Credit access and willingness to pay for insurance among smallholder maize farmers in Bushbuckridge Local Municipality, South Africa

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ABSTRACT

Smallholder maize farmers in developing countries face significant threats to their livelihoods and food security due to unpredictable weather, pest outbreaks, and unstable market prices. Although agricultural insurance and credit services may mitigate these risks and boost productivity, adoption remains low. This low uptake leaves farmers without the means to invest in quality inputs, modern technologies, or risk management tools, making them more vulnerable to these challenges.

In light of the above, the aim of the study was to analyse credit access and willingness to pay for insurance and ascertain if there is any relationship between these two important aspects. The specific objectives of the study were: (i) to determine the socio-economic characteristics of smallholder maize farmers in Bushbuckridge Local Municipality, Mpumalanga Province, South Africa; (ii) to examine factors affecting credit access among smallholder maize farmers; (iii) to investigate smallholder maize farmers willingness to pay for insurance; (iv) to identify factors influencing smallholder maize farmers' willingness to pay for insurance; and (v) to test if there is association between credit access and willingness to pay for insurance in the study area.

Descriptive statistics was used to determine the socioeconomic characteristics of smallholder maize farmers. Multinomial Logistic Regression (MLR) was used to examine factors affecting credit access among smallholder maize farmers, while Contingent Valuation Method (CVM) investigated smallholder maize farmers' willingness to pay for insurance. Ordered Logistic Regression (OLR) model examined factors influencing insurance payment by smallholder maize farmers, and a chi-square test evaluated the association between credit access and willingness to pay for insurance in the study area.

Primary data was collected from 213 smallholder maize farmers through a structured questionnaire via face-to-face interviews. The mixed method approach was employed. Purposive sampling was used to identify the targeted group, which was smallholder maize farmers, and simple random sampling ensured that every maize farmer had an equal chance to be selected and participate in the study. Data analysis was conducted using the Statistical Package for Social Sciences (SPSS) Version 27 and Stata version 14.5.

Most respondents (28.6%) were aged 40 to 49 years, followed by those aged 30 to 39 years (22.5%) and 50 to 59 years (22.1%). This shows that maize production in the study area is dominated by individuals in their economically active years. Among the respondents, 51.2% were female and 48.8% were male, suggesting increased female participation in smallholder maize farming. The results show that 62.9% of respondents had access to informal credit, 20.7% obtained credit from formal sources, and 16.4% reported no access. The results indicate that access to formal credit is still limited. Most farmers faced limitations such as collateral requirements (22.5%), lack of information (31.5%), high interest rates (14.1%), fear of debt (13.1%), and complex applications. Collateral ownership is limited, with only 8.9% of farmers using land and 12.7% using farm equipment as security. Many farmers report that low income from produce restricts both their access to credit and their ability to pay for agricultural insurance. Insurance uptake remains low, with main barriers including low income (25%), self-insurance (10.4%), dependence on personal capital (8.3%), dissatisfaction with coverage (6.3%), lack of trust in providers (6.3%), and complex application processes (10.4%).

The findings from the Multinomial Logistic Regression (MLR) showed that farm size, age of the farmer, access to extension services, gender, and access to credit information are directly associated with formal credit access compared to no credit access. Informal credit access is associated with farm size, main source of income and gender compared with no access. Results from the Contingent Valuation Method (CVM) showed that most smallholder farmers were willing to pay for insurance if it were introduced. Specifically, 43.2% of farmers were more than willing to pay for insurance, 21.1% were moderately willing, 13.1% were less willing, and 22.5% were not willing to pay. Ordered Logistic Regression (OLR) results revealed that gender, age, main source of income, access to land, farm size, access to extension services, and agricultural insurance awareness were the most influential factors affecting smallholder maize farmers' willingness to pay for insurance. Lastly, the chi-square test confirmed a statistically relationship between credit access and willingness to pay for insurance significant (Pearson chi-square = 29.843, df = 6, p <0.001).

In conclusion, the first null hypothesis of this study, stating that there is no statistically significant relationship between socio-economic characteristics and credit access among smallholder maize farmers in Bushbuckridge Local Municipality, Mpumalanga Province,

South Africa, was rejected. The findings indicate that selected socio-economic characteristics significantly influence farmers' access to credit. Theoretically, this aligns with credit rationing theory, and reinforces the importance of these factors in credit access decisions among smallholder farmers.

The second null hypothesis which stated that socio-economic characteristics and other factors do not significantly influence smallholder maize farmers' willingness to pay for insurance in Bushbuckridge Local Municipality, Mpumalanga Province, South Africa, was rejected. The results indicated that socioeconomic characteristics, such as gender and age, can help explain farmers' willingness to pay for insurance. Since socio-economic characteristics affect how farmers adapt, these results highlight the need to incorporate them into strategies to build resilience for smallholder farmers.

