallholder farmers' market choices were carried out by Wen *et al*. (2006), Sirak and Bauer (2007), Koech *et al.* (2015) and Mutura *et al*. (2016). Mutura *et al*. (2016) analysed the determinants of vertical and horizontal integration among smallholder dairy farmers in Lower Central Kenya, and found that integration leads to high gross margins and influences the choice of market channel. Koech *et al.* (2015) also studied the factors influencing the choice of market facilitators by farmers, while marketing their produce in Kenya. In another study, a transaction cost approach was used by Wen *et al*. (2015) to study the factors that influence marketing channel selection by cattle farmers in China, while Sirak and Bauer (2007) analysed the determinants of market participation within the small-scale livestock sector in South Africa. All these researchers used the Binary Logit Model to evaluate the choices made by smallholder farmers in selecting market channels. Although these studies were carried out in different continents, countries and places, some results were similar, while others were different. However, similar conclusions and recommendations were made for farmer training and easy access to market information, as they are key institutional factors that influence market channel choices. All studies recommended the holistic approach to the access to market information and the function of market facilitators in market linkage to smallholder farmers. Musara *et al.* (2018) also used a similar approach to examine the determinants of market participation and marketing channel choice decisions by small-scale sorghum farmers, by using 380 households from five wards in the mid-Zambezi Valley of Zimbabwe. Ninety-six percent (96%) of the sampled farmers participated in some markets, which was influenced by the payment time, the number of buyers in the market, the age of principal decision-maker and the distance to market. Musara *et al.* (2018) isolated three marketing channels, namely, the local marketing channel, the traders and a combination of both. The local marketing channel dominated, due to its convenience and relatively low transaction costs. Using the local market option as the referent category, the weighted average market price of sorghum, the number of buyers in the market, the distance to the market, the dependency ratio and the household income are the most robust determinants of marketing channel selection. Sorghum marketing channel options are limited for small-scale farmers in Zimbabwe.

The Multivariate Probit approach was used by Arinloye *et al.* (2015) to analyse the Beninese smallholder farmers' selection of high-value markets, such as export and processing-oriented marketing channels, in the pineapple supply chain. Four main marketing channels were investigated, namely, the rural, urban and export fresh pineapple markets and the processing-oriented markets. The primary data collected from pineapple farmers through a field survey in different locations in South Benin were used to analyse their simultaneous selection of multiple channels. The farmers' characteristics, the production system features, quality attributes and the

types of marketing context were used as the main explanatory variables. The results indicated that the Beninese pineapple farmers select high-value market channels when they have the expertise and know-how for coping and complying with quality issues. Using a similar approach to the Multivariate Probit model, Mossie *et al.* (2020) analysed the factors affecting the outlet choice of onion producers in north-west Ethiopia. The results showed that the probability of choosing a wholesaler, retailer, rural collectors and consumers market outlet was significantly affected by post-harvest value addition, the amount of onion production, the land size allocated for onion production, the ownership of a motor pump, the educational status of the household head and the total number of livestock owned.

The Probit regression model was also used by Amao and Egbetokun (2018) to examine the transaction cosst involved in the market participation of leafy vegetable farmers. They noted that the gender of the household head, the years of experience in leafy vegetable production, the involvement in group marketing, land ownership and the farm size all determine the probability of market participation among leafy vegetable farmers.

The Multinomial Logit Regression Model, with non-market participation as a reference category, was also used by Nxumalo *et al.* (2019) to assess the socio-economic profile and the determinants of the choices of the market channel utilised by maize and sunflower farmers in the North-West Province, South Africa. A semi-structured questionnaire was used to interview 163 respondents who were categorised according to those who were financially assisted (n = 101) and those who were not (n = 62). Nxumalo *et al.* (2019) noted that most respondents (65%) utilised informal markets, followed by non-market participation and formal markets with 20% and 15%, respectively. The findings emanating from the Multinomial Logit Regression analyses revealed that factors, such as age, marital status, gender, credit access, education and farming experience, significantly influenced the choice of the market channel among maize and sunflowers farmers in the study area. Policies should be informed by these factors and aim at improving the farmers' access to formal markets.

Ndoro *et al.* (2015) applied a transaction cost approach to the analysis of cattle marketing behaviour among smallholder farmers in the communal land areas of KwaZulu-Natal, South Africa. The objective was to test the effects of the information, negotiation and monitoring costs on the decision to sell to private buyers, to speculators or at an auction. The theoretical predictions of transaction cost economics were tested based on the primary data collected from 230 cattle farm households in 13 communities of the Okhahlamba Local Municipality. The results of a Multinomial Logit

Regression analysis revealed some unique insights. They showed that the probability of selling at an auction vs. selling at the farm gate increased during the end-of-year festive season, which indicated the scope of market uncertainty surrounding auctions. They also showed that the probability of selling at an auction vs. selling to speculators increased with their proximity to the auction marketplace and decreased with their knowledge of the buyer, which suggested the higher opportunity cost of time and effort associated with selling at an auction, and the considerable negotiation and monitoring costs incurred when selling to speculators. Other significant predictors of auction channel selection were the volume supplied and the farmer's age.

2.10 Review of the Approaches to Model Market Participation

Various models have been used to understand the determinants of market participation. These include the Tobit, Probit regression, Double Hurdle, Triple Hurdle and Heckman two-stage models. The Tobit model was initially used, but it had drawbacks that resulted in a clustering of zeroes for non- participation and it treated those with zeroes as if they did not sell because they did not want to; however, they may have not sold because there was no market. Reyes *et al.* (2012) highlighted that another major limitation of the Tobit model is that it assumes that the same set of parameters and variables determine both the probability and the intensity of market participation. The Tobit model is only appropriate when the decision to sell and the quantity sold are made simultaneously. Barrett (2007) highlighted that households face a two-step decision-making process about market participation. The first step involves deciding whether to participate in the market, while the second focuses on the quantity to sell once the participation decision has been made. According to Mather *et al.* (2011), the models that are suitable under conditions where decisions are not jointly made, include the double-hurdle and the Heckman two-step model. Both of these models use the Probit model in the first step to determine the probability of participating in the market. In the second step, the double hurdle model uses a truncated model, while the Heckman two-step model uses a regression model to evaluate the factors influencing the quantity of produce sold in the market.

In the event that some participants in the sample did not sell, then the researcher is faced with a selection bias problem and the double-hurdle model is inappropriate, due to its failure to account for the selection bias. Sample selection bias arises when the researcher does not observe a random sample of the population of interest. In the linear regression model, selection bias occurs when data on the dependent are missing or non-randomly conditional on the independent variable. According to Green (2003), if a researcher is faced with such a situation, the selection model is appropriate and the Heckman two-stage model, to be specific. The model uses a Probit regression to assess the

probability of participation and Ordinary Least Squares (OLS) to determine the intensity of market participation. The selection bias is captured by an inverse Mills' ratio that is derived from the first-stage model and incorporated into the second-step regression.

2.11 Review of the Approaches to Model Market Choice Selection

Various models have been used to understand the market choice selection of smallholder farmers. These include the Multinomial Logit model, binomial logistics and the multivariate model. It was noted from the literature, that the binomial logistic model is suitable for dichotomous problems involving two choices only. For markets with more than two choices, the binomial logistics model becomes inappropriate; it also does not incorporate the selection bias of the market choice decision process and selection, due to having both observable and unobservable characteristics. This study methodologically addresses the biases noted in the literature by applying the MNL model that accounts for selection bias (Khonje *et al.*, 2015 and Musara *et al.,* 2018). Furthermore, previous studies (Arinloye *et al.,* 2015 and Mossie *et al.,* 2020) conducted on the choice of market selection decision used the Multinomial Probit model, which assumes that the specified variables are all normally distributed. The main explicit assumption of the MNL is that the variables do not have to be normally distributed. The MNL can therefore be estimated by using continuous, dichotomous and ordinal explanatory variables (Mmbando *et al.,* 2017). This is a much less restrictive assumption than the Multinomial Probit model. The MNL results are also relatively easy to interpret, the empirical results are satisfactory and it reduces the problems of auto-correlation. Hence, this study intends to extend the literature on the smallholder maize farmers' choice of markets by using the Multinomial Logit model.

2.12 Theoretical Framework

In this study, an agricultural household model with transaction costs (Key *et al.,* 2000) was applied, in order to analyse the market participation of smallholder maize farmers in the Mazowe District, by following other studies, such as Bellemare and Barrett (2006), Megerssa, *et al. (*2020) and Andraregie *et al*. (2021).

The theory underpinning this study is based on Fafchamp and Hill (2005) which models the farmer's decision to either sell at the farm gate or to travel to the market in which case the farmer incurs a certain level of transaction costs depending on a type of the buyer and the transaction. When deciding who to sell to, a farmer must identify an option with an optimal balance of price and transaction cost (Fafchamp and Hill 2005).

The household decides how much of each good i to consume (c_i), produce (q_i), and use as an input x_i. The household also decides how much of each good to sell or purchase (m_i). The variable m_i is positive for a sale, and negative for a purchase. Assuming that a household faces transaction costs (both proportional and fixed costs), the objective of the household is to maximise the utility, subject to cash, resource, technology and non-negativity constraints:

Maximise; U (c; z_u) the utility function

Subject to

$$\sum_{i-1}^{N}[\left(p_i^m - t_{pi}^s(Z_t^s)\right)\sigma_i^s - (p_i^m + t_{pi}^b(Z_t^b))\sigma_i^b]m_i - t_{fi}^s(Z_t^{s)}\sigma_i^s - t_{fi}^b(Z_t^b)\sigma_i^b + T = 0 \quad (2.6)$$

Cash constraint

$q_1 - x_i + A_i - m_i - c_i = 0$	Resource balance (i = 1...N)
$G(q, x, A^i - m_i - c_i = 0$	Production technology
$ci, qi, xi, \geq 0$	Non-negativity condition

Where p_i^m is the market price of good i, A_i is endowment in good i, T are exogenous transfers and other incomes, z_u and z_q are exogenous shifters in utility and production, respectively, G represents the production technology. The cash constraint states that expenditure on all purchases must not exceed the revenues from all sales and transfers. The cash constraint includes both the fixed and proportional costs, which leads to an increase in the price paid by the buyer and a decrease in the price received by the producer. The PTCs refer to those costs (such as the transportation and marketing costs) and vary with the quantity transacted. The FTCs, on the other hand, refer to those transaction costs that are invariant to the quantity transacted, such as the cost of drafting a contract. A household pays for the fixed cost t_{fi}^s, if it sells good i, and pays t_{fi}^b if it buys good i. Both PTCs and FTCs are unobservable or cannot be easily recorded in a survey. What can be observed are the exogenous factors that explain these transactions costs. The resource balance states that, for each of N goods, the amount consumed, used as input and sold is equal to what is produced and bought, plus the endowment of the good. The production technology relates inputs (e.g. land and labour) to outputs.

A Lagrange expression can be derived to solve the household problem and the first order conditions for the consumption goods. When transaction costs are incorporated, the supply curve for the selling, buying and that in autarky, is given as follows:

$q^s = q(p^m - t_p^s - t_f^s, Z_q)$ Sellers (2.7)

$q^b = q(p^m + t_p^b + t_f^b, Z_q)$ Buyers (2.8)

$q^a = q(p^{\approx}, Z_q)$ Autarkic households (2.9)

2.13 Conceptual Theoretical Framework

Market participation has been identified as a cause of development because when markets are available and accessible, they provide households with an opportunity to sell their surplus, thus increasing their income earnings (Boughton *et al.,* 2007). Increased income among poor households will mean increased in demand of other goods and services thus improving development. Figure 2.3 postulates the factors that could be influencing market participation among smallholder maize farmers and it shows the conceptualisation of this study. In the literature several factors have been argued to be influencing market participation by the smallholder farmers. According to De Janvry and Sodoulet, (2010), markets in Africa are characterised by imperfections which give rise to higher transaction costs. In cases where these transaction costs are too high, smallholder farmer participation will be very low, or they will not participate. Socio-economic factors such as age, gender, education level of household head and household size also influence market participation. Institutional factors such as membership to a farmer group, access to credit, extension services and policies are important in market participation. Market factors such as distance to market, price of output, access to market information and means of transport also affect market participation. Participation will then lead to the extent of participation and in turn increased household income.

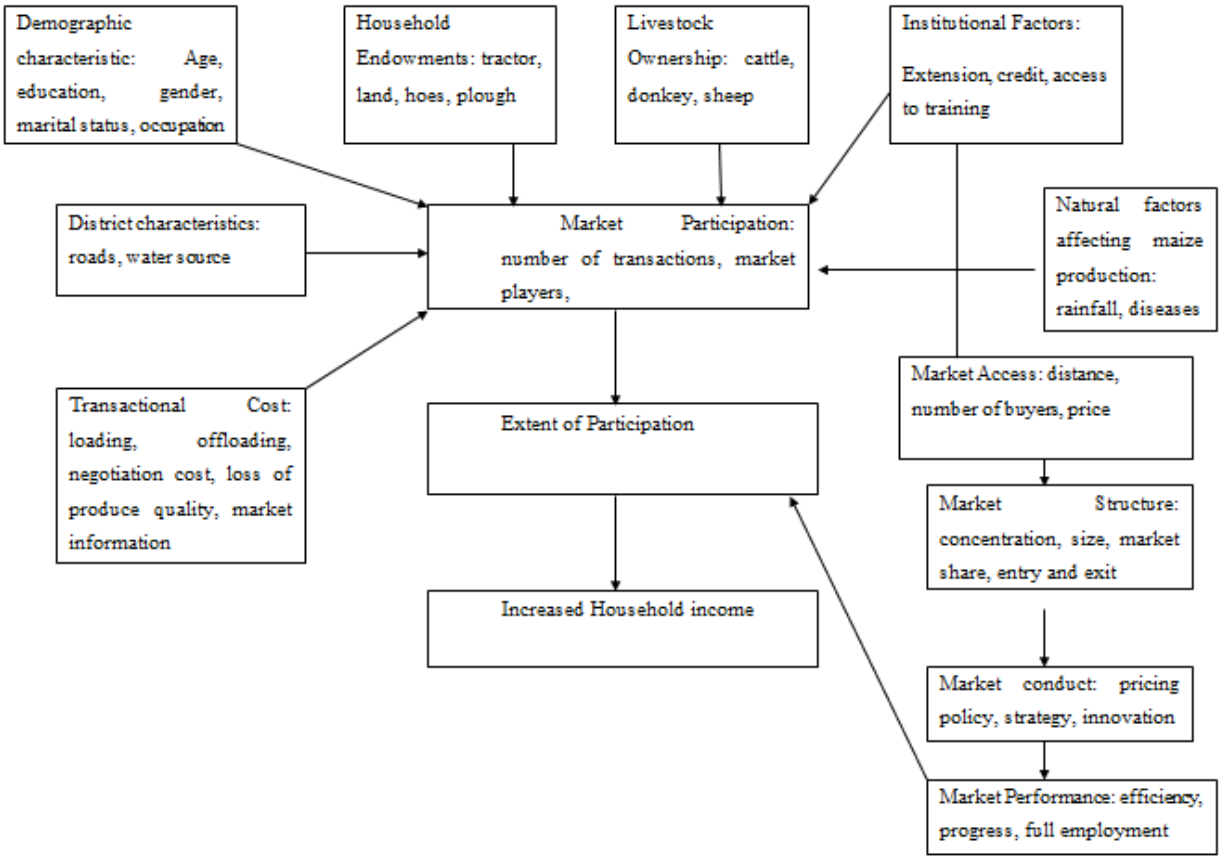

Figure 2.3 Conceptual Framework

2.14 Information and Methodological Gaps in the Literature

Despite the rapidly-growing literature that has empirically investigated the factors that influence smallholder farmer market participation in developing countries (e.g. Alene *et al.*, 2008; Barrett *et al.*, 2012; Biénabe *et al.*, 2011; Mather *et al.*, 2013), few studies (e.g. Mango *et al.*, 2018; Musara *et al.*, 2018) have focused on smallholder farmers market participation in Zimbabwe. Studies in Zimbabwe have not analysed the market participation and intensity to participate of smallholder maize farmers in the country, but have focused on the market channel choices of the producers of crops, such as sorghum (Musara *et al.*, 2018) or groundnuts (Mango *et al.*, 2018). To the best of our knowledge, none of the market participation studies in Zimbabwe have incorporated the endogeneity of the market participation decision process, as well as selection due to both observable and unobservable characteristics. This study methodologically addresses the biases noted in the literature by applying the Heckman's two stage econometric model that accounts for endogeneity and selection bias. This model corrects for the fact that the selling group is not a random sub-sample of the population.

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CHAPTER 3

AN ANALYSIS OF THE MAIZE MARKETING STRUCTURE AND ITS EFFECTS ON THE MARKETING PERFORMANCE IN ZIMBABWE: A CASE OF THE MAZOWE DISTRICT

Abstract

This study ascertains the maize marketing structure and its effects on the marketing performance in Zimbabwe. The structure conduct performance model was used as the main tool of analysis. Due to the narrowness of the maize marketing channel options in the country, three distinct alternatives were isolated, namely, the farm gate, the local market and the Grain Marketing Board (GMB). The results indicated that the number of buyers in the maize grain market is too small to attain a competitive market. The maize grain trade is concentrated and a few traders control it, as shown by the Gini coefficient of 0.51. The Herfindalf-Hirschman Index for the Mazowe District was 0.203, which also implies a concentrated market. The local market channel had a Marketing Efficiency Index of 3.733, compared to 2.322 for the GMB. While both indices are low, when compared to the standard in the literature, the GMB channel was the least efficient. Most farmers indicated that selling their grain at the GMB involved bureaucracy and late payments, which has negatively affected its efficiency. The late payment by the GMB has short-circuited the ability of smallholder farmers to generate a cash-flow to fund their farming activities. The study recommends that the number of intermediaries should be reduced, not to eliminate all the intermediaries, but to lessen their influence in the marketing channels and to provide more shares to farmers, by developing a system of direct selling from the farmers to the consumers in the Mazowe District. It may also help to increase the efficiency of maize marketing.

Keywords: **Herfindalf-Hirschman Index, Gini coefficient, Marketing, Efficiency**

3.1 Introduction

Agriculture occupies a central place in the Zimbabwean economy and contributes 15-18% of the country's Gross Domestic Product (GDP), with over 40% from national export earnings and 60% of the raw materials going to agro-industries (Mutambara, 2016). The agricultural sector provides livelihoods for more than 75% of the population, and smallholder farmers produce 95% of all food and beverages in Zimbabwe. Despite the potential to derive livelihoods from market-oriented agriculture, smallholder farmers often face a number of challenges in production and in accessing high-value markets. Some of the challenges the farmers face are the higher transactional costs, an inefficient information flow (Mango *et al.,* 2018), as well as the market structure, conduct and performance (Senthilkumar, 2015; Ayele *et al.,* 2017; Thangarasu *et al.,* 2021).