Finally, the third null hypothesis, stating that there is no statistically significant association between credit access and willingness to pay for insurance among smallholder maize farmers in Bushbuckridge Local Municipality, Mpumalanga Province, South Africa, was rejected. The findings indicate a statistically significant association between credit access and willingness to pay for agricultural insurance. The results suggest that improving credit access for smallholder farmers may be a key policy area to enhance willingness to pay for insurance. Providing better credit options could increase the likelihood that farmers participate in insurance, thereby aiding them protect their livelihoods against uncertainty.
Keywords: Credit, credit access, insurance, smallholder farmers, Willingness to Pay (WTP)

DECLARATION I

I, the undersigned, Ndzalama Comfort Dhlamini, hereby declare that:

i. The research presented in this dissertation, except where otherwise stated, is my own original work.
ii. This dissertation has not been submitted, either in whole or in part, for the fulfilment of any degree requirements at any other university.
iii. This dissertation does not include data, figures, tables, or any other material from other individuals unless such sources are clearly acknowledged.
iv. All written material or ideas borrowed from other authors have been properly acknowledged. Where such sources have been paraphrased, appropriate referencing has been provided; and where direct quotations have been used, these are enclosed in quotation marks and fully referenced.
v. This dissertation does not contain any text, images, or tables copied from online or printed sources without due acknowledgment, and all external materials used are cited both in the text and in the reference list.

Signature:  Date: 27 November 2025

DECLARATION II

The following publications will form part of the research presented in this dissertation.

Possible publication 1 – Objective 1

Ndzalama C Dhlamini and Nkele D Kgasago. Socioeconomic characteristics influencing financial inclusion among smallholder maize farmers in South Africa**.**

Possible publication 2 – Objective 2

Ndzalama C Dhlamini and Nkele D Kgasago. Determinants of formal and informal credit access among smallholder maize farmers in Bushbuckridge Local Municipality, South Africa.

Possible publication 3 – Objective 3 & 4

Ndzalama C Dhlamini and Nkele D Kgasago. Determinants of willingness to pay for agricultural insurance among smallholder maize farmers in South Africa.

Possible publication 4 – Objective 5

Ndzalama C Dhlamini and Nkele D Kgasago. The relationship between credit access and willingness to pay for agricultural insurance among smallholder maize farmers**.**

DEDICATION

This dissertation is dedicated to my mother, Tshamy Shirly Sithole, and my grandmother, Idah Zondiwe Khoza, whose love, strength, sacrifices and prayers have been my guiding light. To my wonderful, loving and supportive siblings, Vuyani Nhletelo Ngobeni, Vutshila Nhlekelo Ngobeni and Mukutsuri Nhelo Ngobeni, your love and encouragement have carried me through this journey. Lastly, I dedicate this work to Munty Shallotte Sithole, my second mother and my mother's twin sister. Your memory lives within me. Your baby girl is a step closer to becoming a doctor, and I know you are cheering me on from above. I will always love you, Mama.

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"The Lord is my strength and my shield; in him my heart trusts, and I am helped; my heart exults, and with my song I give thanks to him."- Psalms 28:7 . **First and foremost, to God be the glory, now and forevermore**. I give thanks and honour to the LORD, my light and ever-present Father, for guiding me through this journey. Thank you for the strength and peace that sustained my heart each day, even when doing it seemed daunting.

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LIST OF ACRONYMS

ACRE	Agriculture and Climate Risk Enterprise Ltd
AI	Agricultural Insurance
AII	Agricultural Index Insurance
BLM	Bushbuckridge Local Municipality
CVM:	Contingent Valuation Method
DAFF:	Department of Agriculture, Food and Fisheries
EC	Eastern Cape
FAO:	Food and Agriculture Organisation
FS:	Free State
GDP:	Gross Domestic Product (GDP)
GIIF:	Global Index Insurance Facility
IDP:	Integrated Development Plan
IFB:	Insurance Fact Book
LB:	Land Bank
MLR:	Multinomial Logistic Regression
MP:	Mpumalanga Province
NCA:	National Credit Act
NGO:	Non-Government Organisation
NW:	North West
OLR:	Ordered Logistic Regression
PTO:	Permission to Occupy
ROSCAs:	Rotating Savings and Credit Associations
SA:	South Africa
SPSS:	Statistical Package for Social Science
SSA:	Sub-Saharan Africa
StatsSA:	Statistics South Africa
WB:	World Bank
WTA	Willingness to Accept
WTP:	Willingness to Pay

CHAPTER 1: INTRODUCTION

1.1. Background of the study

Maize is the most widely cultivated grain crop in South Africa. It is grown in a variety of conditions across the country (Benimana et al., 2021). It serves as a primary field crop and staple food for most of the population, especially for those facing economic hardship (Obi & Ayodeji, 2020). This critical role makes maize an essential crop for food security and reduction of malnutrition (Obi & Ayodeji, 2020). The main maize-producing regions in South Africa are North West (NW), Free State (FS), and Mpumalanga Province (MP) (Diko & Jun, 2020). Mpumalanga alone contributes 25% of annual maize output, using just 24.74% of the country's production land area (Sechube et al., 2020).

While maize remains a vital crop in South African food systems, broader agricultural challenges threaten long-term productivity across Sub-Saharan Africa (SSA). Agriculture is important for economic growth, providing industrial raw materials, creating jobs and expanding local markets (Idris, 2020). However, the sector faces many challenges, such as persistent food insecurity, rapid population growth, and the impact of climate change (Sakho-Jimbira & Hathie, 2020). These issues severely affect smallholder farmers, who are the cornerstone of rural livelihoods in Sub-Saharan Africa (SSA) (Modi, 2019).

Research highlights several factors contributing to poor agricultural production in Sub-Saharan Africa (SSA). These include limited credit access, climate change, insufficient market access, insecure land ownership, and poor infrastructure (Food and Agriculture Organisation, 2017). Banks are also reluctant to lend to farmers in areas prone to disasters due to the risk of credit defaults (Ramm & Steinmann, 2014). Addressing these challenges is critical for improving agricultural productivity and ensuring the livelihood of smallholder maize farmers. Solving these issues will impact food insecurity and poverty among smallholder maize farmers in South Africa.

Credit access is important for agricultural transformation. It enables investment in high-quality seeds, fertilisers and equipment, ultimately increasing productivity and income. This is especially true for smallholder farmers, who face major challenges due to inadequate funding (Nema, 2024; Sakho-Jimbira & Hathie, 2020). Although efforts are underway to address this gap, many farmers remain excluded from formal credit systems due to high interest rates, risk aversion, and a lack of collateral (Fadeyi, 2018).

In response, governments and stakeholders launched initiatives to promote financial inclusion. They implemented programmes such as those by the Land Bank and World Bank, aimed at improving access to credit by offering financial products, subsidies and training for smallholder farmers (World Bank, 2019). Despite these interventions, the gap has not yet been fully bridged. Smallholder farmers continue to face challenges in obtaining adequate credit (Zakaria et al., 2019). These constraints hinder investment in projects that can enhance productivity, such as adopting irrigation systems, climate-smart technologies and modern farming equipments, which could drastically increase yields and incomes (Assouto & Houngbeme, 2023).

In addition to credit access, innovative financial tools such as insurance and risk management tools have demonstrated potential in mitigating agricultural vulnerabilities. Agricultural insurance can mitigate risks caused by climate change, market fluctuations while improving credit access (Njue et al., 2018). By providing a safety net against unforeseen losses, insurance reduces lenders' perceived risk, thereby unlocking credit for farmers who might otherwise be considered high-risk borrowers (Jensen & Barrett, 2017). However, the adoption of insurance in SSA remains limited, partly due to a lack of data and overreliance on theoretical feasibility rather than practical application (Jensen et al., 2016). Hence, understanding farmers' willingness to pay for insurance and its potential to improve productivity is critical.

In order to develop agriculture, funding and investment are both essential components. Numerous small-scale studies have shown potential for significant advancements in innovative credit and risk management tools, such as insurance (Sakho-Jimbira & Hathie, 2020). Studies indicate that insurance plays a vital role in improving access to credit, thereby enhancing farm productivity through providing essential services and risk mitigation strategies (Njue et al., 2018). The factors that influence the uptake of crop insurance are yet to be completely understood due to a lack of sufficient data and an excessive dependence on hypothetical evidence that appears to support the theoretical feasibility of insurance (Ghosh et al., 2020)

Despite recent improvements, agricultural insurance remains unaccustomed to many in Africa, yet it serves as a key policy tool for boosting farmers' resilience to climate risks, as highlighted by Jensen et al. (2016). Zhichkina et al. (2023) defined crop insurance as a crucial financial tool that enhances the stability and success of crop production by mitigating

agricultural risks. By redistributing risk over time, insurance tools help agricultural enterprises maintain financial stability, even during unfavourable periods. In turn, this fosters favourable conditions for the technological advancements of agro-industrial production (Ahmed et al., 2022).

Despite its benefits, agricultural insurance, especially index-based insurance, is still not well known and or accessible for sale in South Africa (Mathithibane & Chummun, 2022). Yet, the risks associated with climate change, such as more frequent and severe droughts, are getting worse, which makes the need for a good risk transfer system even greater. In many regions around the world, insurance has become a useful tool for farmers to manage agricultural risks (Mathithibane & Chummun, 2022).

Nonetheless, the overall demand for agricultural insurance globally remains very low, mostly because of basis risks, product design, and limited understanding among farmers (Jensen & Barrett, 2017). Regardless of these challenges, agricultural insurance has reached tens of millions of farmers worldwide, demonstrating its growth and potential (Greatrex et al., 2015). According to Cai et al. (2015), farmers with access to insurance are less likely to depend on detrimental coping strategies during climatic shocks and are more likely to invest in agricultural inputs and to engage in riskier but potentially more profitable production decisions.

Marr et al. (2016) highlighted that bundling insurance with credit may increase credit access and approvals; this is due to lenders viewing farmers who are insured to be less risky when obtaining credit. Conversely, Shee et al. (2019) highlighted that when such products are being designed, there is a dire need for both farmers' and lenders' preferences to be considered in order to ensure adoption. Farmers who are constrained from obtaining credit tend to focus more on the premium cost and terms of payment for insurance and display lower willingness to pay for insurance products (Owusu et al., 2021). This is because farmers with limited funds often lack the means to purchase insurance, even though they understand its advantages.