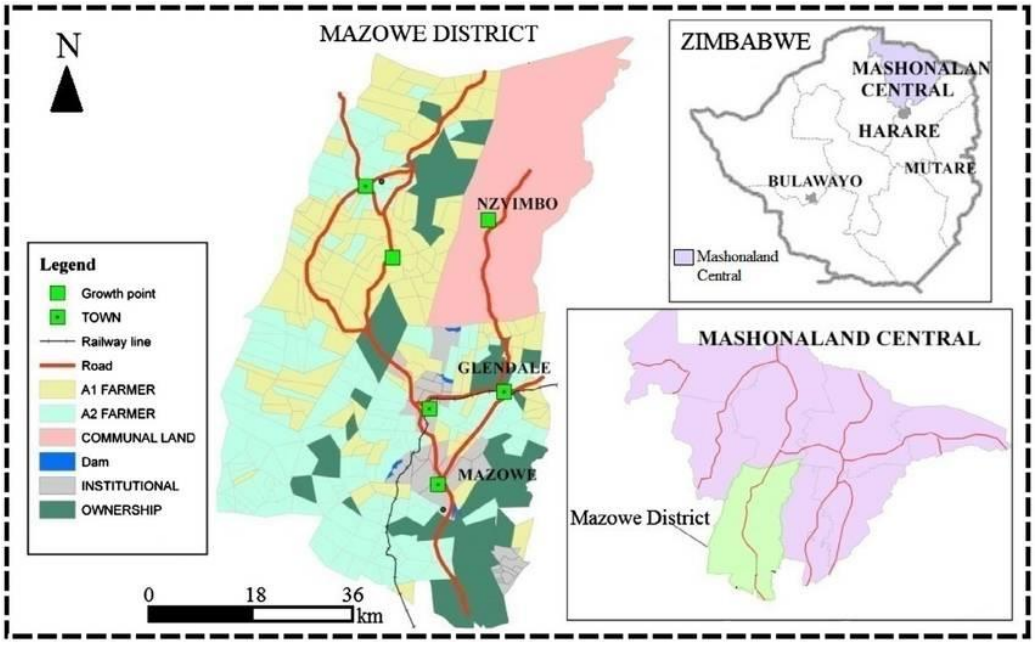
The Structure-Conduct-Performance (SCP), which is defined as the relationship between market structure, conduct and performance of the market players, postulates that the structure of the industry determines behaviour and influences the performance of the industry. This paradigm describes how the observable characteristics of a market or an industry could affect the behaviour and performance of the market's participants. For example, the existence of entry barriers is considered to be a major determinant of the efficiency of the market, since the greater cost of entry makes it easier for existing firms to maintain a monopoly over the profits, by producing a limited supply and charging prices that are above the market-clearing prices (Tung *et al.,* 2010).

However, the structure and conduct of the maize market in Zimbabwe is largely unreported in literature, although numerous studies have been conducted in other African countries on the structure, conduct and performance of the banana market (Enibe *et al.,* 2008), the performance of the vegetable market (Adugna *et.al.,* 2019), the structure, conduct and performance of groundnuts (Giroh *et al.,* 2010), the structure and performance of the bean marketing system (Odhiambo *et al.,* 2006), as well as the structure, conduct and performance of the milk market (Demissie *et al.,* 2015). The lack of information is the result of a lack of empirical knowledge of the market structure, as well as the behavior of the various actors in the marketing system and the constraints that they face, and this has impeded further innovations and productivity growth in the sub-sector. In this context, an attempt was made to ascertain the structure, conduct and performance of the maize market, in order to help frame the policies for the development of an efficient maize market in Zimbabwe, since access to an efficient market is considered to be an essential tool for lifting farmers out of poverty and enhancing their food security.

3.2 Study Area

The study was conducted in the Mashonaland Central Province (Figure 3.1), which is in Natural Region II of Zimbabwe. Given the agro-ecological diversity of Zimbabwe, maize production performs better in Natural Region II, and it is common in the Mashonaland provinces, where production and productivity is relatively higher, compared to the other regions. Natural Region II has a rainfall ranging between 750 mm and 1,000 mm per year and includes a significant proportion of the three Mashonaland Provinces, at 58,600 km^2, or 15% of Zimbabwe's land area (Musemwa *et al.,* 2013). The region is appropriate for intensive farming, typically for maize, tobacco, cotton and livestock. The province was specifically sampled because it is the second leading province, in terms of maize production and the area farmed by the smallholder farmers (ZIMVAC, 2020; Ministry of Agriculture 2021).

Mashonaland Central is mainly a farming province and the 2022 census data indicates that 64% of those employed, work within the agricultural sector (ZIMSTAT, 2022b). Mazowe is one of the seven administrative districts in the province and is located about 60 kilometers from Harare, the capital city of Zimbabwe. Mazowe District covers a total of 453 892 000 hectares of land. Of these, about 1330 square kilometers are within the district's communal area. Mazowe District has a total number of 35 wards and 3 administrative centres which are Glendale, Concession and Mvurwi. The major crops grown include burley and Virginia tobacco, wheat, soya beans, and maize. One of the largest Grain Marketing Board's silos in Zimbabwe is located in the Mazowe District. This reinforces the notion that Mazowe is indeed a farming district. According to Chiweshe (2011), the major crops grown for sale in the area are tobacco and soya beans while maize remains the staple food. The district is also rich in minerals such as gold, chrome and limestone and this has prompted mining activities although on a smaller scale compared to agriculture. While there are some tourist attraction centres in the district they have not been fully developed.



Adapted from Maponga *et al.* (2017)

Figure 3.1 Map of the Mazowe District

3.3 Research design

In this study a quantitative research design was employed. Leavy (2017) indicates that a survey is the most widely used quantitative design in the social sciences. Survey designs provide a quantitative description of trends, attitudes, opinions of a population by studying a sample of the population (Creswell, 2014). The survey relies on asking people standardized questions that can be analysed statistically using descriptive and/or inferential statistics. It allows researchers to collect a breadth of data from large samples and generalise to the large population from which the sample was drawn (Leavy, 2017).

3.4 Sampling Procedures

A multi-stage sampling procedure was adopted. Firstly, the study district was purposively selected owing to high production of maize. From the ZIMVAC reports it can be noted that Mazowe District is one of the leading districts in terms of maize production. Five wards were randomly selected within the district. A formula that Slovin (1960) developed was used to calculate the sample size requirement for the study. Slovin's computations revealed that the sample size must be 382 smallholder farmers (with a 95% confidence level and a margin of error of 0.05).

A formula that Slovin (1960) developed was used to calculate the sample size requirement for the study. The total number of smallholder farmers in the selected district was 8 763. The Slovin's

computations revealed that the sample size must be 382 smallholder farmers (95% confidence and a margin of error of 0.05.

Equation 1: Slovin's Formula for sample size determination

$$n = \frac{8\,763}{1+8\,763(0.05)^2} = 382^{\text{figure rounded off to units}}$$

Where:

n= sample size

N= population size

e= confidence level (95%)

3.5 Data Collection

This study used cross-sectional household-level data on smallholder maize farmers and maize traders in Zimbabwe. Zimbabwe presents an interesting case study for maize marketing research, given the significance of the maize sector in the economy. Maize is thus considered to be a strategic commodity in the Zimbabwean economy, as it is a food security crop and an agro-industrial processing raw material. A questionnaire was used for the collection of primary data. Prior to the main survey, the questionnaire was pre-tested to improve the structure and wording of the questions. It was administered by five trained enumerators to 382 households, and 27 maize traders were randomly selected from five wards in the Mazowe District of Zimbabwe and a minimum of 70 respondents in each ward. The questionnaire, which is presented in Appendix 1, captured the household demographics, farm production and marketing activities of the smallholder farmers.

3.6 Analytical Tools

3.6.1 The Structure-Conduct-Performance model

Mason (1939), and later Bain (1951; 1956), formulated the Structure Conduct Performance (SCP) model, which is a framework for the empirical analysis of the effect of market structure on industry's conduct and performance. The SCP model has three main components, namely, the market structure, the firms' conduct and the market performance. Market structure refers to a description of a market, in terms of the number and the size distribution of the firms, as well as any entry barriers arising from different factors (Ukav, 2017). Market conduct refers to the pattern of

behaviours that firms follow in adapting or adjusting to the markets in which they sell or buy. The dimension of conduct includes the methods employed by firms to determine the price of an output, their sales promotion policies and the presence, or absence, of coercive tactics directed against either established rivals or potential entrants (Bain, 1968). Market performance refers to the economic results that flow from the industry and how well it performs, in terms of efficiency and progressiveness or innovation, given its technical environment (Bain, 1968).

The SCP model assumes that the market structure determines the market efficiency (Adugna *et al.,* 2012; Demisse *et al.,* 2015; Senthilkumar 2015; Ayele, *et al.,* 2017; Thangarasu *et al.,* 2021; Kebede, 2016). Market conduct hinges upon market structure and refers to the way in which buyers and sellers behave, both amongst themselves and amongst each other, such as price-taking, product differentiation, tacit collusion and the exploitation of their market power (Bosena *et al.,* 2011). According to Lelissa and Kuhil (2018), market performance is related to the structural conditions of the market and the firms' conduct with regard to pricing and product policies and profitability. For example, if the structure of a market is competitive, where there are many firms in a market and they are free to enter, then firms in the industry are more likely to compete with each other, and the market is very efficient in the long run. Furthermore, Ayele *et al.* (2017) also stated that the market structure can be reformed to improve market efficiency. The study used the SCP model to evaluate the maize marketing structure and its effects on the marketing performance in Zimbabwe because the model assumes that the market structure will determine market efficiency.

3.6.2 Measuring the market structure

The structure of markets has been analysed by researchers using different approaches. Nambiro *et al.* (2001) analysed the market in the Trans-Nzoia District (Western Kenya) using the Gini coefficients, Enibe *et al.* (2008) described the structure of the banana market in Nigeria using descriptive statistics and the Gini coefficients, Giroh *et al.* (2010) also examined the structure, conduct and performance of the farm gate marketing of natural rubber in Nigeria, using the Gini coefficient, while Odhiambo *et al.* (2006) analysed the structure and performance of the bean marketing system in Nairobi, using descriptive statistics, concentration ratios and cointegration models. In this study the marketing structure of the maize sector was evaluated based on the market concentration exercised by maize traders and the barriers for the market entry of potential traders. The study used the Gini coefficient and the Lorenz curve to measure the market concentration of maize. The Lorenz curve was used to show the quantitative relationship between the cumulative percentages of maize traders against the cumulative percentage of the volume of maize sold in the markets. To compute the cumulative percentage, the volume of maize sold was arranged from the

highest to the lowest. The Gini coefficient, or concentration ratio, was derived from the Lorenz curve and measured the inequality in the sales distribution among the different trader groups. Graphically, the Gini coefficient is the ratio of the area between the diagonal of the Lorenz curve, compared to the area of the half-square in which the curve lies.

The Gini coefficient ranges from 0 to 1, with zero indicating perfect equality in the size and distribution of buyers and sellers and one (1) implying a monopsony/monopoly in the market. A Gini coefficient of 1 means complete inequality.

$$G = 1 - \sum_{k=0}^{k=n-1}(\delta Y_{k-1} + Y_k)(\delta X_{k-1} + X_k) \quad (3.1)$$

where G represents the Gini coefficient
X - marketing agents
Y - volume of trade
δX - cumulated proportion of marketing agents
δY- cumulated proportion of volume of trade
n - number of observations
k = n-1
The quantity of maize traded was categorised, from the smallest quantity traded to the largest. In each category, the specific number of traders who traded in that quantity were recorded and then divided by the total number of interviewed farmers. In order to obtain the cumulative proportion of sales from the different categories created, the total yearly sales for the particular category were calculated and weighted in terms of the total yearly sales of all the categories. The Lorenz curve shows the quantitative relationship between the cumulative percentages of maize traders against the cumulative percentage of the volume of maize sold in the market. In the Lorenz curve analysis, a high inequality in the distribution of the maize market share reflects a high market concentration, which is depicted by a wide gap between the Lorenz curve and the line of perfect equality (this indicates that a few firms control the market).

3.6.3 Analysis of market concentration

The concentration index that was used to measure the market concentration was the Herfindalf-Hirschman Index (HHI). It is the weight index of the market share, with the weights being the shares themselves, which attain the value of unity in the case of a monopoly, and which approach zero as the number of functionaries with identical shares increases (Thangarasu *et al.*, 2021).

$$HHI = \sum s_i^2 \quad (3.2)$$

where s_i represents market share of trader *i.*

3.6.4 Analysis of market performance

Marketing performance is the measurement of the ability of marketing agencies to move maize grains from producers at a minimum cost, by extending the maximum service to buyers (Thangarasu *et al.,* 2021). Market performance can be measured by using the price spread or marketing efficiency (Enibe *et al*., 2008). The price spread refers to the difference between the price paid by the buyer and the net price received by the seller. Thus, the price spread includes the cost involved in the movement of a product from the seller to the buyer and the profit of the various market functionaries involved in the movement of a product from the seller to the buyer (Shivakumara *et al.,* 2019 and Thangarasu *et al.,* 2021). Marketing efficiency is the measure of the ability of marketing agencies to move products from the producers at a minimum cost, by extending the maximum service to buyers (Gebre *et al.,* 2021). The study used the marketing efficiency index as a measure of the marketing performance. As shown by Oteh and Njoku (2014) and Thangarasu *et al.* (2021), marketing efficiency is calculated as the ratio of the total value of maize grain sold to the marketing cost.

$$\boldsymbol{Marketing\ Efficiency} = \frac{\boldsymbol{V}}{\boldsymbol{I}} \quad (3.4)$$

Where V is the value of the maize grain traded and I is the total marketing cost per ton of maize. The marketing costs includes the cost of transport to the roadside, transport to the trader, accommodation at the market place, market fees, handling the maize grain (packing the grain, carrying the bags to the road-side and loading the bags), overnight storage and handling costs. The higher this ratio, the higher would be the efficiency and vice versa

3.7 Results and Discussion

3.7.1 Preferred maize markets

In any value chain, the number of buyers determines the prices of a commodity. If the number of buyers is very high, then the price of the commodity is not expected to be very high. Figure 3.2 shows the preferred maize markets in the Mazowe District by the smallholder farmers.

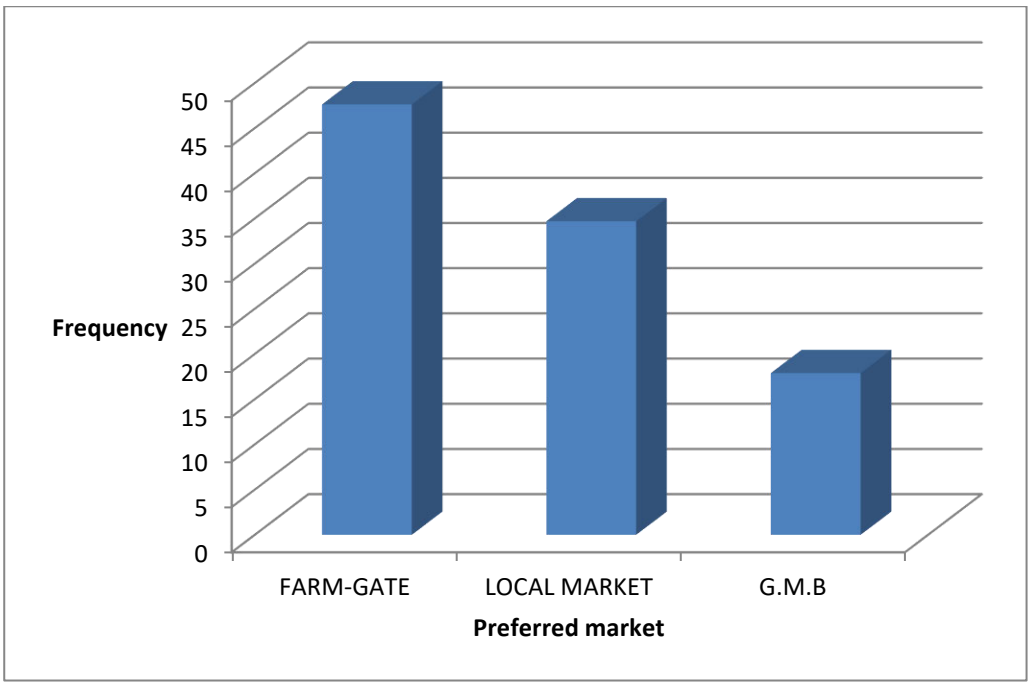


Figure 3.2 Preferred maize market

Smallholder farmers have three basic decisions to make regarding the selling of their surplus maize: they can either sell it at the farm gate at a low price, or travel to the local market, where higher prices are offered. This incurs some transaction costs or selling to the GMB, which offers better prices, but with delayed payments. It can be noted in Figure 3.2 that the popular marketing channel for the smallholder farmers was the farm gate (47.43%), followed by the local market (34.69%), and the GMB (17.89%) was the least-popular marketing channel amongst the smallholder farmers. Smallholder farmers can sell from as little as 1 bag weighing 50kg when selling to the GMB. Some of the farm gate buyers from the study included; neighbours, mission schools, mission hospitals, as well as government and private sector employee's resident in the wards and surrounding areas These findings concur with those of Osmani and Hossain (2015), Mmbando *et al.* (2017), Olutonis *et al.* (2019), Arinloye *et al.* (2020) and Thangarasu *et al.* (2021) who noted that the marketing channel preferred by most smallholder farmers was the farm gate. Although, the price offered is often not competitive, the farmers opt for this, due to the lack of storage facilities and the low transaction costs. Kim *et al.* (2014) and Lee *et al.* (2019) also noted that traditional marketing channels, such as the farm gate, are attractive to farmers because they offer low marketing costs and higher sales, at the expense of lower prices. The results also concur with the findings of Mgale and Yunxian (2020), who noted that most farmers in rural areas still sell their produce to local collectors because of the failure, fear or inability of farmers to venture out of the farm gate into the markets. GMB was the least popular marketing channel used by the smallholder farmers because selling

through the GMB needs one to have a bank account and getting money out of the bank is not easy, especially for smallholder farmers who are located in the remote parts of the country.

3.7.2 Maize market structure

This study used the Lorenz curve and Gini coefficient to determine the grain maize market concentration. A high concentration and inequality indicate an oligopolistic tendency, while a low concentration suggests a tendency towards perfect competition, provided there are no serious barriers for gaining entry into the maize grain market. Oligopolistic behaviour increases as the coefficient approaches 1, while the market becomes most competitive as the Gini coefficient tends to 0. Table 3.1 shows the results of the Gini Coefficient.

Table 3.1 Estimation of the Gini Coefficient

Quantity sold (tonnes)	**Number of maize buyers**	**Proportion of buyers X**	**Cumulative %**	**Total yearly sales (tonnes)**	**Proportion of Total yearly sales**	**Cumulative % Y**	**XY**
0-<5	3	0.111	0.111	14	0.0275	0.0275	0.00305
5-<10	4	0.148	0.259	32.9	0.0647	0.0922	0.0136
10-<15	2	0.074	0.333	29.5	0.058	0.150	0.0111
15-<20	6	0.222	0.555	115.1	0.226	0.3762	0.0835
20-<25	5	0.185	0.74	141	0.277	0.653	0.121
25-<30	7	0.260	1	176.1	0.346	1	0.260
Total	27	1		508.6			∑XY=0.492
Gini coefficient			0.51				

Source: Survey data, 2021

Table 3.1 shows that the randomly-selected five wards had 27 maize grain traders. This small number of traders was attributed to the government control of maize marketing in Zimbabwe. The marketing of maize grain has become challenging in Zimbabwe, due to Statutory Instrument 145 of 2019. This Statutory Instrument averts the side marketing of the maize grain; it allows the government to inspect the grain marketing operations on non-government premises and to set up permit inspections in order to implement the instrument. The traders also noted that financial barriers and the lack of adequate space are some of the barriers to market entry. While maize is a controlled commodity, most farmers in the study area prefer to sell to private grain traders who

make fast and efficient payments, which is evident by the number of farmers who sell at farm gates (47.43%) and the local market (34.69%), as shown in Figure 3.2.

The analysis of the number of sellers and buyers in the maize grain market showed that there are only a few maize grain traders. This finding is supported by a Gini coefficient of 0.51 for maize grain, which is shown in Table 3.1. According to the literature (Tiku *et al*., 2012; Thangarasu *et al.,* 2021; Ordofa *et al.,* 2021; Thangarasu *et al.,* 2021), a Gini coefficient of 0.51 indicates an oligopolistic market structure. The results show that the maize grain trade is highly concentrated and it is controlled by a few traders. The few traders will determine the price of maize on the local market and the traders tend to collude, with respect to the prices. The maize grain traders mentioned Statutory Instrument 145 of 2019, as well as the lack of proper storage facilities and financial capital, as the main barriers for entry in the maize grain market. The findings concur with those of Tiku *et al*. (2012), who found a Gini coefficient of 0.65 and 0.54 for merchants and processors, respectively, which indicate an oligopolistic market structure among palm oil marketers in Nigeria. The findings are also in agreement with the findings of Ordofa *et al.* (2021), who noted a highly-concentrated market for the dairy industry in Ethiopia, while Haruna *et al*. (2012) also identified a highly-concentrated tomato market in Ghana, with concentration ratios of 0.58 and 0.64 for wholesalers and retailers, respectively.