For researchers and policymakers, agricultural insurance remains a popular and promising strategy to improve resilience and promote productivity, especially in rural areas where production depends mainly on rain and is disadvantaged by poorly functioning financial markets (Hazell & Hess, 2010) as cited by (Jensen & Barrett, 2017). Therefore, the aim of the

study was to analyse credit access and willingness to pay for insurance and ascertain if there is any relationship between these two important aspects.

1.2. Problem Statement

Smallholder maize farmers in developing countries are highly vulnerable to unpredictable weather patterns, pest outbreaks, and fluctuating market prices, which pose significant threats to their livelihoods and food security (Sibiko et al., 2018). Although agricultural insurance and credit services have the potential to mitigate these risks and enhance productivity, their adoption among smallholder maize farmers remains notably low (Ngango et al., 2022). Limited access to credit hinders farmers' capacity to invest in production inputs such as high-quality seeds and fertilisers, adopt modern technologies, and use risk management tools like agricultural insurance (Onyekuru et al., 2020).

Despite government intervention, many smallholder farmers still struggle to access credit due to high interest rates, a lack of collateral, and limited knowledge of credit application processes (Abunyuwah et al., 2013). As a result, they are often forced to incur both formal and informal fees or rely on unregulated lenders who charge significantly higher interest rates, further increasing their cost of production (Balogun et al., 2018). These financial limitations can influence farmers' decisions to participate in agricultural insurance (Duchoslav & Van Asseldonk, 2018).

While insurance is used to mitigate risks in sectors such as property and life, its uptake in the agricultural sector remains low (Jepchumba, 2015). The demand for crop insurance among smallholder farmers in South Africa remains relatively low, with a minority of the farmers signing up for agricultural insurance, especially in rural areas (Partridge & Wagner, 2016). Ankrah et al. (2021) emphasise that insurance is a critical component for farmers seeking finance. In response to risk, farmers adopt various strategies.

According to Ali et al. (2020a), limited access to financial resources and information often forces farmers to depend on traditional practices such as mulching, crop diversification, adjusting planting date, borrowing and selling assets. Some farmers also use modern practices such as crop insurance and climate-smart agriculture to transfer some of their risk to third parties. Since farmers often face multiple climate risks, no single strategy is sufficient (Ali et al., 2020b).

This situation is particularly evident in Bushbuckridge Local Municipality, where smallholder maize farmers seem to have difficulties accessing credit services necessary for productive farming. As a result of these financial constraints, their participation in a formal insurance scheme is still questionable. Therefore, the aim of this study was to explore the factors influencing credit access and their willingness to pay for insurance of smallholder maize farmers.

1.3. Motivation of the study

Agriculture plays a vital role in the economies of many countries, especially in developing countries, where the majority of people depend mainly on agriculture for their livelihoods (Assogba et al., 2017). One of the most significant barriers to the growth of smallholder farmers is the inability to obtain credit (Balogun et al., 2018). Regardless of the proven significant role of agricultural credit in increasing farm productivity and overall farmers' welfare, access to credit remains low (Assogba et al., 2017). To ensure resilient and sustainable food systems in the face of climate change requires farmers to adopt climate-smart technologies. However, the majority of these technologies require financial investments, enabling smallholder maize farmers to shift to improved production practices such as buying agricultural insurance (Daemane & Muroyiwa, 2022).

Financial institutions usually perceive smallholder farmers as high-risk clients due to a lack of collateral, and high interest rates further discourage them from borrowing (Daemane & Muroyiwa, 2022). Credit helps farmers to cover their off-farm expenses between planting and harvesting seasons. As a result, limited access to credit not only hinders production but also threatens household stability (Chisasa, 2019). Credit has been recognised as a key tool for improving the livelihoods of smallholder farmers and strengthening their capacity to invest in both human and physical capital (Baiyegunhi & Fraser, 2014).

In addition to credit, agricultural insurance has emerged as a critical risk management tool. Insurance schemes are widely acknowledged for their role in helping farmers cope with unforeseen climatic and environmental shocks (Ngango et al., 2022). The majority of countries have implemented agricultural insurance programmes to help farmers protect themselves from risks beyond their control and support their rural livelihoods (Abebe & Bogale, 2014). Crop insurance is recognised for its ability to reduce risk associated with poor weather and natural disasters in both developed and developing countries (Ellis, 2016).

Nevertheless, regardless of these benefits, crop insurance awareness and uptake in Sub-Saharan Africa remain very low (Fonta et al., 2018).

Abebe and Bogale (2014) emphasised that although agriculture is prone to a variety of risks worldwide, these risks are more severe in low-income countries, underscoring the need for more effective and accessible risk management solutions. Despite these challenges, policymakers and financial institutions lack local empirical information to propose local solutions to inform the development of practical interventions. This study seeks to address the gap that exists by examining credit access and willingness to pay for insurance by smallholder maize farmers in Bushbuckridge Local Municipality. The findings of the study will help design tailored, affordable products and contribute to a broader understanding of agricultural finance and insurance in South Africa, focusing on an understudied region. Moreover, the study underscores the importance of improving credit access as a pathway to improve resilience, productivity and inclusion among smallholder farmers.

1.4. Aim of the study

The aim of the study was to analyse credit access and willingness to pay for insurance and ascertain if there is any relationship between these two important aspects.

1.5. Objectives of the study

The specific objectives of the study were:

i. To determine the socio-economic characteristics of smallholder maize farmers in Bushbuckridge Local Municipality, Mpumalanga Province, South Africa;

ii. To examine factors affecting credit access among smallholder maize farmers in Bushbuckridge Local Municipality, Mpumalanga Province, South Africa;

iii. To investigate smallholder maize farmers' willingness to pay for insurance in Bushbuckridge Local Municipality, Mpumalanga Province, South Africa;

iv. To identify factors influencing smallholder maize farmers' willingness to pay for insurance in Bushbuckridge Local Municipality, Mpumalanga Province, South Africa;

v. To test if there is an association between credit access and willingness to pay for insurance in Bushbuckridge Local Municipality, Mpumalanga Province, South Africa.

1.6. Hypotheses of the study

i. There is no statistically significant relationship between socio-economic characteristics and credit access among smallholder maize farmers in Bushbuckridge Local Municipality, Mpumalanga Province, South Africa.

ii. Socio-economic characteristics and other factors do not significantly influence smallholder maize farmers' willingness to pay for insurance in Bushbuckridge Local Municipality, Mpumalanga Province, South Africa.

iii. There is no statistically significant association between credit access and willingness to pay for insurance among smallholder maize farmers in Bushbuckridge Local Municipality, Mpumalanga Province, South Africa.

1.7. Organisational structure

The first chapter provides background on the study of credit access and willingness to pay for insurance. It highlights the problem statement, motivation, aims and objectives, and hypotheses of the study. Building on this, the second chapter includes the overview of the study, frameworks adopted in the study, defines key concepts such as credit access, agricultural insurance, and willingness to pay, and provides a literature review on credit access and willingness to pay for insurance. The third chapter discusses the study area and outlines the research methodology, including the use of surveys for data collection and statistical analysis techniques for data interpretation. The fourth chapter presents the findings for descriptive statistics while the fifth chapter includes the empirical results from Contingent Valuation Method, Multinomial Logistic Regression, the Ordered Logistic Model and chi-square test. Finally, the sixth chapter ties together the cumulative insights gained from previous chapters by presenting the summary, conclusion, and recommendations drawn from the study, as well as future research areas that need to be tackled in the field of credit and insurance.

1.8. Summary of the chapter

This chapter introduced the study by presenting the background on credit access and willingness to pay for agricultural insurance among smallholder maize farmers in Bushbuckridge Local Municipality, Mpumalanga Province, South Africa. It underscored the significance of maize production for food security and rural livelihoods, and outlined the challenges associated with limited credit access, climate change, and the low uptake of agricultural insurance.

The chapter further presented the problem statement, demonstrating the need to investigate the factors influencing smallholder maize farmers' access to credit and willingness to pay for agricultural insurance. The motivation for the study was discussed, emphasising the contribution of the research to agricultural finance, risk management, and policy formulation. The aim, specific objectives, and hypotheses of the study were also presented to guide the empirical investigation. Finally, the chapter outlined the organisation of the dissertation by providing an overview of the contents of each chapter.

CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

This chapter reviews existing literature on credit access and willingness to pay for insurance, particularly focusing on smallholder maize farmers. It starts with definitions of key concepts related to credit and insurance, followed by an explanation of the theoretical and conceptual framework that the study is based. The chapter reviews previous studies on credit access and willingness to pay for insurance undertaken both locally and internationally. Furthermore, it examines factors influencing credit access and willingness to pay for insurance and the relationship that exists between both aspects. The policy and institutional framework in South Africa is also examined to offer a local perspective. Finally, the chapter identifies knowledge gaps in the literature that the study seeks to address.

2.2. Overview of the study: credit access and willingness to pay for insurance

Credit can be characterised as a mechanism that enables the transitory transmission of purchasing power from those who have excesses to those who require it. As a result, credit entails both short- and long-term transfers of wealth (Meena et al., 2021). According to Boufous et al. (2024), in agriculture, credit can be defined as financial resources made available to farmers and agribusinesses to support various activities, such as crop and livestock production, purchasing or refinancing capital assets, for example, land, machinery and equipment, and making improvements to farm infrastructure.

Agricultural credit plays a vital role in enabling farmers to invest in essential inputs, adopt innovative technologies and improve their overall productivity. It offers a range of financial services specifically designed for the agricultural sector, including credit, savings, payment systems, money transfer services and risk management tools such as crop and livestock insurance (DaşdemİR & Turan, 2023). Credit for agriculture can come from various sources, such as government, private banks, cooperatives, non-bank financial institutions and other entities involved in the agricultural value chain, including input suppliers and processors (DaşdemİR & Turan, 2023).