The Lorenz curve was drawn, based on the percentage distribution table of the cumulative traders and the cumulative volume of maize traded (see Figure 3.3). The Lorenz curve, which is an important tool for the measurement of inequality, relates the cumulative proportion of the volume of maize traded to the cumulative proportion of traders. In this study, the Lorenz curve shows the quantitative relationship between the cumulative percentages of maize traders against the cumulative percentage of the volume of maize sold in the markets. It can be noted from Figure 3.3 that the distribution curve on the volume of maize traded is far from the line of equality, which indicates the prevalence of inequality in the volume of trade. This concurs with the findings of Gebremedhin and Tesfaye (2015). It can be noted from Figure 3.3 that 40% of the traders account for 60% of the total maize grain traded in the market, while 20% of the traders account for 40% of the cumulative yearly maize sales, which indicates the oligopolistic nature of the maize market in the Mazowe District.

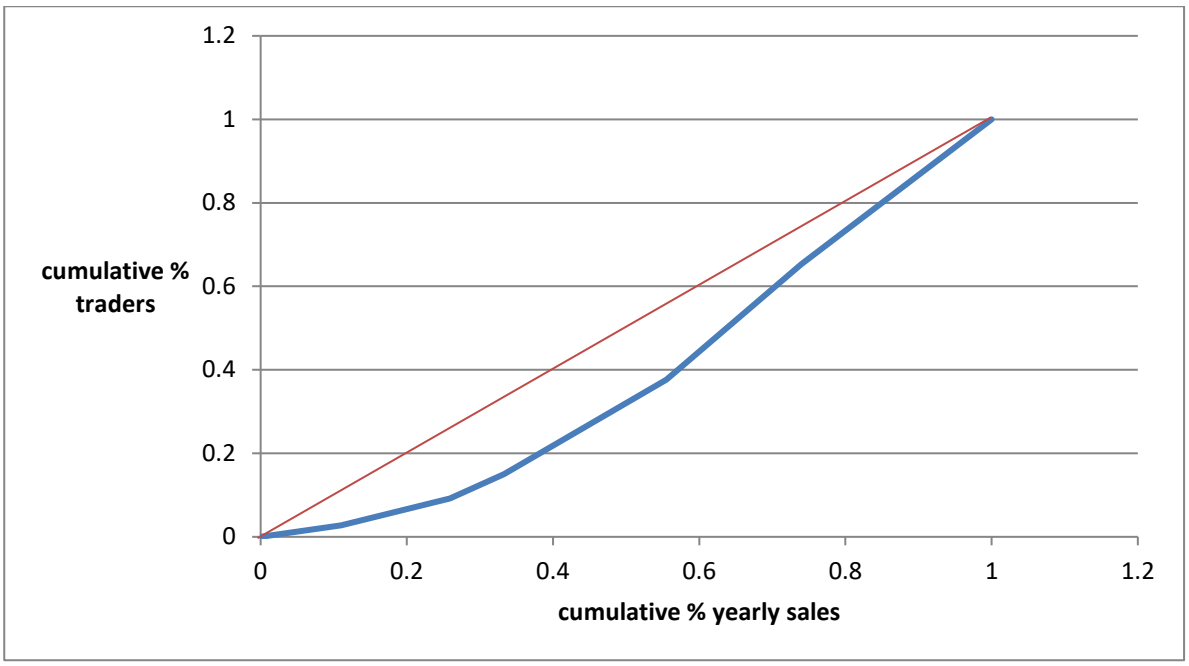


Figure 3.3 The Lorenz curve
Source: Survey data, 2021

The Herfindalf-Hirschman Index for the district was 0.203, which shows a concentrated market. The research findings show that the maize market in the study district is highly concentrated and that there are a few traders who dominate the maize market. The dominance of a few buyers in the district implies that there is low competition among the traders, which concurs with the findings of Gichangi (2010), Haruna *et al.* (2012) and Nzima *et al.* (2014), who noted a higher market concentration and inefficiency in the agricultural market.

3.7.3 Marketing costs

The movement of produce from the smallholder farmers to the eventual buyers incurs a large number of costs, some of which may not be immediately obvious to farmers. The marketing costs include all the expenses incurred in the performance of the marketing functions, as a commodity moves from the producer to the ultimate consumers (Gebre *et al.*, 2021). The marketing costs were obtained by summing up the cost from the marketing activities carried out by each marketing agency; these costs differed from one channel to another, due to the marketing location, the type of marketing institutions and the marketing activities (Mgale and Yunxian, 2020). There are a multitude of factors that affect marketing cost in the smallholder communities. These expenses include the cost of transportation, handling, storage, packaging and labour, marketing charges, as well as the cost of assembling, processing and distributing the maize grain. The number of intermediaries in a marketing channel is a major factor when it comes to increasing or decreasing

the marketing cost. Table 3.2 illustrates the costs for the different marketing channels being used by the smallholder maize farmers in the Mazowe District.

Table 3.2 Maize marketing costs per tonne tonne of maize

TYPE OF OPERATIONAL COST	**Local Market COST/UNIT (US$)**	**GMB Market COST/UNIT (US$)**
Transportation (market and road side)	30.50	53.00
Handling	3.00	3.00
Storage	6.00	17.00
Packaging material	6.50	10.50
Labour	13.00	25.00
Marketing charges	0	5.00
Accommodation	12.00	30.00
Other costs	4.00	6.50
Total Costs	75	155

The marketing cost for the farm gate was nil, because the farmers sold their goods at their farms and did not incur any transactional costs associated with moving the products to the market. In terms of the packaging material, the smallholder farmers used old fertiliser sacks and, in some instances, the buyers brought their own packaging material. The GMB had higher transport costs, compared to the local market. Most roads in the district are in bad and chaotic state, which results in the transporters charging the maize producers exorbitant transport costs. The survey revealed that the cost of transporting a ton of maize to the GMB was $53, compared to $30.50 to the local market.

From the survey, it was noted that maize traders in the district will pay a higher price for bagged maize. Local maize traders expect the farmer to provide the bag, while the GMB will give the farmer a bag in which to pack the maize and it will deduct the money when the smallholder farmer delivers the maize to its depot. Smallholder farmers may have to store unsold maize at the market overnight, hence incurring storage costs. For those who sell at the GMB, the storage cost was $17, compared to the local market, which was $6. The storage costs included a charge made by the warehouse owner for storing the bags of maize, the cost associated with the maintenance of the quality of the maize while it is in storage (for example, the cost of chemicals), as well as losses in quantity and quality while the maize is being stored.

3.7.4 Marketing efficiency

The Shepherd Index was used to measure the marketing efficiency of the maize grain sector. Marketing efficiency is related to the cost involved in moving goods from the producer to the ultimate consumer and the quantity of the services offered. Improved marketing efficiency means a reduced marketing cost, without a reduction of the quantum of services to the consumer. The results of the selling price, marketing cost and marketing efficiency of maize channels used in the Mazowe District are shown in Table 3.3.

Table 3.3 Estimation of the Marketing Efficiency Index

	Marketing Channels		
Variable	Farm gate	Local market	GMB
Average Selling Price (US$)	240	280	360
Average Marketing Cost (US$)	0	75	155
Marketing Efficiency Index	**-**	**3.733**	**2.322**

Source: Survey data, 2021

The marketing cost for the farm gate was nil, because the farmers are selling at their farms and they do not incur any transaction costs associated with moving the products to the market. In terms of the packaging material, the smallholder farmers use old fertiliser sacks and, in some instances, the buyers bring their own packaging material. The average farm-gate selling price was $240, which was very low, when compared to the officially-gazetted price of $360. However, most farmers prefer it since the method of payment is fast, compared to that of the local market and the GMB.

Most roads in the district are in a bad and chaotic state, which results in the producers charging exorbitant transport costs. This situation forces producers to sell their maize to private buyers who pay them very little money, but they incur lower transport costs, as compared to the GMB.

Based on the Shepherd Index, the local market channel was the most efficient, with a marketing efficiency index of 3.733, while the GMB had a lower marketing efficiency index of 2.322. From the findings, it can be noted that the marketing efficiency indices are relatively low for both the local market and the GMB. These findings are in line with those of Nyiatagher (2017), who noted that maize traders were not efficient in their marketing of maize. The lower marketing efficiency experienced by farmers when selling grain to the GMB can be attributed to the higher transport costs. Most smallholder farmers are situated in areas that are far from the markets and roads. The

road infrastructure in their communities is not well-developed, and this has resulted in the lower marketing efficiency of the GMB channel. The GMB channel was the least efficient because it used to be the last resort of the sellers before the introduction of Statutory Instrument 145 of 2019. Some (12.4%) of the smallholder farmers indicated that there is a lot of bureaucracy involved when selling their grain at the GMB, and 8.8% noted that the late payments negatively affected its efficiency.

Zimbabwean maize grain producers are exposed to a volatile maize grain market; they face great uncertainty and risk with regard to their grain prices, on one hand, and their input costs, on the other hand. The producer price of maize at the local market was noted to be higher than that at the farm gate; the average price was US$280. The government has announced prices that were equivalent to the import parity price of maize, or even more, but when it comes to implementation, it is the private traders who pay prices that are even below the import parity price, as shown in Figure 3.4.

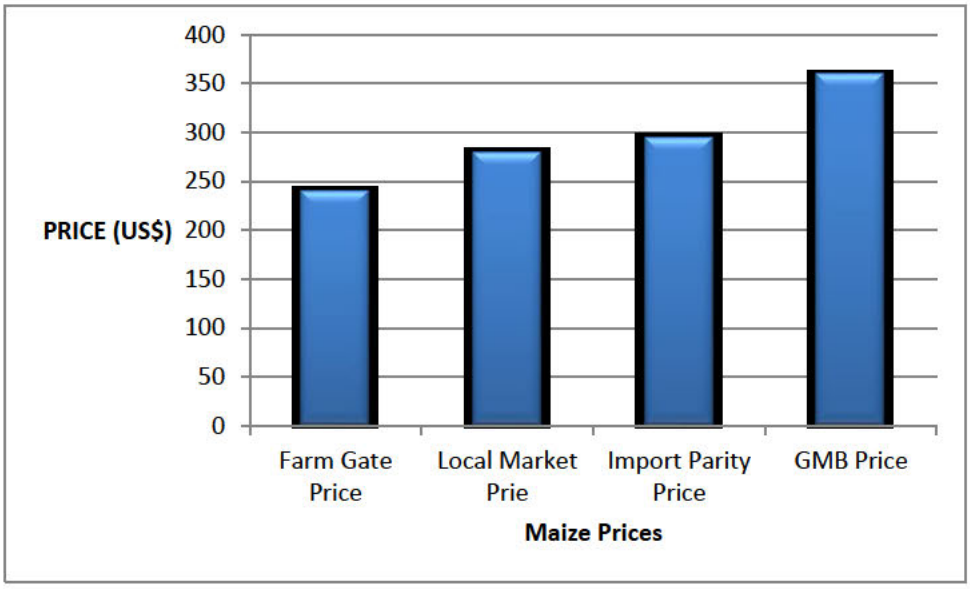


Figure 3.4 Comparative analysis of maize prices

Figure 3.4 shows that the maize import parity price was $295, which was higher than the local market price of $280, but less than the GMB price of $360. The maize producer price at the GMB was noted to be US$360, which was higher than the average farm-gate price, the import parity price and the local market, as shown in Figure 3.4. The transactional cost for the marketing channel was very high at $155. The higher transactional costs were due to the distance to the GMB, the poor road infrastructure and the fact that some farmers had their produce returned to them because it

failed to meet the required moisture content level and a higher batch of deliveries was not accepted because of the higher moisture content.

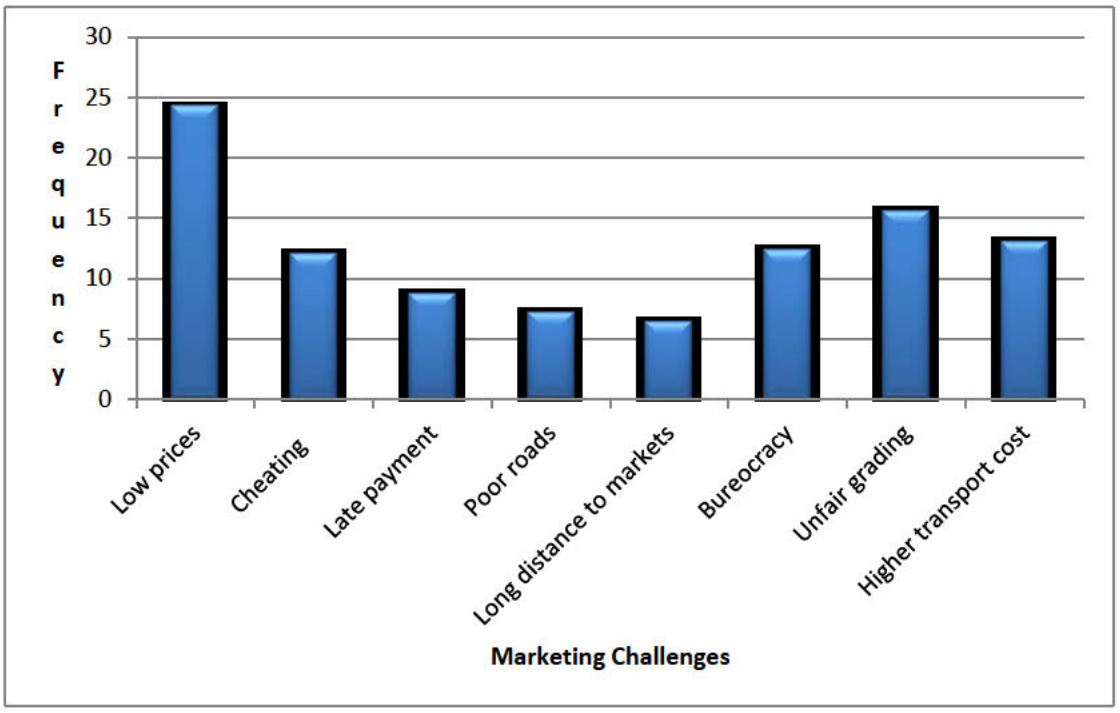


Figure 3.5 Maize Marketing Challenges

Some 15.6% of the smallholder farmers indicated that the GMB's grading system is unfair. The farmers send their produce in groups, in order to meet the quantity requirements. The GMB just takes a sample from the truckload and awards the same grade to the whole consignment. The late payment by GMB has short-circuited the ability of small-scale farmers to generate a cash-flow in order to fund their agriculture activities. The findings concur with those of Nakhumwa (2001), who noted that the most formal markets are the least efficient, and they attributed this to the level of bureaucracy that is involved. These findings are consistent with those of Akieyo *et al.* (2014) and Massoud and Srinivasa (2012), who postulated that there is a lower marketing efficiency in the marketing channels with a poor road network.

3.8 Conclusion

The study revealed that the existing marketing channels that were being used by the smallholder maize grain producers were the farm gate, the local market and the Grain Marketing Board. It was noted that the market structure for maize grain was highly concentrated and it was controlled by very few traders. The Herfindalf-Hirschman Index for the Mazowe District was 0.203, which shows a highly-concentrated market. From the findings of this research it can cautiously be concluded that the maize grain market in the district is highly concentrated and that there are few traders who

dominate the market. The few traders determine the price of maize and there is a tendency for collusion, with regard to the prices. The researcher also concluded that the local market was the most efficient market, with most farmers indicating that the late payments, poor road infrastructure and the level of bureaucracy experienced at the GMB negatively affected its marketing efficiency.

3.9 Policy Recommendations

A transportation and marketing information system should be developed, as it would contribute greatly towards reducing the transportation costs and increasing overall efficiency of the maize marketing system. The government need to put more resources to the construction and maintaining of roads by the local authorities. Marketing Information involves gathering, storing, analysing and distributing valuable marketing data to assist the smallholder farmers to make informed marketing decision. The smallholder famers must be able to collect relevant internal and external maze marketing information, analyse and interpret the marketing data. The number of intermediaries should be reduced, but not all eliminated, to lessen their influence in the marketing channels and to provide more shares to farmers by developing a system of direct selling from the farmers to the consumers in the Mazowe District. It may also help to increase the efficiency of maize marketing.

Farmers should organise themselves into a body that can perform group marketing. As an organised body, they would acquire a better bargaining power for their products over the middlemen, who manipulate and control the price of maize in the marketing system. Strengthening the institutions that convey reliable and timely market information and addressing the issues of Statutory Instrument 145 of 2019 might reduce the oligopolistic tendency in the maize market.

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CHAPTER 4

DETERMINANTS OF THE MARKET CHANNEL CHOICE BY SMALLHOLDER MAIZE FARMERS IN ZIMBABWE: A CASE OF THE MAZOWE DISTRICT

Abstract

Household demographics and transactional costs play a critical role in understanding the smallholder farmers' choice of specific market channels. The objective of this paper was to determine which marketing alternatives are being used by the smallholder maize farmers in the Mazowe District, the relative extent of their use and what personal characteristics of the respondents may affect their decision/choice of a market outlet. Data were collected from 382 smallholder maize farmers in the Mazowe District, which is one of the main maize-producing districts in Zimbabwe. The Multinomial Logit Model was used as the main analytical tool to assess the determinants of the market choices of maize smallholder farmers. Three distinct maize marketing channel options were identified, namely, the farm gate, the local market and the Grain Marketing Board. The results indicated that the factors that significantly influenced the market choice by the smallholder farmers are the age of the household head, extension contacts, market information, the distance to the market and the price offered to the maize producer. The number of visits by extension workers significantly increased the likelihood that a maize producer would sell at the local market, rather than the farm gate. The distance to the market significantly influenced the probability of choosing the local market to the farm gate. As the distance to the local market increases, the smallholder farmers in Mazowe will prefer the farm gate for selling their produce. To overcome the transaction costs associated with long distances, farmers need investments that are geared specifically to transportation vehicles, to storage facilities and to embracing the group marketing of their produce. The study also recommends that the local authorities should improve their rural infrastructure, such as roads, and that the GMB depots should be decentralised.

Keywords: Multinomial, logistic, regression model, Smallholder, Market Choice, Farm gate

4.1 Introduction

The commercialisation of smallholder agriculture through the increased participation of smallholder farmers in the formal markets is a critical requirement for the economic growth and development of most developing countries that rely on agriculture for their economic growth (Saha *et al.,* 2021; Carletto *et al.,* 2017; Muricho *et al.,* 2017). There is strong empirical evidence that promoting the market access of smallholder producers improves their welfare and economic development (Wickramasinghe *et al*., 2014). Access to efficient markets is considered to be an essential tool for lifting farmers out of poverty and enhancing the food security in developing countries. Studies have shown that the increased market access of smallholder farmers in Zimbabwe has improved their comparative advantage in their farming activities and in specialisation, which has led to an increase in their household incomes (World Bank, 2015; Wickramasinghe *et al*., 2014).

Most sub-Saharan African countries have recognised maize market access as one of the key components for development (Brian and Barret, 2014; NEPAD, 2010). Markets play an important role in rural development, employment creation, income generation, food security, technology diffusion, enhancing resource-use efficiency and developing rural-market linkages. The availability of markets and enhancing the ability of smallholder and resource-poor rural farmers to access these market opportunities and diversify their links with the markets is therefore a prerequisite for enhancing agriculture-based economic growth and increasing their rural incomes. Therefore, access to different markets by smallholder farmers is a crucial development matter that relates to addressing poverty and fairness, because markets are not only an economic issue, but they are embedded in socio-economic and political institutions.

Despite the rapidly-growing number of literature sources that have empirically investigated the factors that farmers consider when choosing a particular commodity market in developing countries, only a few have assessed their choice of market outlet. However, none of these few studies have incorporated the selection bias of the market choice/decision process, and both the observable and unobservable characteristics of this selection. This study methodologically addresses the biases noted in the literature by applying the MNL model, which accounts for selection bias (Musara *et al.*, 2018**).** Furthermore, previous studies (e.g. Mossie *et al.,* 2020) conducted on the choice of the market selection decision used the Multinomial Probit Model (MNL), which assumes that the specified variables are all normally distributed. The main explicit assumption of the MNL is that the variables do not have to be multivariate in order to be normally distributed. The MNL can therefore be estimated by using continuous, dichotomous and ordinal

explanatory variables (Mmbando *et al.,* 2017). This is a much less restrictive assumption than the Multinomial Probit Model. The MNL results are also relatively easy to interpret, the empirical results are satisfactory and it reduces the problems of auto-correlation, compared to the Multinomial Probit Model. Hence, this study intends to extend the literature on the smallholder maize farmers' choice of markets by using the Multinomial Logit Model. The findings of this study will inform policy formulation that intervenes in agricultural marketing. This will go a long way in improving the livelihoods of smallholder maize farmers in Zimbabwe's communal areas.

4.2 Study Area

The study was conducted in the Mashonaland Central Province (Figure 3.1), which is in Natural Region II of Zimbabwe. Given the agro-ecological diversity of Zimbabwe, maize production performs better in Natural Region II, and it is common in the Mashonaland provinces, where production and productivity is relatively higher, compared to the other regions. Natural Region II has a rainfall ranging between 750 mm and 1,000 mm per year and includes a significant proportion of the three Mashonaland Provinces, at 58,600 km^2, or 15% of Zimbabwe's land area (Musemwa *et al.,* 2013). The region is appropriate for intensive farming, typically for maize, tobacco, cotton and livestock. The province was specifically sampled because it is the second leading province, in terms of maize production and the area farmed by the smallholder farmers (ZIMVAC, 2020; Ministry of Agriculture 2021).

Mashonaland Central is mainly a farming province and the 2022 census data indicates that 64% of those employed, work within the agricultural sector (ZIMSTAT, 2022b). Mazowe is one of the seven administrative districts in the province and is located about 60 kilometers from Harare, the capital city of Zimbabwe. Mazowe District covers a total of 453 892 000 hectares of land. Of these, about 1330 square kilometers are within the district's communal area. Mazowe District has a total number of 35 wards and 3 administrative centres which are Glendale, Concession and Mvurwi. The major crops grown include burley and Virginia tobacco, wheat, soya beans, and maize. One of the largest Grain Marketing Board's silos in Zimbabwe is located in the Mazowe District. This reinforces the notion that Mazowe is indeed a farming district. According to Chiweshe (2011), the major crops grown for sale in the area are tobacco and soya beans while maize remains the staple food. The district is also rich in minerals such as gold, chrome and limestone and this has prompted mining activities although on a smaller scale compared to agriculture. While there are some tourist attraction centres in the district they have not been fully developed.

4.3 Research design

In this study a quantitative research design was employed. Leavy (2017) indicates that a survey is the most widely used quantitative design in the social sciences. Survey designs provide a quantitative description of trends, attitudes, opinions of a population by studying a sample of the population (Creswell, 2014). The survey relies on asking people standardized questions that can be analysed statistically using descriptive and/or inferential statistics. It allows researchers to collect a breadth of data from large samples and generalise to the large population from which the sample was drawn (Leavy, 2017).

4.4 Sampling Procedures

A multi-stage sampling procedure was adopted. Firstly, the study district was purposively selected owing to its high production of maize. From the ZIMVAC reports it can be noted that Mazowe District is one of the leading districts in terms of maize production. Five wards were randomly selected within the district. A formula that Slovin (1960) developed was used to calculate the sample size requirement for the study. Slovin's computations revealed that the sample size must be 382 smallholder farmers.

A formula that Slovin (1960) developed was used to calculate the sample size requirement for the study. The total number of smallholder farmers in the selected district was 8 763. The Slovin's computations revealed that the sample size must be 382 smallholder farmers (95% confidence and a margin of error of 0.05).

Equation 2: Slovin's Formula for sample size determination

$$n = \frac{8\,763}{1+8\,763(0.05)^2} = 382^{\text{figure rounded off to units}}$$

Where:

n= sample size

N= population size

e= confidence level (95%)

4.5 Data Collection

This study used cross-sectional household-level data on smallholder maize farmers and maize traders in Zimbabwe. Zimbabwe presents an interesting case study for maize marketing research, given the significance of the maize sector in the economy. Maize is thus considered to be a strategic commodity in the Zimbabwean economy, as it is a food security crop and an agro-industrial processing raw material. A questionnaire was used for the collection of primary data. Prior to the main survey, the questionnaire was pre-tested to improve the structure and wording of the questions. It was administered by five trained enumerators to 382 households, and 27 maize traders were randomly selected from five wards in the Mazowe District of Zimbabwe and a minimum of 70 respondents in each ward. The questionnaire, which is presented in Appendix 1, captured the household demographics, farm production and marketing activities of the smallholder farmers.

4.6 The Multinomial Logit Model

Given that the sampled farmers in the study areas have more than two alternative channel choices, the Multinomial Logit (MNL) Model was applied to estimate the factors affecting their choice of marketing channel. This model is the best approach for choices that are based on the attributes of the decision-maker, rather than on the choice itself. The model is widely used in studies involving multiple choices that define the dependent variable (Gujarati and Porter, 2009). The independent variables can be either dichotomous (i.e. binary) or continuous (i.e. interval or ratio in scale). MNL regression uses maximum likelihood estimation to evaluate the probability of categorical membership (Schwab, 2002).

The MNL estimates the probability of a maize farmer having a set of socio-economic characteristics, so that:

$$P(Y_h = i) = \frac{\exp(\beta_i^I X_j)}{\sum_{i=1}^{3} \exp(\beta_i^I X_j)}, \qquad (4.1)$$

Where i=1,2,3,

$X_j = X_1, X_2, X_3$.....

β_i is a vector of coefficients on each of the explanatory variables X_j. The above equation can be normalised to remove indeterminacy from the model, by assuming that the probabilities can be estimated as:

$$P(Y_h = i|X_j) = \frac{\exp(\beta_i^I X_j)}{1+\sum_{i=1}^{3} \exp(\beta_i^I X_j)} \qquad (4.2)$$

A set of socio-economic characteristics, institutional factors and market characteristics that are conditioned on the smallholder maize farmer, are presented in Table 4.1. The following explanatory variables were included in the model: the age of the household head, extension contacts, membership of an association, household income, household size, market information, the distance to the market, membership of an association and the maize producer price.

4.6.1 Market Choice Selection Model Justification

Various models have been used to understand the market choice selection of smallholder farmers. These include the Multinomial Logit model, binomial logistics and the multivariate model. It was noted from the literature, that the binomial logistic model is suitable for dichotomous problems involving two choices only. For markets with more than two choices, the binomial logistics model becomes inappropriate; it also does not incorporate the selection bias of the market choice decision process and selection, due to having both observable and unobservable characteristics. This study methodologically addresses the biases noted in the literature by applying the MNL model that accounts for selection bias (Khonje *et al.,* 2015 and Musara *et al.,* 2018**).** Furthermore, previous studies (e.g. Mossie *et al.,* 2020) conducted on the choice of the market selection decision used the Multinomial Probit Model (MNL), which assumes that the specified variables are all normally distributed. The main explicit assumption of the MNL is that the variables do not have to be multivariate in order to be normally distributed. The MNL can therefore be estimated by using continuous, dichotomous and ordinal explanatory variables (Mmbando *et al.,* 2017). This is a much less restrictive assumption than the Multinomial Probit Model. The MNL results are also relatively easy to interpret, the empirical results are satisfactory and it reduces the problems of auto-correlation, compared to the Multinomial Probit Model. Hence, this study intends to extend the literature on the smallholder maize farmers' choice of markets by using the Multinomial Logit Model. Since the researcher was mainly concerned with the main market only that's makes the MNL the most appropriate model.

Education: Education was captured as a continuous variable indicating the number of years of schooling of the household head. According to Mmbando *et al.* (2015), the educational level of the household head is used as a proxy for the farmers' ability to acquire and use information effectively. Investment in education and training is important, as it is widely believed that the educational level of farmers will improve their information-seeking behaviour and their adoption of agricultural innovations (Nxumalo *et al.,* 2019). Musara *et al.* (2018) and Ndoro *et al.* (2015) explained that educational levels affect the interpretation of market information and choice, which

thus influences the choice of the market channel. The household head's years of formal education are expected to increase the likelihood of selling to more complex markets.

Table 4.1 Definition of Variables

Variable Name	**Variable Type**	**Variable definition and Measurement**	**Hypothesised Effect**
Dependent variables			
Output Market choice	Dummy	1= farm gate, 2 = local market, 3 = GMB	
Explanatory variables			
Age	Continuous	Age of household head (years)	+
Education	Continuous	Number of years in school (years)	+
Household size	Continuous	Number of family members in a household	+
Number of Extension contacts	Continuous	Access to extension worker per production season	+
Distance to market	Continuous	Distance to the nearest market (km)	-
Membership of an association	Dummy	Membership to a farmer group (1 = yes, 0 = no)	+
Income	Continuous	Household monthly income (US$)	+
Price	Continuous	Maize producer price (US$)	+
Market Information	Dummy	Access to market information (1 = yes, 0 = otherwise)	+
Maize Farming Experience	Continuous	Number of years growing maize	+
Number of Buyers	Continuous	Number of maize buyers in the district	+

Extension contacts were captured as a continuous variable that indicated the number of visits by the extension officers to the household during the production year. Agricultural extension services, which are provided by the AGRITEX members, convey knowledge, market information and technical skills to smallholder maize farmers in the study area. It is hypothesised that the frequency of contact with extension workers is expected to facilitate smallholder linkages with input and output markets. Gebremaddhin *et al.* (2009), Roy *et al.* (2013), *Mmbando et al.* (2015) and Mukarambwa *et al.* (2018) noted that farmers who have more interaction with the extension agents have a higher chance of selling to more complex markets.

Membership of an association was captured as a dummy variable. Olwande and Mathenge (2011) noted that belonging to a farmers' organisation improves the capability of farmers to participate in the market because they have an increased bargaining power for better prices and increased access to farming and market information.

Age of the household head is a latent characteristic in the marketing outlet choice, and it was captured as a continuous variable. In a study in Tanzania, Mmbando *et al.* (2015) found that older farmers are more likely to sell through markets that are closer. Age influences their participation in markets in various ways, such as their experience, risk preference and access to resources (Ochieng *et al.* 2017). Younger farmers are expected to be risk-takers, innovative and involved in activities such as value addition, in order to access other alternative markets. Thus, the age of the farmer is expected to increase the likelihood of using the farm gate.

Maize experience was captured as a continuous variable. A farmer's experience can generate confidence; with more experience, a farmer can become more efficient in production and hence produce more for the market. Mukarumbwa *et al.* (2018) noted that maize farming experience is a key factor that improves the farmers' negotiation skills in the output market. The farmers' experience in maize farming is hypothesised to positively influence their market choice decisions.

Distance to the market was measured as a continuous variable in kilometers. Farmers who travel long distances to the market experience high transaction costs, thus constraining them to buy at the farm gate or to take only a small amount to the market because of the bulky nature of maize. Osmani and Hossain (2015), Ndoro *et al.* (2015), Musara *et al.* (2018), Megerssa *et al.* (2020), Kangile *et al.* (2020) and Hlatshwayo *et al.* (2021) noted that farmers located far from the markets are less likely to participate in the markets, probably because of the restrictive market access costs. As the distance to the market increases, the likelihood of a farmer participating in that market

decreases. The further the production area is from the market, the less likely it is that the farmer will participate in that market, since it implies higher transportation costs and less access to market information (Mbando *et al.,* 2015). Therefore, it was hypothesised that the further the distance to the market, the more the likelihood there is of selling at the farm gate.

Total household income is a continuous variable measured in US$. Smallholder farmers with a high total income are likely to participate in lucrative markets because they are able to meet the transaction costs, such as the transportation of the produce to the market. According to Nyaga *et al.* (2016), an increased income is also likely to enable farmers to invest in storage facilities, value addition and processing facilities and other inputs that lead to increased production, thus positively influencing their market choice decision.

Marketing Information: Access to market information was measured by the farmer's ability and aptitude to interpret it correctly. The source of information that the farmer receives is an important factor when farmers are choosing where to sell. According to Ndoro *et al.* (2015), Nyaga *et al.* (2016), Mukarumbwa *et al.* (2018) and Musara *et al.* (2018), access to market information influences their market channel decisions positively. Farmers with market information are expected to make more informed decisions; hence, their access to variable information is expected to be significant and positive.

Maize producer price denoted the lagged price offered by a particular maize marketing channel in the district. Farmers spend a considerable number of resources and time searching for markets that offer lucrative prices. A marketing channel offering a higher price is likely to act as an incentive for farmers to participate in that particular marketing channel (Nyaga *et al.,* 2016; Mmbando *et al.,* 2017and Mukarambwa *et al.,* 2018;). Therefore, a channel offering a better price was hypothesised to have a positive effect on the selection of that particular marketing channel in the study area.

Received Aid denoted the number of household members who are of beneficiaries to different donations from government and non-governmental organisations. Musara *et al.,* (2018) noted that households that receive aid have a higher probability of choosing the farm gate since the smallholder farmers receive donations and cannot produce for the distant market.

Yield per Ha denoted the tonnes that smallholder farmers are producing per ha of land. Mmbando *et al.,* 2017 noted that farmers who produce more tonnes of maize per ha are mostly likely to be market their produce at a distant market where prices are higher than the farm gate.

Household size was measured as the number of family members in a household and captured as a continuous variable. Nxumalo *et al.*, (2019), noted that increase in the household size means the household must produce and sell more to better markets. The household size is hypothesised to positively influence the household market choice decisions.

4.7 Results and Discussion

4.7.1 Household characteristics

Descriptive study findings from the 382 smallholder farmers in the five selected wards of Mazowe District are presented in Table 4.2.

Table 4.2 Household socio-economic characteristics

Variable Name	**Variable definition and Measurement**	**Mean**	**Standard Deviation**
Age	Age of household head (years)	51.52	12.24
Education	Number of years in school (years)	8.22	4.00
Household size	Number of family members in a household	7.33	2.19
Number of Extension contact	Access to extension worker per production season	5.27	2.97
Distance to market	Distance to the nearest market (km)	10.28	8.33
Number of buyers	Total number of buyers that the household interacts	3.34	2.94
Income	Household monthly income (US$)	135.12	53.97
Price	Maize producer price (US$)	259.68	37.66
Maize farming Experience	Total number of years the household has been growing maize	14.89	9.99

Generated by authors from the 2021 Maize Survey data, using STATA

The farmers' household characteristics and transaction costs play a very important role in their market channel selection. Table 4.2 shows that the mean age of the household head was 52 years.

The average age of the farming household was noted to be a productive age and this concurred with the findings of Tauer (2017), who noted that the mean age of smallholder farmers is around the most productive age. The age of an individual has an influence on productivity, as well as on food consumption. Age can partly explain the level of production and efficiency (Basnayake *et al.,* 2002). The age of the head of the household also indicates the managerial capital of the smallholder farmer (Ndoro *et al.,* 2015). At middle age, people are very active, aggressive and motivated by the needs of their families. Therefore, the age composition of respondents was considered to be an important factor in this study. The average household size for the market participants was approximately seven people, which, according to the ZIMSTATS Report (2022), is slightly above the national mean figure of five members per household.

The mean number of years that the household head spent at school was 8.22. Education increases the knowledge of the farmers, and this can be used to collect information, interpret the information received and to make informed marketing decisions (Mossie *et al.,* 2020). As their level of education increases, the farmers' productivity increases and their linkage to lucrative markets strengthens. Table 4.2 indicates that the average distance to the output market is 10.28 km. Distance is a key determination in the choice of a marketing channel by smallholder maize farmers (Cheelo and van der Merwe, 2021).

The mean number of visits by extension officers to the sampled smallholder farmers was 5.27. The general trend was that smallholder farmers have not been accessing adequate extension services in the district and this has negatively affected their productivity. The ZIMVAC Report (2021) confirmed that extension service delivery to small-holder farmers is generally limited; hence there is a need for the capacity-building of government extension service providers, in order to increase their coverage of extension services to smallholder maize farmers. The ZIMVAC Report (2021) also indicated that one of the greatest challenges has been the limited mobility of the ward-based extension workers, which limits their interaction with smallholder maize farmers.

In any value chain, the number of buyers plays an important role in determining the prices of a commodity. The mean number of maize buyers in the study area was 3.34. A higher number of buyers usually imply the lower chance of risk and exploitation for the farmers. This can lead to higher revenues and gross margins. The trend has been such that, over the years when surplus production is realised, the private sector has offered farmers lower prices than those quoted by the state agency, but they have managed to lure the farmers into selling their grain to them by using incentives, such as immediate cash payments and the provision of transport. The private traders then

re-sell their grain stocks to the state agency at higher prices. In years where there are maize shortages, the private sector tends to offer higher prices than the formal market, and they re-sell the maize directly to millers and other companies that use the grain as an input in manufacturing and processing activities. The lower number of maize buyers in the study area has been attributed to the reintroduction of the monopoly status. A controlled price and an inflexible marketing situation has been recreated, forcing the private sector out of the market.

4.7.2 Multinomial Logit results

Due to the narrowness of the maize marketing channel options in the country, three distinct alternatives were isolated, namely, the farm gate, the local market and the Grain Marketing Board (GMB). The explanatory variables that were discussed in a previous section (sub-section 4.5.1), were considered for the model and tested for their significance. The farm gate was used as the referent category because this channel was chosen by most of the farmers for trading their maize, and the results were interpreted relative to the farm gate. The positive sign of the coefficient indicates an increase in the likelihood that a farmer will change to the alternative option. On the other hand, a negative value shows that it is less likely that a farmer will consider the alternative option. The levels of the categorical variable and the marketing channel choice are assumed to have no natural order.

The estimated LR chi^2 is 616.39 and shows a statistical significance at well above the 5% level, which suggests that the Multinomial Logit Model adequately fits the data. The Pseudo R^2 of 84% shows the proportionate improvement in the model fit relative to the null model.

The age of the household head significantly reduced the likelihood that a maize producer would sell to the local market, rather than at the farm gate. It also significantly reduced the likelihood that a maize producer would sell to the GMB, rather than at the farm gate. Most old farmers do not have the capacity to transport their maize to the local market and the GMB, and hence, they prefer the farm gate. It can be concluded from the research findings that, as the farmers get older, they prefer to sell their produce at the farm gate because they may be better connected and have developed social capital with the traders there. These producers also have more established relationship networks within the community, which enhances their ability to market to the locals (Lee *et al.*, 2019). These findings concur with those of Arinloye *et al.* (2014), Okorley (2014), Mmbando *et al.* (2017), Kgomugisha *et al.* (2019) and Akrong *et al.* (2021), who noted that older farmers will most likely sell through closer markets because they are likely to have established relationships with the buyers who purchase from them at the farm gate.