Chisasa (2019) reported that in South Africa, commercial banks lend to smallholder farmers less frequently than informal credit institutions. Lending institutions have reduced agricultural funding due to its inherently risky nature (Trivelli, 2004). This reduction underscores the importance of risk transfer mechanisms such as insurance, particularly for

smallholder farmers. Limited credit access increases farmers' financial vulnerability. Research conducted by Carriquiry and Osgood (2012) revealed that an effective insurance plan can transfer risk to broader financial markets. However, Ivanovna et al. (2018) identified challenges in structuring management accounting within insurance companies from the perspective of categorising insurance risks, especially in countries with low purchasing power.

Mahul and Stutley (2010) argue that insurance can encourage farmers to focus on high-productivity farming practices by reducing their production risk. A well-structured insurance programme could encourage farmers to adopt effective risk mitigation strategies. The promotion and subsidisation of agricultural insurance as the standard practice for the best risk management is the current global trend. The state should theoretically calculate and fund the difference between farmers' willingness to pay for insurance (WTP) and their fair premiums (Yuanchang & Jiyu, 2010). Empirical evidence indicates that targeted state subsidies for insurance can bridge the affordability-premium gap, thereby facilitating adoption among smallholder farmers.

2.3. Definition of key concepts

2.3.1. Agricultural credit

Agricultural credit is a mechanism for providing farmers with immediate and long-term financial help from a variety of sources. The transmission of credit to farmers is handled by a variety of entities. Credit can be regarded as a mechanism that enables the temporary transmission of purchasing power from those who have excess to those who need it. As a result, credit entails both a short-term and long-term transfer of wealth (Meena et al., 2021).

2.3.2. Credit access

Lumoindong et al. (2021) defined credit access as the ability to reach out to financial institutions and acquire credit services. Credit is essential for both farming and as a funding source for family and consumption expenses. Farmers' produce suffers as a result of limited credit access (Chisasa, 2019). Agricultural credit plays a vital role in economic development, especially in agriculture. Access to credit involves following procedures set by the institutions that provide it.

2.3.2.1. Type of credit access by source

Credit access can be classified into two main categories: formal credit sources and informal credit sources. Formal credit sources are given by banks or co-operatives that are supervised by the central bank, as they are constituted by law, while informal credit sources are normally given by money lenders, friends or relatives, where there is no legal regulator to manage the credit activities. Regardless of the type of source, credit access is quite instrumental in fulfilling food emergency requirements (Darnton-Hill, 2001), as cited by (Salima et al., 2023). The formal sector includes commercial banks, agricultural development banks, microfinance institutions and other licensed lenders that operate under regulatory frameworks, while the informal sector includes rotating savings and credit associations (ROSCAs), cooperative saving groups, community-based lending schemes, contributions from friends and relatives and loan sharks (Saleem et al., 2014).

2.3.2.2. Requirements for accessing credit

According to Kosgey (2013), formal credit lending institutions have requirements compared to informal lending institutions. These requirements include collateral security, which is adequate proof that a farmer can repay the credit on time, guarantors and signed commitments alluding to the fact that the borrower agreed to comply with the terms and conditions of the credit. Lending agencies require collateral to lessen the risks associated with lending, so they can protect themselves from the setback of default by smallholder farmers. Conversely, Sebatta et al. (2014) reveal that the requirements have made accessing credit a difficult task for many farmers. Many farmers are being discouraged by the bureaucracy and time-consuming procedures required to access credit.

2.3.3. Insurance

Insurance is a financial tool that seeks to reduce the uncertainty of loss by pooling a larger number of risks, thereby transferring the burden of loss. In general, each policyholder contributes to the fund through a premium payment that is proportional to the level of risk they assume. The insurer, therefore, uses these funds to reimburse any losses incurred by the insured (Mahul & Stutley, 2010).

2.3.3.1. Agricultural Insurance

Agricultural insurance provides coverage for agricultural production assets. These assets include livestock, aquaculture, crops, equine and bloodstock, forestry, and greenhouses, all of

which are considered biological systems (Hohl, 2019). Agricultural insurance can be broadly categorised into two: crop insurance and livestock insurance. However, this study focuses on crop insurance.

Crop insurance is available to farmers, ranchers, and agricultural producers to protect their farms against losses resulting from natural disasters such as drought, floods, and hail, as well as potential revenue losses due to declining market prices for agricultural commodities (Insurance Fact Book, 2017). There are two primary categories of crop insurance: indemnity-based and index-based insurance.

2.3.3.2. Types of crop insurance

a. Multi-peril crop insurance

Multi-peril crop insurance provides extensive coverage and offers nearly full compensation in the event of losses, making it common in middle-income countries. However, it necessitates farm evaluations and loss assessments, which make it more costly to manage. The risk-related costs linked to this type of insurance are comparatively high because of the wide range of agricultural risks it covers (Chatterjee, 2017).

b. Named peril crop insurance

Named peril crop insurance is the opposite of the multi-peril insurance. It is less expensive and simpler to manage, because its coverage is limited to a certain type of risks, such as drought. Nonetheless, these limitations in coverage make it less appealing to farmers (Chatterjee, 2017).

c. Index-based insurance

Index insurance is a specialised type of financial contract designed to provide payouts solely on one or more pre-specified indices. For instance, weather index insurance determines claim payments based on future occurrences of weather events, as measured by specific weather indices. The primary distinction between index insurance and indemnity-based insurance lies in their payout structure. In indemnity-based insurance, payouts are directly linked to the actual losses incurred by policyholders. Conversely, index insurance relies on predetermined indices that should be based on transparent, representative data (Turvey, 2001).