Table 4.3 Multinomial Logit results

Variables	$In\ (\frac{P_1}{P_2})$ Local Market vs Farm Gate			$In\ (\frac{P_3}{P_2})$ GMB vs Farm Gate		
	Coef.	P>|z|	Marginal Effects *dy/dx*	Coef.	P>|z|	Marginal Effects *dy/dx*
Age	-0.071	0.004***	0.015 (0.016)	-13.470	0.085*	-0.0075 (0.13)
Number of Buyers	0.016	0.645	-0.048 (0.12)	-0.676	0.147	-0.062 (0.012)
Extension contacts	0.102	0.074**	-0.0031 (0.0075)	0.027	0.231	-0.0028 (0.0062)
Membership of associations	0.592	0.003***	-0.0060 (0.020)	-0.009	0.994	-0.0083 (0.017)
Household size	0.012	0.945	-0.014 (0.011)	2.629	0.364	0.0078 (0.0091)
Income	0.210	0.004***	-0.0019 (0.0040)	0.737	0.005***	-0.001 (0.0034)
Market Information	0.001	0.030**	-0.011 (0.032)	0.043	0.012**	0.0050 (0.026)
Yield per ha	5.815	0.254	-0.047 (0.027)	1.901	0.315	-0.0037 (0.23)
Distance	-0.030	0.043**	0.0072 (0.0027)	1.496	0.343	0.0017 (0.0021)
Transport to market	-0.306	0.678	-0.0037 (0.0027)	-0.167	0.091*	0.0029 (0.0022)
Education	0.627	0.011***	-0.0054 (0.018)	2.612	0.080	0.24 (0.016)
Price	0.030	0.014**	-0.0020 (0.0011)	-0.168	0.079	-0.0013 (0.0095)
Received aid	-0.105	0.349	0.0091 (0.0091)	0.450	0.084**	0.0085 0.0077)
_cons	-6.043	0.656		-311.217	0.080	
	Number of observations 370					
	LR $chi^2(34)$ = 616.39**					
	Pseudo R^2 = 84%					

Source: Generated by authors from 2021 maize survey data using STATA.

Notes: -***; ** and * indicate p-values significant at 1%, 5% and 10% levels respectively.

-The standard errors are in parenthesis

The number of visits by extension workers significantly increased the likelihood that a maize producer would sell at the local market, rather than at the farm gate. Access to extension services is expected to increase the ability of farmers to acquire relevant market-price information and related production information which, in turn, increases a farmer's ability to choose the distant market. The findings concur with those of Alemu *et al.* (2012), Ochieng *et al.* (2018), Mukarumbwa *et al.* (2018), Musara *et al.* (2018) and Mgale *et al.* (2020), who noted that access to extension services significantly, increased the likelihood of a small-scale farmer choosing the district market, which is more lucrative than the farm gate.

The results in Table 4.3 shows that, being a member of a group was associated with the increased likelihood of a farmer selling to the local market, as opposed to the farm gate. Farmers in groups have the advantage of bulking, and hence gaining economies of scale. The importance of collective action has been emphasised by most institutional economics authors like de Janvry *et al*. (1991), Kirsten *et al*. (2008), Elizabeth and Martin (2012), among others. It is also easier and cheaper for traders to enforce the quality and grade requirements through reaching farmers in groups, rather than individually. Literature on collective action has indicated that by organising themselves into groups, farmers have more bargaining power and fewer transaction costs (Pham *et al.*, 2019). This is consistent with the findings of Boughton *et al*. (2007), who noted that being a member of an association also allows farmers to gain access to the information that is needed to increase their returns on crop production and marketing activities. Mukarumbwa *et al.* (2018), Abdul-Hanan *et al.* (2014) and Markelova *et al.* (2009) also noted that group participation enables smallholder farmers to gain access to markets that they might find difficult to penetrate individually.

Road infrastructure and transport availability have an influence on market choice, especially if the farmer is located some distance from the market. The distance to the market significantly influenced the probability of choosing the farm gate, rather than the local market, and this is consistent with the *a priori* expectations. As the distance to the local market increases, the smallholder farmers in Mazowe will prefer gate to sell their maize at the farm gate, and as the distance to the market decreases, they will also sell at the farm gate, where they have natural, trustworthy and reliable bonds that are cemented between the smallholder farmers and the local maize buyers. Farmers who are located further away from markets face higher transaction costs and so may opt to sell their maize surplus at the farm gate, rather than selling to the local market, which will increase their transaction costs. Ogunleye *et al.* (2007), Ndoro *et al.* (2015), Muthini *et al.* (2017), Mmbando *et al.* (2017), Adugna *et al.* (2019), Pingali *et al.* (2019) and Mgale and Yunxion (2020) also noted that the further the distance, the higher the transportation costs and the higher the cost of marketing, which farmers always like to reduce, in order to enhance their profit. This is also consistent with the findings of Jari and Fraser (2009), who noted that as distance to the market increases, the transport costs also follow the same pattern, thereby increasing the costs associated with marketing and reducing the net benefits in the process.

The results in Table 4.3 shows that, formal education is expected to increase a household's understanding of the market dynamics and it therefore improves the decision regarding the market choice by the household head. The results revealed that more educated farmers were more likely to choose the local markets over the farm gate. Highly-educated farmers have a better understanding

of the production processes, market dynamics, as well as the supply requirements, which can enhance their access to the local market. When farmers are more educated, they become aware of the value of their produce and hence the likelihood of them dealing with traders at the farm gate is reduced. This is in line with the findings of Bobojonov *et al*. (2016), Mmbando *et al.* (2017), Maspaitella *et al.* (2018), Nxumalo *et al.* (2019), Mossie *et al.* (2020), Akrong *et al.* (2021) and Cheelo and van der Merwe (2021) who noted that highly-educated farmers are more likely to shift from the farm gate to better and more lucrative markets, if they are educated. The educated farmers know how to build contracts in different market channels and are able to meet the often-stringent requirements of the lucrative markets.

The income of the household significantly increases the probability of selling to the local market, rather than the farm gate. Smallholder farmers that have resources are more capable of owning vehicles that can be used to transport their produce to the more distant markets, instead of selling at the farm gate. This finding is consistent with the findings of Fafchamps and Vargas-Hill (2005), who established a positive relationship between income and market choice. According to Fafchamps and Vargas-Hill (2005), Mmbando *et al.* (2017) and Cheelo and van de Merwe (2021), well-resourced farmers are less likely to sell at the farm gate as the quantity sold increases, and they are more likely to travel to the market in order to trade their produce. The income of the household significantly increases the probability of selling to the GMB, rather than at the farm gate. As the wealth of the farmers' increases, the farmers tend to prefer more formalised markets like the GMB.

Access to market information is a positive sign for both the local market and the GMB. The positive coefficient for choosing the local market, and the GMB, imply that there is enough evidence to support that an increase in the availability of market information results in an increase in the probability of smallholder farmers' choosing either the local market or the GMB, when selling their maize produce. The larger coefficient values show that households with the available market information are likely to increase their participation in both the local and the GMB markets. Households that are unable to obtain pricing information are less likely to travel to the local market and the GMB and will sell their produce at the farm gate. These findings concur with those of Jari and Fraser (2009), Panda and Sreekumar (2012), Magesa *et al.* (2014), Mmbando *et al.* (2017), Pham *et al.* (2019) and Cheelo and van der Merwe (2021), who noted that timely access to marketing information helps smallholder farmers to make informed decisions and it increases the likelihood of the farmer choosing the most lucrative markets for their produce. Access to reliable market information helps to reduce the transaction costs associated with the search for a market.

Price was also statistically significant in determining the factors that influence the channel choice decision of smallholder maize farmers in the Mazowe District. A positive sign on its coefficient indicates that an increase in the price of maize increases the probability of the farmer selling the maize at the local market *vis a vis* the farm gate. The sign is consistent with the *a priori* expectation that when the price of a product increases, the farmers will supply their produce to the local market, rather than selling it at the farm gate. From the research findings, it can be noted that if smallholder farmers are assured of a good producer price, they are willing to travel long distances to access lucrative markets, rather than settling for the farm gate. This concurs with Arega *et al.* (2007), who noted that as the price of a commodity increases, the farmer will prefer better and more formalised markets and will forego selling their produce at the farm gate.

4.8 Conclusion

The household demographics and transaction costs offer key insights through which the smallholder maize farmers' relationship to different marketing channels can be understood. This chapter has provided empirical evidence of influence of household demographics and transaction costs on the market choices of smallholder maize farmers in the Mazowe District. The number of visits by extension workers significantly increased the likelihood of a maize producer selling at the local market relative, to the farm gate. Access to extension services increases the ability of farmers to acquire relevant market prices and related production information which, in turn, increases the farmer's ability to choose the more distant market. Extension officers are the major source of marketing information for the smallholder farmers. They give information about the selling price, the most viable market and the best time to market the produce. Extension officers are also expected to facilitate smallholder maize farmers' linkages with input and output markets.

4.9 Policy Recommendations

This study provides a number of recommendations. Firstly, there should be mechanisms in place for developing the capacity of farmers to access marketing information so that they can make informed decisions regarding their choice of marketing channel, in order to increase their income from maize marketing. Government need to capacitate the extension workers with the required marketing information; use the local radio stations to provide marketing information to the smallholder farmers, regular training of the extension workers and providing them with internet gadgets so that they can regularly search for the market information. Governments need to think about how to help farmers to engage better with the existing profitable market channels for smallholder maize farmers.

Being a member of an association increases the probability of a farmer selling to more lucrative markets. Farmers in groups have the advantage of bulking, hence gaining economies of scale. There is also a need for farmers to invest more in collective action so as to benefit from economies of scale. It is easier and cheaper for traders to enforce the quality and grade requirements through reaching farmers in groups, rather than individually.

Access to extension services increases the ability of farmers to acquire relevant market price information and related production information which, in turn, increases their ability to choose a more distant market. Increasing the frequency of extension-farmer contact will provide timely and updated information on the market conditions, especially the costs and net benefits associated with each transaction and marketing channel. The government and the government partners need to make the extension workers mobile and also reduce the extension worker- farmer ratio.

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CHAPTER 5

FACTORS DETERMINING THE LIKELIHOOD AND INTENSITY OF THE SMALLHOLDER MAIZE FARMERS'MARKET PARTICIPATION: A CASE OF THE MAZOWE DISTRICT IN ZIMBABWE

Abstract

Marketing plays a crucial role in alleviating poverty, as well as in achieving food security and sustainable agriculture goals, especially among smallholder maize farmers. Enhancing the ability of poor smallholder farmers to actively engage in the markets is one of the most pressing development challenges. Maize marketing has the potential to improve the resilience of households against food insecurity, which is caused by multiple factors which may be natural factors, socio-economic and institutional factors. This study ascertained the factors determining the likelihood and intensity of smallholder maize farmers participating in the maize markets. Data were collected from 382 smallholder maize farmers in the Mazowe District in Zimbabwe, by using questionnaires. The Heckman Selection Model was used as the main analytical tool to estimate the smallholder farmers' market participation and their intensity to participate in the maize market. The results indicated that the factors that were significantly associated with the likelihood of the farmers' participation and their intensity of participation were the age of household head, the number of maize buyers at district level, their extension contacts, their membership of a marketing association and the distance to the market. Contrary to *apriori* expectations, the distance to the market had a positive and significant impact on their intensity to participate in the maize market, which means that there was an increase in the volume of maize sold with the increase in the distance to the market. This might be due to the fact that farmers located further away from the markets need to sell more, in order to cover their transport costs. The study recommends that to increase their market participation and intensity to participate in the markets, the development agents should encourage farmers to be affiliated to marketing associations. This strategy can promote the dissemination of market information on maize marketing, which will result in greater market participation.

Keywords: Heckman selection model, Market Participation, Smallholder farmer

5.1 Introduction

Although industrialisation remains the prime goal of political and economic planners throughout the developing world, the past decade has seen a strong resurgence of interest in, and a concern for, smallholder agriculture. Most African countries cannot afford to ignore smallholder agriculture, as higher proportions of their populations are involved in smallholder activities (Larson *et al.,* 2016), and there appears to be little immediate prospect of rural industrialisation, or other non-farm engines for growth. Smallholder agriculture is likely to remain the major source of rural growth and livelihood improvement for some time, and it will continue to play a positive role in employment, human welfare and political stability in sub-Saharan Africa.

Market participation is both a cause and a consequence of economic development. Markets offer households the opportunity to specialise, according to their comparative advantages (Gebrehiwot *et al.,* 2018). During the 1980s, the recognition of the potential of markets as engines of economic development and structural transformation gave rise to a market-led paradigm of agricultural development (Reardon and Timmer, 2006), which was accompanied by the widespread promotion of market liberalisation policy agendas in sub-Saharan Africa (SSA) and other low-income regions.

In order to bring about transformation in the agricultural sector, it is necessary to promote smallholder farmer participation in the agricultural markets. Market access is critical for improving rural incomes, particularly in sub-Saharan Africa (Ouma *et al*., 2010). The attempts of smallholder farmers to market their products, especially food staples, is hampered by a poor infrastructure, information asymmetry and communication problems, which is compounded by the geographical dispersion of the farmers, inadequate support services and weak institutions (World Bank, 2007: 247). The farmers generally have low income levels, few assets and little capital to cope with the high transaction costs associated with market participation under these conditions. Several studies, e.g. Carletto *et al.* (2017), Barret *et al.* (2012) and Megerssa *et al.* (2020), have observed that smallholder farmers sell an insignificant proportion of their crop output in Africa (about 20%), and they have identified that both the lack of asset endowment and the high transactional costs, especially in remote areas, are strongly hindering their market participation.

Despite the rapidly-growing amount of empirical literature that has investigated the factors that influence the market participation of smallholder farmers in developing countries (e.g. Alene *et al.,* 2008; Barrett *et al.,* 2012; Biénabe *et al.,* 2011; Mather *et al.,* 2013), only a few studies (e.g. Mango *et al.,* 2018; Musara *et al.,* 2018) have focused on the market participation of such farmers in Zimbabwe. Studies in Zimbabwe have focused on the market channel choices of producers of crops

like sorghum, but they have not analysed the market participation and intensity to participate of smallholder maize or groundnut farmers (Musara *et al.,* 2018; Mango *et al.,* 2018). To the best of our knowledge, none of the market participation studies in Zimbabwe have incorporated the endogeneity of the market participation decision process, and selection due to both observable and unobservable characteristics. This study methodologically addresses the biases noted in the literature by applying the Heckman's two-stage model, which accounts for endogeneity and selection bias. This two stage selection model corrects for the fact that the selling group is not a random sub-sample of the population. Furthermore, previous Zimbabwean studies on the determinants of the market participation decision were not able to determine the factors affecting the degree of market participation; they only determined the factors affecting the binary (participating and non-participating) marketing decisions of farmers. The choice of the Heckman two-stage model allows the determinant factors to vary for the participation, as well as the level of participation. The decisions to either participate in the market or not, as well as the level and extent of participation, will be estimated simultaneously.

5.2 Theoretical Framework

In this study, an agricultural household model with transaction costs (Key *et al.,* 2000) was applied, by following other studies such as Bellemare and Barrett (2006), Megerssa *et al.* (2020) and Andraregie *et al*. (2021), in order to analyse the market participation of maize farmers in the Mazowe District.

The discussion below summarises the model, as presented in Key *et al.* (2000). The household decides how much of each good *i* to consume (c_i), produce (q_i), and use as an input x_i. The household also decides how much of each good to sell or purchase (m_i). The variable m_i is positive for a sale, and negative for a purchase. Assuming that a household faces transaction costs (both proportional and fixed costs), the objective of the household is to maximise their use, subject to the cash, resource, technology and non-negativity constraints:

Maximise; U (c; z_u) the utility function

Subject to

$$\sum_{i-1}^{N}[\left(p_i^m - t_{pi}^s(Z_t^s)\right)\sigma_i^s - (p_i^m + t_{pi}^b(Z_t^b))\sigma_i^b]m_i - t_{fi}^s(Z_t^{s)}\sigma_i^s - t_{fi}^b(Z_t^b)\sigma_i^b + T = 0 \quad (5.1)$$

cash constraint

$q_1 - x_i + A_i - m_i - c_i = 0$ resource balance (i = 1...N)

$G(q, x, A^i - m_i - c_i = 0$ production technology

$ci, qi, xi, \geq 0$ non-negativity condition

Where p_i^m is the market price of good *i*, A_i is the endowment in good *i*, *T* is the exogenous transfers and other incomes, z_u and z_q are exogenous shifters in utility and production, respectively, and G represents the production technology. The cash constraint states that expenditure on all purchases must not exceed the revenue from all the sales and transfers. The cash constraint includes both the fixed and proportional costs, which lead to an increase in the price paid by the buyer and a decrease in the price received by the producer. The Proportional Transaction Costs (PTCs) refer to those costs that vary with the quantity transacted, such as the transportation and marketing costs. The Fixed Transactional Costs (FTCs), on the other hand, refer to those transaction costs that are invariant to the quantity transacted, such as the cost of drafting a contract. A household pays for the fixed cost t_{fi}^s, if it sells good *i*, and pays t_{fi}^b if it buys good *i*. Both PTCs and FTCs are unobservable or cannot be easily recorded in a survey. What can be observed are the exogenous factors that explain these transactions costs. The resource balance states that, for each of N goods, the amount consumed, used as input and sold, is equal to what is produced and bought, plus the endowment of the good. The production technology relates the inputs (e.g. land and labour) to the outputs.

A Lagrange expression can be derived to solve the household problem and first-order conditions for the consumption goods. When the transaction costs are incorporated, the supply curve for the selling, buying are in autarky, and is given as follows:

$q^s = q(p^m - t_p^s - t_f^s, Z_q)$ sellers

$q^b = q(p^m + t_p^b + t_f^b, Z_q)$ buyers

$q^a = q(p^{\approx}, Z_q)$ autarkic households

For empirical analysis, this study focused on the selling households. A linear expression is assumed for the supply functions and is given as follows;

$$q(p, Z_q) = P\beta + z_Q\beta_Q - t_p^b$$

Where $t_p^s = -z_t^s\beta_p^s$ and $t_p^b = -z_t^b\beta_p^b$

This will then lead to the linear expression for sellers given as;

$$q^{s*} = p_m\beta_m + z_t^s\beta_t^s + z_q\beta_q$$

The linear expression for the production threshold levels are thus given as;

$$q^s = z_s^t\alpha_t^s + z_t^s\alpha_t^s + z_c\alpha_c^s$$

z^t are exogenous characteristics which affect transaction costs when selling; z_q are production shifters; z_c are consumption shifters; $\alpha_t^s and \alpha_c^s$ are coefficients; $\beta_t^s and \beta_q$ are coefficients of

$z_t^s and z_q$ respectively; q^{s*} is a latent supply if a household is a seller and observed if it is higher than a threshold for market participation, q^s.

Thus, if $q^{s*} > q^s$, the household is said to participating in the market as a seller. The expression equation below therefore allows for identification of parameters, β_i, using Probit analysis. Factors that influence the decision of maize farmers to participate in the market can be determined as shown below;

$q^{s*} > q^s \equiv Prob(y = 1) = X_i\beta_i + \mu$

The estimation of $\beta_m, \beta_t^s and \beta_q$ captures the intensity of market participation among the maize farmers in the study area

5.3 Heckman Selection Model Results

For the empirical analysis, this study focused on the selling households. After several steps, Key *et al.* (2000) shows that the following two econometric equations can be specified for selling households: a supply equation and a production threshold equation:

Supply equation for selling households:

$$q^{s*} = p_m\beta_m + z_t^s\beta_t^s + z_q\beta_q + u_i \quad (5.1)$$

Production threshold levels equation:

$$q^s = z_s^t\alpha_t^s + z_t^s\alpha_t^s + z_c\alpha_c^s + u_2 \quad (5.2)$$

Where: z^t are exogenous characteristics that affect the transaction costs when selling; z_q are the production shifters; z_c are the consumption shifters; $\alpha_t^s and \alpha_c^s$ are coefficients; $\beta_t^s and \beta_q$ are coefficients of $z_t^s and z_q$ respectively; q^{s*} is a latent supply if a household is a seller, and observed if it is higher than a threshold for market participation, q^s.

Thus, if $q^{s*} > q^s$, the household is said to participate in the market as a seller. The expression $q^s = z_s^t\alpha_t^s + z_t^s\alpha_t^s + z_c\alpha_c^s$ therefore allows for the identification of parameters β_i.

To determine the factors influencing the participation and intensity of participation in maize marketing by the smallholder farmers, the Heckman two-stage selection model (Heckman 1979) was used. This model involved the estimation of two equations. The first is whether a household participated in the maize market or not, and the second is the intensity of that market participation. The proportion of maize sales was conditional on the decision to participate in the market.

The first step involved the estimation of the Probit Model predicting the probability of whether an individual household participated in the maize market or not, as shown in the equations below:

Step 1 (selection equation)

$$P_{i(0,1)} = \beta_0 + \beta_1 X_1 + \cdots\cdots + \beta_n X_n + \varepsilon \quad (5.3)$$

$$P_{i(0,1)} = \beta_0 + \beta_1 Age + \beta_2 Tmaize + \beta_3 Edu + \beta_4 Hsize + \beta_5 Buyers + \beta_6 Income + \beta_7 Yield + \beta_8 Frmexp + \beta_9 Distmkt + \beta_{10} Aid + \beta_{11} Ext + \beta_{12} Memb + \beta_{13} Agesqu + \beta_{14} Edusqu + \beta_{15} Payspeed \quad (5.4)$$

The participation equation was used to generate a selection variable (inverse Mills ratio) which, when included in the Step 2 equation, makes the estimates unbiased and consistent.

The second stage involved adding the inverse Mills ratio to the response equation and estimating the regression model, as shown in equation 5.5:

Step 2 (outcome equation)

$$Y_i = \beta_0 + \beta_1 X_1 + \cdots\cdots + \beta_n X_n + \epsilon$$

$$Y_i = \beta_0 + \beta_1 Age + \beta_2 Tmaize + \beta_3 Edu + \beta_4 Hsize + \beta_5 Buyers + \beta_6 Income + \beta_7 Yield + \beta_8 Frmexp + \beta_9 Distmkt + \beta_{10} Aid + \beta_{11} Ext + \beta_{12} Memb + \beta_{13} Agesqu + \beta_{14} Edusqu + \beta_{15} Payspeed + \epsilon \quad (5.5)$$

5.4 Model Justification

The presence of different buyer options available for the farmers, it is plausible to assume that the observed zero amount of sales by a farmer reflect the farmer's optimal choice. This is in line with the assumptions in other studies in the context of Ghana's Upper West Region (Musah, Bonsu and Seini 2014). From the empirical modeling perspective, the zeros in the observed market participation variable imply a corner solution. A corner-solution applies to data where the dependent variables is truncated and "piles up" at some given value, but has a continuous distribution for positive values (Burke 2009). The Tobit model has been traditionally used for data characterized by a corner solution. However, its major limitation is that the participation decision and the amount decision are governed by the same process (Wooldridge 2009). That is, in the

context of this study, it requires that the decision to sell a particular crop and the decision about how much of that crop to sell be determined by the same variables, which makes it fairly restrictive (Burke 2009; Wooldridge 2003; Ricker-Gilbert, Jayne, and Chirwa, 2011. The Heckman regression first estimates a probit model of market participation; then, in the second step, it uses ordinary least squares (OLS) to estimate the quantity traded conditional on market participation (Wooldridge 2003). It is designed for incidental truncation, where the zeros are unobserved values (Ricker-Gilbert, Jayne and Chirwa 2011). The model allows for the participation and amount decision to be affected by the same set of factors

5.5 Study Area

The study was conducted in the Mashonaland Central Province (Figure 3.1), which is in Natural Region II of Zimbabwe. Mashonaland Central is mainly a farming province and the 2022 census data indicates that 64% of those employed, work within the agricultural sector (ZIMSTAT, 2022b). Mazowe is one of the seven administrative districts in the province and is located about 60 kilometers from Harare, the capital city of Zimbabwe. Mazowe District is surrounded by Goromonzi District to the east, Muzarabani District to the north and Guruve District to the west. It covers a total of 453 892 000 hectares of land. Of these, about 1330 square kilometers are within the district's communal area. Mazowe District has a total number of 35 wards and 3 administrative centres which are Glendale, Concession and Mvurwi. The major crops grown include burley and Virginia tobacco, wheat, soya beans, and maize. One of the largest Grain Marketing Board's silos in Zimbabwe is located in the Mazowe District. This reinforces the notion that Mazowe is indeed a farming district. According to Chiweshe (2011), the major crops grown for sale in the area are tobacco and soya beans while maize remains the staple food. The district is also rich in minerals such as gold, chrome and limestone and this has prompted mining activities although on a smaller scale compared to agriculture. While there are some tourist attraction centres in the district they have not been fully developed.

Given the agro-ecological diversity of Zimbabwe, maize production performs better in Natural Region II, and it is common in the Mashonaland provinces, where production and productivity is relatively higher, compared to the other regions. Natural Region II has a rainfall ranging between 750 mm and 1,000 mm per year and includes a significant proportion of the three Mashonaland Provinces, at 58,600 km^2, or 15% of Zimbabwe's land area (Musemwa *et al.,* 2013). The region is appropriate for intensive farming, typically for maize, tobacco, cotton and livestock. The province was specifically sampled because it is the second leading province, in terms of maize production and the area farmed by the smallholder farmers (ZIMVAC, 2020; Ministry of Agriculture 2021).

5.6 Research design

In this study a quantitative research design was employed. Leavy (2017) indicates that a survey is the most widely used quantitative design in the social sciences. Survey designs provide a quantitative description of trends, attitudes, opinions of a population by studying a sample of the population (Creswell, 2014). The survey relies on asking people standardized questions that can be analysed statistically using descriptive and/or inferential statistics. It allows researchers to collect a breadth of data from large samples and generalise to the large population from which the sample was drawn (Leavy, 2017).

5.7 Sampling Procedures

A multi-stage sampling procedure was adopted. Firstly, the study district was purposively selected owing to its high production of maize. From the ZIMVAC reports it can be noted that Mazowe District is one of the leading districts in terms of maize production. Five wards were randomly selected within the district. A formula that Slovin (1960) developed was used to calculate the sample size requirement for the study. Slovin's computations revealed that the sample size must be 382 smallholder farmers (with a 95% confidence level and a margin of error of 0.05).

A formula that Slovin (1960) developed was used to calculate the sample size requirement for the study. The total number of smallholder farmers in the selected district was 8 763. The Slovin's computations revealed that the sample size must be 382 smallholder farmers (95% confidence and a margin of error of 0.05.

Equation 3: Slovin's Formula for sample size determination

$$n = \frac{8\,763}{1+8\,763(0.05)^2} = 382^{\text{figure rounded off to units}}$$

Where:

n= sample size

N= population size

e= confidence level (95%)

5.8 Data Collection

This study used cross-sectional household-level data on smallholder maize farmers and maize traders in Zimbabwe. Zimbabwe presents an interesting case study for maize marketing research, given the significance of the maize sector in the economy. Maize is thus considered to be a strategic commodity in the Zimbabwean economy, as it is a food security crop and an agro-industrial processing raw material. A questionnaire was used for the collection of primary data. Prior to the main survey, the questionnaire was pre-tested to improve the structure and wording of the questions. It was administered by five trained enumerators to 382 households, and 27 maize traders were randomly selected from five wards in the Mazowe District of Zimbabwe and a minimum of 70 respondents in each ward. The questionnaire, which is presented in Appendix 1, captured the household demographics, farm production and marketing activities of the smallholder farmers.

5.9 Definition of Variables

Table 5.1 describes the variables and their hypothesised signs in the estimated market participation model. The explanatory variables that were hypothesised to explain the probability and intensity of market participation of maize were identified, based on the theoretical framework and past empirical work on market participation.

Market participation: Market participation is defined as a binary response variable which takes the value Y=1, if the farmer's maize sales exceed a threshold or critical level of Y^* (75%) and Y = 0 if $Y \leq Y^*$.

Intensity of market participation: the intensity of market participation was measured in the tons of maize output sold by the market participants.

Education: Education was captured as a continuous variable that indicated the number of years of schooling of the household head. In a study in Zambia, Lubungu *et al.* (2012) found that exposure to education increases a farmer's ability to obtain, process and use information for market participation, while in a study in Mozambique, Boughton *et al.* (2007) and Osmani and Hossain (2015) indicated that the level of education of the household head positively influenced both the probability and intensity of the market participation among smallholder farmers. This variable was hypothesised to be positively related to the probability and intensity of their market participation.

Table 5.1 Definition of variables

Variable Name	Source	Variable Type	Variable definition and Measurement	Hypothesised Effect on Market Participation
Dependent variables				
Market participation	Primary	Dummy	1= participate, 0 = otherwise	
Quantity of maize sold	Primary	Continuous	Tons	
Independent variables				
Age of household head	Primary	Continuous	Age of household head (years)	±
Education level of household head	Primary	Continuous	Number of years in school	+
Household size	Primary	Continuous	Number of family members in a household	+
Maize farming experience	Primary	Continuous	Number of years farmer is engaged in maize farming	-
Extension contacts	Primary	Continuous	number of visits by extension officers	+
Distance to market	Primary	Continuous	Distance to the nearest market (km)	-
Membership of an association	Primary	Dummy	Membership to a farmer group (1= yes, 0 = no)	+
Total Yield	Primary	Continuous	Quantity produced per hectare (kg)	+

Extension contact was captured as a continuous variable that indicated the number of visits by the extension officers to the households during the production year. The agricultural extension services provided by the AGRITEX members are the major source of agricultural information in the study area. It is hypothesised that frequent contact with extension workers will increase the likelihood of the farmers participating in the market. Alene *et al.* (2000), Nxumalo *et al*. (2019) and Belay (2020) noted that farmers who have more interaction with the extension agents have a higher chance of participating in the market. This variable was hypothesised to be positively related to the probability and intensity of market participation.

Membership of an association was captured as a dummy variable. Olwande and Mathenge (2011) noted that belonging to a farmers' organisation improves the capability of farmers to participate in the market, because they have an increased bargaining power for seeking better prices and increased access to farming and market information. In this study, being a member of an association was hypothesised to positively influence both the probability and intensity of market participation among smallholder maize farmers.

Age of the household head: The age of an individual has an influence on productivity, as well as on food consumption, and it is a factor that can explain the level of production and efficiency (Basnayake *et al.,* 2002). The performance of economic activities can be influenced by the age of the farmer. In a study in Kenya, Olwande and Mathenge (2011) found that the age of the household head negatively influenced his decision to enter the market. This may be because farmers who are younger are expected to have more bargaining strength than their aged counterparts. Martey *et al.* (2010) found that age has a positive influence on the intensity of market participation among cassava producers. This might be because older farmers have more experience than the younger farmers and also because a dialogue must take place between buyer and seller, which demands that both sides have negotiating skills, in order to get an advantageous deal. In this study, the age of the household head was hypothesised to have an indeterminate relationship with market participation and the intensity of market participation.

Household size was captured as a continuous variable, indicating the number of family members in a household and those who are directly dependent on it. A large household size negatively influences the extent of the farmers market participation (Mwema *et al.* 2013), as more of the farm produce will be held back for home consumption. This variable was hypothesised to negatively influence market participation.

Yield was measured in the tons of maize produced per hectare. Chilundika (2011) found that yield positively influences both the probability and intensity of market participation among bean producers in Zambia. Thus, yield was hypothesised to positively influence both the decision to enter the market and the intensity of their participation.

Maize farming experience was captured as a continuous variable. If a farmer has more experience, it can generate confidence; the farmer can become more efficient in production and hence produce more for the market. According to Renos *et al.* (2003), experience also reflects the ability to better

negotiate. The farmers' experience in growing maize is hypothesised to positively influence their decision to participate in the market and the intensity of their participation.

Distance to the market was measured as a continuous variable in kilometres. Farmers who travel long distances to the market experience high transaction costs, which thus restricts them to buyers at the farm, or to them only taking a small amount of maize to the market because of its bulky nature. Megerssa *et al.* (2020), Osmani and Hossain, (2015), Musara *et al.* (2018), Kangile *et al.* (2020) and Hlatshwayo *et al.* (2021) noted that farmers who are located far from markets are less likely to participate in the markets, probably because of the restrictive market access costs. As the distance to the market increases, the likelihood of a farmer participating in that market decreases. In this study, the distance to the market was hypothesised to have a negative influence on the probability and intensity of market participation among smallholder maize farmers in the Mazowe District.

5.10 Household Characteristics by Market Participation

Descriptive study findings from the five selected wards are presented in Table 5.2. The table shows that the mean age of market participants was 52 years, whilst that of the non-market participants was 44 years. The average age of the farming household was noted to be a productive age, which concurs with the findings of Tauer (2017), who noted that the mean age of smallholder farmers is also the productive age. The age of an individual has an influence on productivity as well as on food consumption, and it can partly explain the level of production and efficiency (Basnayake *et al.*, 2002). At middle age, people are very active, aggressive and motivated by needs of their families. Therefore, the age of the respondents was considered to be an important factor in this study. The average household size for the market participants was approximately seven people, which is slightly above the national mean figure of five members per household, according to the ZIMSTATS Report (2022). It has been found that a large household size negatively influences the extent of the farmers' market participation (Mwema *et al.*, 2013), as more of the farm produce will be held back for home consumption. Therefore, the household size was considered to be an important factor in this study.

The mean extension visits to the market participants was 5.3, whilst for non-market participants it was 4.09. The general trend was that smallholder farmers have not been accessing adequate extension services in the district and this has negatively affected their productivity. The ZIMVAC Report (2021) confirmed that the extension service delivery to smallholder farmers is generally limited, hence there is need for capacity building and for government extension service providers to increase the coverage of extension services to smallholder maize farmers. The ZIMVAC Report

(2021) also indicated that one of the greatest challenges has been the limited mobility of the ward-based extension workers, which limits their interaction with the smallholder maize farmers.

Table 5.2 Household socio-economic characteristics by market participation

	Market Participants		**Non-Market Participants**	
Variable	**Mean**	**Standard deviation**	**Mean**	**Standard deviation**
Age (years)	51.79	12.30	43.54	6.59
Household size	7.29	2.19	8.36	2.16
Income (US$)	135.12	54.55	138.18	32.19
Distance to the market (km)	10.34	8.39	8.27	6.44
Number of buyers	3.33	2.97	3.54	1.86
Extension visits	5.30	2.98	4.09	2.66
Price per ton (US$)	260.05	37.89	252.73	25.73
Arable land (ha)	4.20	1.23	3.58	0.89
Maize area (ha)	2.74	0.97	0.28	0.93
Maize farming experience(years)	14.94	10.05	10.78	2.44
Years at school (years)	8.64	4.03	8.22	3.44
Total sales	3.56	2.49	0.48	0.68
Total yield	2.67	1.05	2.08	1.11
Payment speed	1.86	1.06	0.43	0.87

Source: Generated by authors from the 2021 maize survey data using STATA

Farmers located far from the input and output markets are less likely to participate in the markets, probably because of the restrictive market access costs. However, Table 5.2 indicates that the average distance to the market for market participants (10.34 km) was greater than that of non-market participants (8.27 km).

In any value chain, the number of buyers plays an important role in determining the prices of a commodity. The mean number of maize buyers for the market participants was 3.33. A higher number of buyers usually implies a lower chance of risk and exploitation for the farmers. This can

lead to higher revenues and gross margins. Over the years, the trend has been that, when surplus production is realised, the private sector has offered farmers lower prices than those quoted by the state agency, but they have managed to lure the farmers into selling their grain to them by giving them incentives, such as immediate cash payments and the provision of transport. The private traders then re-sell the grain stocks to the state agency at higher prices. In years when there are maize shortages, the private sector tends to offer higher prices than the formal market, and it re-sells the maize directly to millers and other companies that use the grain as an input in their manufacturing and processing activities. The lower number of maize buyers in the study area has been attributed to the reintroduction of the monopoly status. A controlled price and an inflexible marketing situation have been recreated, forcing the private sector out of the market.

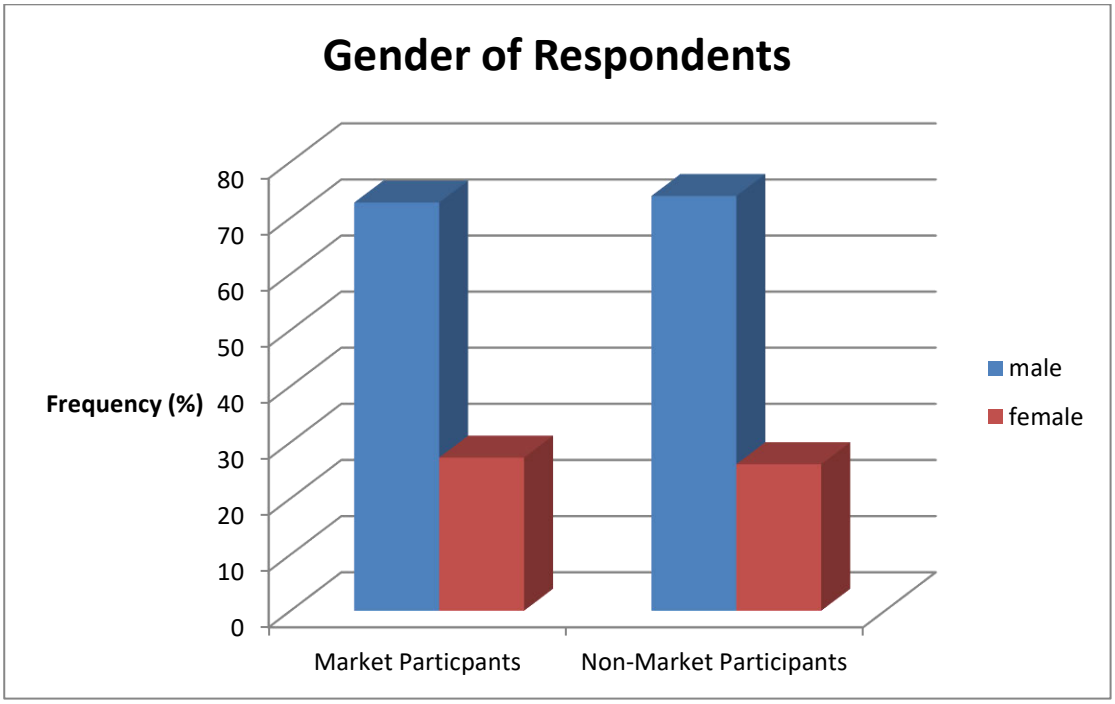

Figure 5.1 Gender of respondents by market participation status

The results in Figure 5.1 above show that most households are headed by males (72.73% for market participants and 73.91% for non-market participants), which indicates that the study area is patriarch-dominated. These results concur with those of Afolabi (2010), who noted that most of the agriculture-based households are male-headed and who attributed this to the drudgery of agricultural production. This contradicts the findings of Edem *et al.* (2014) and Abankwah *et al.* (2016), who noted that female-headed households constitute 60 to 80% of the agricultural labour force in developing countries.

5.11 Heckman Two-stage Selection Model Results

The first stage of the Heckman Two-stage Selectivity Model estimates the maize market participation of smallholder farmers by using the Probit Model, and the second stage of the selectivity model estimates the intensity of market participation by using the heteroskedasticity-corrected regression estimates. Table 5.3 presents the results of the Heckman two stage selection Model that explain the probability of households participating in maize marketing and the intensity of such market participation.

5.11.1 Determinants of the market participation decision

The Probit Model was used to estimate the determinants of market participation. In the Heckman Two-stage estimation, the coefficients on the Mill's ratio (lambda) are insignificant at a probability of less than 5%. This shows that there is no sample selection bias. No unobservable characteristics are influencing the farmers' likelihood to participate in maize marketing and thereby affecting their intensity of participation. Therefore, sample selection bias would not have resulted, if the intensity of maize marketing had been estimated without considering the discrete decision to participate in marketing (Belay 2020).