2.3.4. Willingness to pay

According to Oduniyi et al. (2020), willingness to pay is an approach that uses dichotomous choice techniques to question individuals if they are willing or not to pay for a specific

product at a given price. Willingness to pay (WTP) is the maximum amount of money that a customer is willing to pay for a product or service (Chambers et al., 2022), taking into account their income and risk preferences while keeping their utility constant.

"It can be expressed mathematically as:

$$V(\text{y-WTP}, p, q_1; Z) = V(y, pq_0; Z) \quad (1)$$

Where V denotes the indirect utility function, y represents income, p indicates the vector of the prices encountered by individuals, q_0 and q_1 denotes alternative levels of goods or quality indexes ($q_1 > q_0$, indicating that q_1 holds better environment quality). Furthermore, WTP can be calculated as follows:

$$\varepsilon = WTP = \sum_{i=1}^{n} \alpha_i pr_i \quad (2)$$

This model was adopted as per definition by (Oduniyi et al., 2020)"

2.3.5. Smallholder farmers

The term smallholder farmer can mean many different things depending on the situation, the nation, and even the biological zone. Smallholder, in general, only refers to their sparse resource endowment in comparison to other farmers in the sector. Smallholder farmers are also those who cultivate one or more income crops on little hectares of land, primarily using family labour (Department of Agriculture, 2012). They often operate with significantly low capital-to-labour ratios, relying on more labour than capital to produce food (Rapsomanikis, 2015). Smallholder farms usually produce in an area of less than 5 hectares and exhibit a high level of diversity, although they differ significantly throughout the continent (Evenson & Pingali, 2009).

2.4. Smallholder farmers in South Africa

Smallholder farmers do not represent a uniform group that practices farming the same way; rather, they are a varied collection of individuals with different requirements based on their livelihoods. This diversity among smallholder farmers complicates the task of accurately defining them (Fanadzo & Dube, 2018). The inconsistent use of terms such as 'small', 'small scale', 'subsistence', ' emerging', and 'smallholder" has been used to label a certain group of farmers, including this study. A commonly used global approach to define smallholder farmers involves assessing shared characteristics of these farmers, such as their access to land

and capital, their vulnerability to risks and the use of agricultural technology and market orientation (Chamberlin, 2008) as cited by (Pienaar & Traub, 2015).

The phrase “small-scale” in South Africa typically refers to the total number of farmers or households engaged in any form of agricultural production. Department of Agriculture Forestry and Fisheries (2011) states that this wider category of small-scale producers should be divided into two segments: Emerging farmers and Smallholder farmers. The former refers to around 200,000 farmers who market their produce, while the latter refers to the remaining farmers who cultivate primarily for household consumption. According to Department of Agriculture Forestry and Fisheries (2014), smallholder farmers are defined as those who cultivate crops for both household consumption and market sales, thereby generating continuous income from their agricultural businesses, which serve as a family income source. These farmers have the potential to expand their production into commercial farming but require extensive support in technical, financial, and managerial resources.

Okunlola et al. (2016) highlighted that despite government efforts to provide continuous support to smallholder farmers over the past twenty-five years, dependable information for these farmers remains limited. Currently, the smallholder sector is characterised by its small-scale farms that are labour-intensive, use traditional farming methods, and often lack the necessary institutional support and capacity (Louw, 2017).

Smallholder farmers are fundamental to the rural economy, food security and alleviation of poverty in South Africa. Despite their significance, they continue to encounter challenges related to productivity, market access, and climate resilience, which restrict their ability to contribute to sustainable development (Hlatshwayo et al., 2021).

2.5. Theoretical framework

This study is based on the fundamental principles of Credit Rationing Theory framework to thoroughly analyse the factors affecting credit access, and on Expected Utility theory to explain willingness to pay for insurance in the agricultural space**.**

2.5.1. Credit Rationing Theory

Stiglitz and Weiss (1981) argued that credit rationing theory arises from information asymmetry between borrowers and lenders, resulting in potential borrowers being denied credit even when they are willing to pay higher interest rates. Ullah et al. (2024) explained that lenders limit access to credit due to high perceived risks, a lack of collateral, information

gaps, and concerns about credit defaults. These constraints result in two types of rationing: quantity rationing, where lenders provide less credit than requested or deny applications, and price rationing, which consists of high interest rates or steep collateral requirements.

Farmers may also exclude themselves from credit markets because of fear of losing their collateral, high interest costs and uncertainty about repayment, particularly when risk is involved, e.g., drought (Balana & Oyeyemi, 2022). Weak farmers' cooperatives, lack of trust and lack of information may further intensify rationing, especially within maize value chains (Agyekumhene et al., 2018). Informal credits often emerge to address imperfections arising from moral hazard, adverse selection, and limited engagement. Many low-income households find themselves excluded from the formal credit market due to their inability to provide collateral, lack of credit history, financial illiteracy, and insecure property titles (Rahman & Smolak, 2014).