The first panel provides the Probit coefficients for the market participation decision. It shows that the age of the principal decision-maker is non-linearly and significantly related to the propensity to participate in the maize market by smallholder farmers. While there is a positive relationship between age and the chance of market participation for younger people, the likelihood will reach a point when it will start to decrease, since the relationship between age and the likelihood of participating is a nonlinear relationship. These findings are consistent with those of Belay (2020), who reported that the age of the household head is a statistically-significant factor that influences market participation among smallholder farmers. This implies that older farmers, up to a certain age, have more connections and social capital, which can assist them in reducing the transaction costs of market participation. However, after a certain age is reached, market participation declines with age, indicating that such characteristics of older farmers, such as risk aversion and a reluctance to adopt technology, and hence their inability to produce for the market. These findings are in line with those of Belay (2020).

Table 5.3 Heckman Selection model results

Variables	1st Stage (Market Participation) Dependent variable: Market Participation			2nd stage (Market Intensity) Dependent variable: Total maize sold	
	Coef.	Marginal effect (dy/dx)	p-value	Coef.	p-value
Age	0.512 (0.049)	0.091	0.000***	1.687 (0.872)	0.053*
Agesquared	-0.005 (0.0005)	0.0013	0.000***	-0.015 (0.0086)	0.084*
Total maize produced	0.367 (0.023)	0.331	0.000***	0.4 (0.45)	0.379
Number of Buyers	-0.021 (0.012)	-0.0104	0.091*	-0.346 (0.204)	0.090*
Extension contacts	0.040 (0.012)	0.0075	0.001***	0.594 (0.275)	0.030**
Member of associations	0.027 (0.032)	0.0038	0.401	1.077 (0.491)	0.028**
House hold size	0.184 (0.017)	0.016	0.000***	0.872 (0.381)	0.022**
Payment speed	0.0656 (0.034)	0.0125	0.053*	-0.594 (0.472)	0.209
Income	-0.0002 (0.0007)	-0.0015	0.763	-0.001 (0.008)	0.875
Yield per ha	0.064 (0.053)	0.0156	0.229	-2.376 (0.977)	0.015**
Distance	-0.015 (0.005)	-0.023	0.006***	0.250 (0.106)	0.018**
Maize experience	-0.0006 (0.004)	-0.0023	0.888	0.055 (0.063)	0.383
Education	0.1 (0.03)	0.022	0.001***	0.215 (0.364)	0.554
Education squared	-0.003 (0.002)	-0.0016	0.020**	-0.009 (0.026)	0.740
Received aid	0.02 (0.015)	0.038	0.175	0.972 (0.436)	0.026**
_cons	-12.17 (1.199)		0.000***	-46.93387 (22.23)	0.035**
/mills lambda	0.103 (0.447)		0.817		
Number of observation	377	sigma | 0 .687			
Number selected	368	rho | 0.1503			

Source: Generated by authors from 2021 maize survey data using STATA

Notes: -***; ** and * indicate p-values significant at 1%, 5% and 10% levels, respectively.

-The standard errors are in parenthesis

Even though the initiatives of communal farmers for the development of their agricultural capacity have generally received support from the private sector and non-governmental organisations, the number of visits by extension workers has been observed to increase the likelihood of market

participation by smallholder communal farmers in the Mazowe District. This is because farmers who are trained have a better capacity and ability to make use of the available market information for their own benefit, in the form of contractual arrangements, than untrained farmers. The results conform with those of Alene *et al*. (2008), Mmbando *et al*. (2015), Hassan *et al. (*2016), Musara *et al*. (2018), Amare *et al.* (2019) and Ndlovu *et al.* (2021), who noted that contact with extension workers provides technical assistance and information on improved technologies and marketing. Smallholder farmers who are frequently visited by extension agents during the production season are more likely to participate in supplying their maize output to the market. Since extension agents are a source of information on the usage of inputs, production and marketing, frequent extension visits increase the chance of farmers participating in the market (Hassan *et al.*, 2016; Andraregie *et al*., 2021).

The estimated coefficient of distance to nearest market is statistically significant and inversely related to the market participation of smallholder maize farmers. Farmers located far from the markets are less likely to participate in the markets, probably because of the restrictive access costs. As distance to the market increases, the likelihood of a maize farmer participating in a market decreases. The variable distance to the market has a positive co-relationship with the transaction costs that are incurred by the farmers in getting their produce to the market. Longer distances also imply that the transactional costs at the market also increase. Aggregating these costs would imply that farmers lose out on the potential gains from maize marketing. This result concurs with the findings of Alene *et al*. (2008), Ouma *et al*. (2010), Mather *et al.* (2013), Mmbando *et al*. (2015), Musara *et al*. (2018), Megerssa *et al.* (2020), Belay (2020) and Beyene *et al*. (2020), where the coefficient of distance to the nearest market was statistically significant and negatively related to their market participation. This reinforces the argument that poor market access for households located in remote areas is due to the costs associated with marketing and information.

The findings also show that the total maize production has a positive and significant association with the farmer's decision to participate in the market. If the smallholder farmers produce more maize output, they are more likely to sell more maize at the market, and they are more likely to be market-oriented because of the available surplus output than those who produce less or who tend to produce for subsistence and have no surplus to sell. The payment speed is another factor that the farmers consider when participating in a market. Most farmers prefer payment methods that are faster, as it is their major source of income. It can be noted from the findings that the payment method has a positive and significant effect on the farmer's decision to participate in a particular market.

The educational level plays a major role in enhancing production and mitigating the transaction costs by increasing the farmers' ability to obtain market information. The educational level of the household heads was significantly and positively associated with their participation in the maize market. This can be explained by the fact that, as an individual accesses more education, he/she is empowered with the marketing skills and knowledge that will spur him/her on and increase the likelihood of him/her participating in the market. Andaregie *et al.* (2021) noted that literate household heads are more aware of the importance of marketing and market participation. This is consistent with the findings of Mmbando *et al*. (2015), Olutimise (2022), Adewusi and Adenegon (2020), Hlatshwayo *et al.* (2021) and Megerssa *et al.* (2020), who also noted that advancement in education increases their ability to obtain and process market information.

The results also revealed that the number of buyers in the study area had a significantly negative effect on the decision of farmers to participate in the output market. The results showed that an increase in the number of buyers in the market decreases the likelihood of a household participating in the market. The maize markets in Mazowe District are highly concentrated and controlled by a few traders. The few traders will determine the price of maize on the local market and the traders have a tendency to collude, with respect to the prices. If the number of maize buyers increases, the traders will collude to lower the producer price of maize and hence discouraging farmers from selling their produce at the market so as to drive the other buyers out of the market. This is in contrast to many studies, for example Poulton *et al*. (2006), Erickson *et al*. (2002) and Pye-Smith (2013), who noted that the number of buyers is an indicator of the efficient functioning of markets and it is therefore expected to significantly affect the decision of farmers to participate in the market.

5.11.2 Determinants of the intensity of market participation

The results in Table 5.3 show that there is a significant non-linear relationship between the age of the principal decision-maker and the intensity to participate in the maize market in the country. The household size is positively and significantly linked to their intensity to participate. For the smallholder farmers' households, the main source of income is selling maize; therefore, if the household size increases, the income demands will also increase and hence they will sell more maize. This finding corroborates those of Alene *et al.* (2008) and Musara *et al*. (2018).

Being a member of a farmers' association group was significantly and positively related to the intensity of their market participation. It allows farmers to market together and reduces the

transaction costs associated with products reaching the market. It also increases their access to information, such as production techniques and available markets. Belonging to a farmers' group is a social capital aspect that increases the farmers' bargaining power. The results are consistent with the findings of Adeoti *et al*. (2014), Mmbando *et al*. (2015), Gebrehiwot *et al.* (2018), Ndlovu *et al.* 2021) and Hao *et al.* (2018), who noted that membership of a farmers' association had a positive and statistically-significant impact on their intensity to participate in output markets. Being a member of a marketing group motivates farmers to sell more on the market through networking and it provides up-to-date information to its members. As a result, the likelihood of farm households who are involved in a farmers' cooperative are more likely to be participants, rather than non-participants.

Interestingly, distance to the nearest market correlated positively and significantly with market intensity, which means that there is an increase in the volume of maize sold with an increase in the distance to the market. The results show that for those farmers located further from the nearest market, the intensity to participate in the market increases, compared with those living closer to these markets. This might be due to the fact that those located furthest from the markets have to sell more to make a profit, as they face higher transportation costs. The findings conflict with those of Ouma *et al*. (2010), Mmbando *et al*. (2015) and Beyene *et al.* (2020), who noted that when farmers are located far from the market, it reduces their intensity to participate in markets.

The role of extension officers is to equip the farmers with the necessary skills and knowledge on sustainable production and marketing practices (Rukuni *et al*., 2006; Hassan *et al.,* 2016). This is achieved by providing them with up-to-date information on production practices, market prices and the benefits of commercial agriculture through embracing agriculture as a business, as opposed to having a subsistence mind-set, which most communal farmers have. The estimated coefficient for the frequency of contact with extension agents was positive and statistically significant. This means that those farmers who have more interaction with the extension agents have a higher chance of intensifying their market participation. This concurs with Kilima *et al*.'s (2010) study in Tanzania, who observed the positive impact of agricultural training. Gebrehiwot *et al.* (2018), Megerssa *et al.* (2020) and Beyene *et al.* (2020) also reported that contact with extension agents is significantly improving the participation intensity of smallholder farmers in different markets.

5.12 Conclusion

Smallholder farmers in Zimbabwe remain susceptible to food insecurity and poverty. In order to combat these challenges, they need to be market-oriented. This chapter analysed the determinants of

maize market participation, as well as the intensity of their participation, by using household-level data collected from smallholder farmers in the Mazowe District in Zimbabwe. The result reveals that market participation and the intensity to participate in the maize markets by smallholder maize farmers are highly correlated with the transactional costs and socio-economic variables. Some of the significant factors affecting their market participation are the number of visits by extension workers, being a member of an association and their educational level. The improvement of human capital also appears to be crucial for smallholder market participation and their intensity to participate in the market, while the distance to the market was also of paramount importance for smallholder farmers in the Mazowe District.

5.13 Policy Recommendations

The physical linkage of areas of smallholder farmers to the markets is a policy that could improve the market participation of smallholder farmers in the country, since distance is one of the factors that affects the market participation of smallholder farmers in the district. There is need to establish and maintain the roads, since smallholder farmers prefer markets that are far away. The transactional costs of the marketing of maize could be reduced by promoting collective marketing and membership of associations or groups, while improvements to the markets, based on their location, for example at district level, could benefit smallholder farmers.

Extension contacts provide smallholder maize farmers with the necessary skills and knowledge. Farmers who have more interaction with the extension officers have a higher chance of participating and intensifying their market participation. There is need to re-orientate the extension methods and to gear them towards developing effective information-disseminating pathways. This can be done by increasing the frequency of extension-farmer contact by using informal networks. Improving communication between the farmers and extension officers is recommended, in order to increase information dissemination.

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CHAPTER 6

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter gives an overview of the research study in a reduced manner giving a recap of the research problem which was mainly on the low market participation by the maize smallholder farmers, study methodology and the major findings of the study. The scope of the chapter is given out through information presented as the research summary, conclusions, policy implication and recommendations considering the research outcomes, areas for further research based on the noted gaps, References as well as appendices.

6.2 Research Summary

Marketing by smallholder maize farmers plays a crucial role in alleviating poverty, achieving food security and sustainable agriculture goals. Enhancing the ability of poor smallholder farmers to actively engage in markets is one of the most pressing development challenges. Maize marketing has the potential to improve the resilience of households against food insecurity, which is caused by multiple factors which may be natural factors, socio-economic and institutional factors. The main objective of the study was to analyse the effects of the maize market structure on the market participation of smallholder farmers in Zimbabwe, and cross-sectional household-level data was used. The study was conducted in the Mashonaland Central Province, which is in Natural Region II of Zimbabwe's five agro-ecological regions. The province was specifically sampled, as it is one of the leading provinces, in terms of maize production and the area under maize. A multi-stage sampling procedure was adopted. Firstly, the study district was specifically selected owing to its large number of smallholder farmers. This was followed by selecting the wards. Simple random sampling was conducted on 382 smallholder farmers within the wards.

Given that the sampled farmers in the study area have more than two market choices, the Multinomial Logit (MNL) model was applied to estimate the factors affecting their choice of marketing channel. The study used the Heckman Two-stage Selection model to determine the factors influencing the participation of smallholder farmers and the intensity of their participation in maize marketing. This model involved the estimation of two equations. The first was whether a household participated in the maize market or not, and the second was the intensity of its market participation. The proportion of maize sales was conditional on the decision to participate in the

market. The market structure of the maize sector in Zimbabwe was evaluated, based on the concentration of maize traders and the barriers to market entry for potential traders. The Gini coefficient and the Lorenz curve were used to measure the market concentration of the maize sector.

The study findings showed that smallholder farmers have three basic options regarding the selling of their surplus maize, i.e. they can sell at the farm gate at low prices, or they can travel to the local market where higher prices are offered, while incurring some transaction costs, or they can sell to the Grain Marketing Board, which offers better prices, but with delayed payments. In this study, marketing at the farm gate was the most popular among the smallholder farmers (47.43%), followed by the local market (34.69%), and the GMB (17.89%) was the least-used marketing channel. The number of visits by extension workers significantly increased the likelihood that a maize producer would sell at the local market, rather than the farm gate. Access to extension services was expected to increase the ability of farmers to acquire relevant information on market prices and related production information which, in turn, increases their ability to choose a market. Being a member of a farmers' association was associated with an increased likelihood of a farmer selling to the local market, as opposed to the farm gate. Farmers in groups have the advantage of bulking and hence gaining economies of scale.

The education level of the household head was significantly and positively associated with his/her participation in the maize market. This was explained by the fact that as an individual accesses more education, he/she is empowered with marketing skills and knowledge, which will spur him/her on and increase the likelihood that he/she will participate in the market. The distance to the nearest market was positively and significantly correlated with market intensity. This means that there is an increase in the volume of maize sold with an increase in the distance to reach the market. The results showed that for farmers located further from the nearest market, the intensity to participate in the markets increased, compared to those living closer to these markets.

The study examined the concentration and spread of maize marketing by smallholder farmers in the most productive wards of the Mazowe District. The results showed that the maize grain trade is very highly concentrated and that it is controlled by a few traders. The few traders determine the maize price at the local market and have a tendency of collude on the prices. The Gini coefficient indicates that there is a non-competitive market in the district and that there is evidence of barriers to entry. Based on the Shepherd Index, the local market channel was deemed to be the most efficient, with a marketing efficiency index of 3.733, while the GMB had a lower marketing efficiency index of 2.322. The findings show that the marketing efficiency indexes are relatively low for both the local market and the GMB.

6.3 Conclusions

The research provided empirical evidence of the influence of household demographics and transaction costs on the market choices, the participation in the maize market and the intensity of market participation of smallholder maize farmers in the Mazowe District. The research finding shows that the maize market in the district is highly concentrated and there are few traders who dominate the market. These few traders determine the price for the maize and have a tendency to collude on the prices. The collusion by the buyers has resulted in few traders entering the markets. The study indicated that, due to the narrowness of the maize marketing channel options in the district, three distinct alternatives were identified, namely, the farm gate, the local market and the GMB. Smallholder farmers have three basic decisions to make regarding selling their surplus maize: to sell at the farm gate at low prices, to travel to the local market where higher prices are offered, incurring some transaction costs, or to sell to the GMB, which offers better prices but has delayed payments, farmers need to have a bank account and higher transactional costs. The traditional marketing channels, such as the farm gate, are attractive to farmers because they offer low marketing costs and higher sales, at the expense of lower prices. The farm gate was found out to be attractive to the smallholder farmers because the farmers are also selling to the buyers that have established networks.

The empirical results revealed that there are a number of significant household and market-specific influencing factors that affect the marketing channel choice of smallholder farmers. Their age, extension contacts, membership of an association, income, market information, distance to the market, education and price are the most robust determinants of marketing channel selection by the smallholder farmers in the Mazowe District. The age of the household head significantly reduced the likelihood that a maize producer would sell to the GMB, rather than at the farm gate. The researcher, can conclude that older farmers do not have the capacity to transport the maize to the local market and the GMB, and they therefore prefer the farm gate where there is no need to transport the maize and also buyers are the ones that visits the homestead to purchase the maize.

The number of visits by extension workers significantly increased the likelihood of a maize producer selling at the local market relative, to the farm gate. Access to extension services increases the ability of farmers to acquire relevant market prices and related production information which, in turn, increases the farmer’s ability to choose the more distant market. Extension officers are the major source of marketing information for the smallholder farmers. They give information about the

selling price, the most viable market and the best time to market the produce. Extension officers are also expected to facilitate smallholder maize farmers linkages with input and output markets.

The key message drawn from the results is that market participation plays a crucial role in improving food security and poverty alleviation among the smallholder farmers in the district. The results reveal that the market participation of smallholder maize farmers and their intensity to participate in the markets are highly correlated with the transactional costs and socio-economic variables. Some of the significant factors affecting market participation are the number of visits received by extension workers, being a member of an association, as well as their educational level. The age of the principal decision-maker was non-linearly and significantly related to the propensity of the smallholder farmers to participate in the maize market. Even though the initiatives of communal farmers to develop their agricultural capacity have generally received support from the private sector and non-governmental organisations, the number of visits by extension workers has been observed to increase the likelihood of market participation by smallholder communal farmers in the Mazowe District. Those who have more interaction with the extension agents have a higher chance of intensifying their market participation. The improvement of human capital appeared to be crucial for smallholder market participation and the intensity of their participation in the market, while the distance to the market was also of paramount importance. Belonging to a farmers' association/group increased their access to information, which is critical for production and making marketing decisions, and it also contributed towards reducing their transaction costs and strengthening their bargaining power. Their educational level plays a major role in enhancing production and mitigating the transaction costs by increasing their ability to obtain market information. The educational level of the household heads was significantly and positively associated with their participation in the maize market. The key lessons drawn from the results is that market participation plays a crucial role in improving food security and poverty alleviation among smallholder maize farmers in the Mazowe District. The majority of the population relies on agriculture for their livelihood, and smallholder farmers can only turn their surpluses into an income if they have access to the markets. The increased income will, in turn, increase the food security and help to alleviate poverty in the district.

6.4 Policy Implications and Recommendations

The following recommendations are made, based on the findings of this study:

- The government and private sector companies should encourage more farmers to become affiliated to marketing associations, as this has proved to be a key strategy that can be used

to promote market information dissemination on maize marketing. It can also ultimately result in smallholder farmers going into commercial maize production, as they pool their resources and increase their maize production by gaining access to information and to the required production and marketing resources.

- Extension contacts provide the maize smallholder farmers with the necessary skills and knowledge. Farmers who have more interaction with the extension officers have a higher chance of participating and intensifying their market participation. There is need to re-orient the extension models and to gear them towards becoming effective information-disseminating pathways. This can be done by increasing the frequency of extension-farmer contacts by using informal networks. It is recommended that the communication between the farmers and extension officers must be improved, in order to increase information dissemination.
- Farmers should organise themselves into a body and engage in group marketing. As an organised body, they would acquire a better bargaining power for their products over the middlemen, who manipulate and control the price of maize in the marketing system. This will increase the farmers' profits considerably.
- A transportation and marketing information system should be developed, as it would contribute greatly towards reducing the transportation costs and increasing the overall efficiency of the maize marketing system. The efficiency of the less-efficient channels can also be improved by developing better transportation and communication systems.

6.5 Areas for Further Research

In this study, market participation, market choice selection and the structure-conduct-performance were analysed by using cross-sectional data from the Mazowe District. These data have many limitations with respect to giving a robust picture of the move towards market participation. In this regard, the impact of market participation and the conduct-performance can be analysed more efficiently by using panel data. Panel data can control the temporal persistent differences among individuals which, in many instances, may bias the estimates obtained from cross-sections, and they also treat individuals as homogenous. Using panel data in future research in the areas of market participation and conduct-performance, could provide further insights into the subject area.

APPENDIX 1

HOUSEHOLD LEVEL SURVEY QUESTIONNAIRE

Introduction

My name is **Vincent Munyati,** and I am from the University of KwaZulu-Natal. The university is conducting research in MASHONALAND CENTRAL that is looking at **maize markets and their effects on production decisions among smallholder farmers in Zimbabwe.** There are no wrong and right answers to these questions. I would like to assure you that all the information provided here will be treated as **STRICTLY CONFIDENTIAL**, and will be used for academic purposes only. Interview will take about 60 minutes.

Questionnaire No.: _____ **Date of Interview:** _____

District: _____ **Ward:** _____ **Village:** _____

Location: *1. Resettlement 2. Communal*

SECTION A: HOUSEHOLD HEAD CHARACTERISTICS

A. HOUSEHOLD DEMOGRAPHIC AND SOCIO ECONOMC INFORMATION					
1. Head of household					
a. Gender	Male			Female	
b. Age					
c. Marital status	Married	Single	Divorced	Widowed	
d. Highest level of education of household head					
No formal or informal education	Informal education	Primary	Secondary	Tertiary education	**Number of years at school**
e. Highest level of education of any household member					
	No formal or informal education	Informal education	Primary	Secondary	Tertiary education
2. What is your principal occupation?					
3. What is the size of your household?		Adults (≥18)	Children (<18)		
	Male				
	Female				
4. Household monthly income…….. **What are your sources of income?** (Rank 1 as the most important source of income)					
	Source	**Amount in the last 4 weeks**	**Rank**		

	Crops		
	Vegetables		
	Livestock		
	Poultry		
	Salary/wages		
	Pension/grants		
	Trade (transport, resale of goods)		
	Sale of wild foods		
	Craftwork (mats, baskets, pots)		
	Community projects		
	Other (specify)		

Section B: Livestock Information

B1		Number in 2020	Uses *(1-Sale, 2-Draught, 3-Meat, 4-Milk)*	Number sold in 2020	Price	Distance to the market *(km)*
Goats	Male goats					
	Female goats					
Cows	Trained oxen for ploughing					
	Bulls					
	Heifers					
	Calves					
Sheep	Male sheep					
	Female sheep					
Chickens	Indigenous chickens					
	Broilers					
	Layers					

B2: Where do your livestock graze

1-paddock, 2-communal grazing land, 3-field (not in use), 4-forest, 5-other (specify)

B3: Did you vaccinate your livestock?

1-yes, 2-no

SECTION C: SOCIAL CAPITAL, NETWORKING, ACCESS TO INSTITUTIONS AND SERVICES

C1	DISTRICT CHARACTERISTICS	
1	Year resettled at the farm/plot	
2	Experience in growing maize	……*years*
3	Distance to the main market from the residence	……*km*
4	Mode of transport used	*1.Walking; 2. Bicycle; 3. Tractor; 4. Minibus; 5. Other,specify*……

5	Quality of the road to the main market	*1= Very poor; 2= Poor; 3= Average; 4=Good; 5= Very good*
6	Distance to the nearest source of seed dealer from residence	*……..km*
7	Distance to the nearest source of fertilizer dealer from residence	*……..km*
8	Distance to the nearest source of herbicides dealer from residence	*……..km*
9	Distance to the nearest source of agric extension officer from residence	*……..km*
10	Distance to the nearest lead farmer from your homestead	*……..km*
11	Distance to the nearest farmer cooperative from your homestead	*……..km*
12	Main source of drinking water	*1= Tape Water; 2=Borehole; 3= River; 4=well; 5= spring*
13	Distance to main water source for drinking from residence	*……..km*
14	Distance to the nearest health center from residence	*……..km*
15	Number of grain traders that you know in this district who could buy your grain	
16	Number of grain traders that you know outside this district who could buy your grain	
17	I trust traders in the district	*1. Strongly disagree; 2. Disagree; 3. Slightly disagree; 4. Slightly agree; 5. Agree; 6. Strongly agree*
18	I am confident of the skills of government officials including extension workers to do their job in the district	*1. Strongly disagree; 2. Disagree; 3. Slightly disagree; 4. Slightly agree; 5. Agree; 6. Strongly agree*
19	Member of any association	*1-Yes, 2-No*

Agricultural extension services

		How many times do you interact/discuss with […] in the past 12 months	*How many field days/training organised by [.....] did you attend in the past 12months*	*How relevant was the information/training 1=very high; 2=high; 3=okay; 4=not relevant; 5=don't remember*
1	Government extension service providers			
2	Government research service provider			
3	Farmer cooperatives			
4	Lead farmers			
5	Agro-dealers			
6	Crop output traders			
7	NGO			
8	Private, national and international			

	research			
9	Financial service providers			

SECTION D: LAND OWNERSHIP AND MAJOR CROPS

D1: Are you satisfied with the current land tenure system

1-Yes, 2-No

D2: How do you feel about your land size

1-Too small, 2-Just right, 3-Too large

D3: How do you prepare the land

1-hoe, 2-own cattle/donkey, 3-higher draft power, 4- tractor

Total land owned (ha)	**Total arable land owned (ha)**	**Crops grown and hectarage**									
		Maize		**Sorghum**		**Millet**		**COWPEAS**		**GROUND-NUTS**	
		Yield (tons)	Area planted (ha)	Yield (tons)	Area planted (ha)	Yield (tons)	Area planted (ha)	Yield (tons)	Area planted (ha)	Yield (tons)	Area planted (ha)
2014/15 season											
2015/16 season											
2016/17 season											
2018/19 season											
2019/20 season											

D4: Cropping system during the previous season

1-monoculture, 2-intercropping

D5: Maize variety used……

D6: Source for the maize seed

1-previous harvest, 2-neighbour, 3-local agro dealer, 4-major cities, 5- other (specify)

D7: How do you control weeds in your maize field

1-Weeding, 2-Herbicides, 3-Weeding and Herbicides, 4-None

D8: Source for the fertilizer

1-neighbour, 2-local agro dealer, 3-major cities, 4- other (specify)

D9: Source for herbicides

1-neighbour, 2-local agro dealer, 3-major cities, 4- other (specify)

SECTION E: CROP PRODUCTION, UTILIZATION AND FOOD SECURITY

E1: What is the main purpose of maize production

1-main source of food, 2-extra source of food, 3-main source of income, 4-extra source of income, 5-leisure activity, 6-other (specify)

CROP	STOCKS BEFORE HARVEST	TOTAL HARVEST	TOTAL AVAILABLE STOCK AFTER HARVEST	QUANTITY SOLD	QUANTITY DONATED	QUANTITY CONSUMED
MAIZE						
SORGHUM						
MILLET						
COWPEAS						
GROUND NUTS						

E2: Did you receive any aid?
1-yes, 2-no

E3: If yes; what was the source of the aid……

SECTION F: POST-HARVEST HANDLING AND TRANSACTION COST

F1: Do you have storage facilities on the farm
1-yes, 2-no,

F2: If yes, which type do you use for storing maize
1-mud silo, 2-granary, 3-metallic silo, 4-crib, 5-ground pit, 6-galvanised bins, 7-hermetic bags 8-others (specify)……..

F3: What is the duration of grain storage in your selected storage structure

1. *0-3months, 2. 3-6months, 3. 6-9months, 4. 9-12months, 5. 12-24months*

F4: How many bags of maize can be stored in your storage structure

1. *1-10bags, 2. 11-20bags, 3. 21-30bags, 4. 31-40bags, 5. 40 or more bags*

F5: Reasons for using the current storage facilities for maize
1-ease of user 2-affordability, 3-maize storage duration, 4-durability of storage facility, 5-market price of maize 6-maize grain safety 7-cost of acquiring storage facility 8-cost of maintaining storage facility 9-others (specify)……..

F6: Type of storage bags used to store maize
1-natural fiber, -2polypropylene, 3-plastic bags, 4-jute bags, 5-others (specify)……..

F7: Which is the most common cause of maize grain loss during transportation from field to homestead

1-rain, 2-theft, 3-breakage, 4-packaging, 5-others (specify)……..

SECTIONG: MAIZE COST OF PRODUCTION

G1; Household main source of inputs for maize

1-purchase, 2-local agro dealer, 3-major cities, 4- government programmes, 5-other (specify)

TYPE OF OPERATIONAL COST	QUANTITY	COST/UNIT (US$)	TOTAL COST (US$)
SEEDS			
FERTILISER			
HERBICIDES			
LABOUR COST			
LAND PREPATION			
WEEDING			
FERTILISER APPLICATION			
HARVESTING			
ELECTRICITY			
OTHER (SPECIFY)			

SECTION H: MARKETING OF CROPS

H1: Do you search for information before marketing your maize?

1-yes, 2-no

H2: If YES how do you search for the information on maize marketing?

1-internet, 2-visit the market first, 3-other farmers, 4-newspapers/radio/TV, 5- extension officers, 6-other(specify)…….

H3: Have you ever received information on maize marketing?

1-yes, 2-no

H4: If YES who provided the information on maize marketing

1- Government 2-farmer groups 3-neighbour farmers 4-seed traders 5-NGO's 6-other private traders 7-research institutions 8-Radio/TV 9-Newspaper 10-mobile phones 11-other, specify

H5: I trust the information on maize marketing

1. Strongly disagree; 2. Disagree; 3. Slightly disagree; 4. Slightly agree; 5. Agree; 6. Strongly agree

H6: Is the information relevant?

1-yes, 2-no

H7: How do you sell your maize

1-individual, 2-collectively, 3- other (specify)

H8: Have you ever failed to sell your produce due to lack of market

1-Yes, 2-No

H9: If YES, how often do you fail to sell your farm produce due to lack of market

1-Sometimes, 2-Always

H10 CROP	**PREFERRED MARKET** *Code A*	**QUANTITY SOLD**	**PRICE @ PREFERRED MARKET**	**PERIOD TO PAYMENT AFTER SELLING (speed of payment)**	**MODE OF PAYMENT** *Code B*	**Who sets the price** *Code C*	**ACTUAL TRANSPORT COST**	**Major buyer of your produce** *Code D*
MAIZE								
SORGHUM								
MILLET								
COWPEAS								
GROUND NUTS								

Code A*:* 1.Farmgate, 2.local market, 3.GMB
Code B*:* 1.Cash, 2.Mobile money, 3.Bank transfer, 4.barter
Code C: 1.government, 2 farmer, 3.buyer
Code D*: 1-Farmer group, 2-consumer/other farmer, 3- rural assembler, 4-middleen, 5-rural grain trader, 6-rural wholesaler, 7-urban wholesaler, 8-urban grain trader, 9-exporter, 10-other (specify)……..*

H11 Market and price risk for maize		
		Response
1	Has the price of maize fluctuated significantly over the past 5 years? **(Code B)**	
2	Is the price of maize expected to fluctuate significantly over the next 5 years? **(Code B)**	
3	Who negotiates for prices of maize for your household in the main market? **(Code B)**	
4	Are you aware of alternative maize markets? **(Code B)**	
5	State major constraints in penetrating these markets. **(Code E) (Rank Main 3)**	
6	How many local traders do you have binding relationships with for maize	
7	Please state the nature of relationships. **(Code F) (Rank Main 3)**	
8	How many urban traders do you have binding relationships with for maize	
9	Please state the nature of relationships**. (Code F)**	

	(Rank Main 3)										
10	Do you think the relationships are and fair **Code G**										

Code B 1=yes; 2=no	**Code C** 1=buyer; 2=seller; 3=farmer cooperative/union; 4=buyer union; 5=government; 6=negotiation between buyer and seller	**Code D** 1=Male; 2=Female; 3=Both	**Code E** 1=High transport cost; 2=dominated by large corporate companies; 3=low prices; 4=unreliable/untrustworthy buyers; 5=no information on prices and time to sell; 6=content with current	**Code F** 1=full package contracts; 2=production credit only; 3=marketing of produce;4=market information; 5=credit buying/selling	**Code G** 1=strongly agree; 2=agree; 3=neutral;4=disagree; 5=strongly disagree

H12: Rate the level of market access

1-Poor, 2-Average, 3-Good

H13: Transport arrangement for maize marketing

1-own transport, 2-private transport, 3-public transport, 4-buyers pick it up

H14: Please indicate the level to which the following reasons influence your market outlet preference for maize

Codes: 1-strongly disagree, 2-disagree, 3-neutral, 4-agree, 5-strongly agree

REASON	**LEVEL**
Higher Prices	
Lower Market Costs	
More market information	
Networking	
Near	
Less Risky	
Only Channel available	
Convenient	

H15: What major factors do you consider when searching for a buyer for maize (rank)?

1-price, 2-mode of payment, 3-distance, 4-duration of payment, 5-previous transactions, 6-transport, 7-other (specify)

H16: Do you grade the maize before marketing?

1-yes, 2-no

H17: If YES who determines the grades for maize

1- Government 2-farmer 3-buyer4- other, specify……..

H18: Who is your most preferred buyer of maize……..

1-Farmer group, 2-consumer/other farmer, 3- rural assembler, 4-middleen, 5-rural grain trader, 6-rural wholesaler, 7-urban wholesaler, 8-urban grain trader, 9-GMB, 10-other (specify)……..

H19: Which major challenge do you face when marketing your maize ?

1- *Low prices, 2- Cheating, 3- Late payment, 4- poor roads, 5-long distance to markets, 6-bureocracy, 7-unfair grading 8- higher transport cost*

H20: Are you a member of any marketing association

1-yes, 2-no

H21: Maize Marketing Cost

TYPE OF OPERATIONAL COST	**COST/UNIT (US$)**	**TOTAL COST (US$)**
Transportation		
Handling		
Storage		
Packaging		
Labour		
Marketing Charges		
Other Cost(specify)		

SECTION I: GENERAL CONSTRAINTS

Constraints to production and marketing of maize			
Constraint		How severe is the constraint in maize production and marketing **(Code A)**	
		Production	Marketing
1	Late delivery of inputs		
2	Unavailability of inputs in local agro dealership		
3	Insufficient government extension services		
4	Higher Input prices		
5	Labour shortage during critical of the season		
6	Pests and diseases		
7	Market unreliability (intermittent buyers)		
8	High transport cost		
9	Low market prices		
10	Weak credit networks		

11	Government policy bias		
12	Consumer taste and preference		
13	Other (specify)		
Code A 1=extreme severe; 2=very severe; 3=moderately severe; 4=slightly severe; 5=not severe			

Thank you for your time and thoughtful insights!

APPENDIX 2

CHECKLIST FOR DISCUSSIONS WITH AGRO-TRADERS

1	**Name of Agro-Trader _____** **Location of trading post:** **Ward_____ Township_____** **Years of Trading_____ Year of Birth_____** **Gender_____**	
2	**List of and volumes of agricultural commodities purchased annually (and current purchase price** **(a) Maize _____ (Buying price $_____ Selling Price $_____)** **(b) Sorghum _____ (BP_____SP_____)** **(c) Soybeans _____ (BP_____SP_____)** **(d) Groundnuts _____ (BP_____SP_____)** **(e) Sesame _____ (BP_____SP_____)** **(f) Livestock: cattle _____ (BP_____SP_____)** **(g) Livestock: goats_____ (BP_____SP_____)** **(h) Others :**	
3	**Maize Buying Strategy** **(a) Do you roam villages buying from farmers' homesteads? _____** **(b) Do you buy from temporary rotational trading post in different t/s? _____** **(c) Do you buy from a fixed shop or buying point in the ward? _____** **(d) Do you offer transport service when buying from distant farmers? _____** **(e) How far do you (or farmers) travel to buy produce? _____km**	
4	**Use of mobile phone** **(a) Do you use mobile phone for making purchasing arrangements with farmers? ___** **(b) What proportion of farmers selling produce to you get paid by using** **(c) Do you use your phone to advertise agricultural buying prices to farmer leaders/extension workers?** **(d) Have you used your cell phone to access agric information?**	**1=Yes** **2=No** **Bank Transfer……..** **Mobile Money……..** **CASH ……** **Barter…….** **1=Yes** **2=No** **1=Yes** **2=No**

	(e) Have you used your mobile phone to search for potential buyers for your purchases? **(f) Do you sometimes travel to Harare or Bindura primarily to search for best buyers for your purchased maize produce?** **_____**	**1=Yes** **2=No** **1=Yes** **2=No**
5	**Marketing Challenges and Strategies** **(a) Lack of information about farmers selling produce** **(b) Price Challenge & Strategy used** **(c) High searching and transport cost to achieve target tonnage** **(d) Low volumes problem & strategy** **(e) Grades and standard -**	
6	**Do you carry out any physical treatment to maintain product quality?** **If yes, please specify**	**1=Yes 2=No** **1. Sorting** **2. Packaging 3. Grading** **4. Other (specify)**
7	**How long does it take for you to re-sell the acquired maize**	**1.Immediately** **2.Day** **3.Week** **4.Other (specify**
8	**Who sets the selling price**	**1.Myself** **2.Negotiations** **3.The buyer** **4.The market** **5.Other (specify)**
9	**What are the marketing costs incurred** **Transport** **Packaging** **Loading/off-loading produce** **Market charges** **Produce loss**	
10	**Are there any restrictions for entry and exit of the market**	**1=Yes 2=No**
11	**Constraints faced when sourcing for local produce**	**1-low quality** **2-inconsistent supply** **3-low supply** **4-poor road infrastructure** **5-poor post-harvest technology** **6-poor variety**

APPENDIX 3

INFORMED CONSENT FORM

UKZN HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE (HSSREC)

APPLICATION FOR ETHICS APPROVAL

For research with human participants

INFORMED CONSENT FORM

Information Sheet and Consent to Participate in Research

Date:

Greeting:

Good day

My name is **Vincent Munyati,** I am from the University of KwaZulu-Natal. I am conducting a research in MASHONALAND CENTRAL that is looking at **maize markets and their effects on production decisions among smallholder farmers in Zimbabwe.** I would like to assure you that all the information provided here will be treated as **STRICTLY CONFIDENTIAL**, and will be used for academic purposes only. Your name will not be mentioned anywhere in the research work. Therefore, try as much as possible to be accurate and objective in your responses. In the process of interview, you are free to interrupt me and ask for any clarification. The study will provide no direct benefits to the participants. I respect all the responses you give and appreciate your cooperation. Interview will take about 60 minutes

This study has been ethically reviewed and approved by the UKZN Humanities and Social Sciences Research Ethics Committee (approval number_____).

You have the liberty or legal right to call the principal researcher (Vincent Munyati) on the mobile number 0772318757 and ask for any clarification at any point in time or the UKZN Humanities & Social Sciences Research Ethics Committee, contact details as follows:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION

Research Office, Westville Campus

Govan Mbeki Building

Private Bag X 54001
Durban
4000

KwaZulu-Natal, SOUTH AFRICA

Tel: 27 31 2604557- Fax: 27 31 2604609

Email: HSSREC@ukzn.ac.za

CONSENT

I ..... have been informed about the study entitled **maize markets and their effects on production decisions among smallholder farmers in Zimbabwe** by Vincent Munyati.

I understand the purpose and procedures of the study.

I have been given an opportunity to answer questions about the study and have had answers to my satisfaction.

I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting any of the benefits that I usually am entitled to.

I have been informed that there is no available compensation or medical treatment if injury occurs to me as a result of study-related procedures.

If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher at 0772318757.

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION

Research Office, Westville Campus

Govan Mbeki Building

Private Bag X 54001
Durban
4000

KwaZulu-Natal, SOUTH AFRICA

Tel: 27 31 2604557 - Fax: 27 31 2604609

Email: HSSREC@ukzn.ac.za

_____ _____

Signature of Participant **Date**

_____ _____

Signature of Witness **Date**

(Where applicable)

_____ _____

Signature of Translator **Date**

(Where applicable)