In this study, credit rationing theory helps explain why farmers rely more on informal rather than formal credit. A farmer's creditworthiness is shaped by factors such as age, farming experience, education, and income. Generally, older and more experienced farmers are viewed as less risky. Likewise, higher education and income can alleviate lenders' concerns about repayment, improving access to credit (Stiglitz & Weiss, 1981). Engagements with input markets and access to agricultural extension services are critical for the effective use of credit, as they offer essential resources and knowledge for successful agricultural investments. Together, these factors correlate with the credit rationing theory by demonstrating how individual and financial characteristics affect access to and use of credit.

2.5.2. Expected Utility Theory

The framework employed to investigate smallholder farmers' willingness to pay for insurance assumes that farmers maximise the expected utility of end-of-period wealth by choosing production factors, such as insurance, subject to physical and technical constraints. Sherrick et al. (2004) indicated that crop insurance involves exchanging a fixed premium payment for the potential receipt of a contingent indemnity. Compared to a scenario without insurance, the contingent payment limits or alters crop revenues below a covered threshold, while the premium payment reduces the revenue distribution by the value of the premium.

As defined by Hojjati and Bockstael (1988), the utility of a farmer is dependent on the income or profit generated from production. Their risk preferences will be evident in the

expected utility associated with other outcomes they face during uncertainty. In this framework, it can be assumed that each farmer's satisfaction relies on both their expected profit and its variance, guiding their decisions theoretical framework outlined below clarifies how financial leverage and risk preferences play a role in assessing insurance options. This approach, adopted from Sherrick et al. (2004), assumes that different farmers calculate their reservation insurance premiums for crop insurance based on their individual business risks, financial uncertainties, and levels of risk aversion, acknowledging that the impact of crop insurance on future returns varies across producers. To analyse various return distributions, each farmer evaluates the certainty equivalent of a random return associated with different insurance options and determines the corresponding reservation premium, which is the figure that would render the farmer indifferent toward purchasing insurance. The farmer then contrasts the reservation premium for each insurance product with the actual premium and selects the option that maximises the certainty equivalent of crop returns, or opts out of insurance altogether if none of the products enhances the certainty equivalent of crop returns.

A producer is expected to assess crop insurance based on how it influences the returns distribution for a set of assets, A, involved in production. These assets possess a stochastic rate of return, represented by r_A, and with a mean indicated by $\bar{r}_A$ and a variance of $\sigma^2 A$, which accounts for structural and business risks. Financial risk arises from the utilisation of debt capital to amplify returns on equity. By examining the balance sheet identified as A = D+E, and assuming a constant cost of debt as r_D, the anticipated return on equity can be determined as

$$\tilde{r}_E = \bar{r}_A \left(\frac{A}{E}\right) - rD \left(\frac{D}{E}\right) \quad (1)$$

The variance of the return to equity is given as:

$$\sigma^2 E = \left(\frac{A}{E}\right)^2 \sigma^2 A \quad (2)$$

The farmer's goal is to maximise the expected utility of their end-of-period wealth, which can be approximated, under certain known conditions, given by:

$$WCE = \bar{W} - \lambda\, \sigma^2 W \quad (3)$$

Here, WCE represents the certainty equivalent of risky end-of-period wealth, W, with an average of $\bar{W}$ and variance $\sigma^2 W$, while λ captures risk attitudes by quantifying the trade-off rate between mean and variance. Maximising the certainty equivalent of end-of-period wealth is equivalent to optimising the certainty equivalent rate of returns on equity, represented as:

$$r_{CE} = \bar{r}_E - \lambda \sigma^2 E \tag{4}$$

Which can be written using (1 and (2) as:

$$r_{CE} = \bar{r}_A \left(\frac{A}{E}\right) - r_D \left(\frac{D}{E}\right) - \lambda \left(\frac{A}{E}\right)^2 \sigma^2 A \tag{5}$$

The influence of insurance is reflected through variations in the means and variances of the returns distribution, alongside the fixed payment, P_i, that farmers make for insurance product i. When utilising insurance product i, the expected rate of return on assets, including indemnity payments, becomes, $\bar{r}_{Ai}$, and the variance of the return to the insured assets is denoted by $\sigma^2 Ai$. Consequently, the producer incurs a cost, P_i, which effectively diminishes the rate of return on equity by $\frac{P_i}{E}$. Therefore, the certainty equivalent rate of return on equity, when insurance is considered, can be expressed as:

$$r_{CE,i} = \bar{r}_{Ai} \left(\frac{A}{E}\right) - r_D \left(\frac{D}{E}\right) - \frac{P_i}{E} - \lambda \left(\frac{A}{E}\right)^2 \sigma^2 Ai \tag{6}$$

The maximum amount that a producer is willing to pay for insurance is the premium that equates their utility with and without insurance. Thus, the reservation premium, P_i*, can be derived by setting the certainty equivalents with and without insurance equal to each other (equations 5 and 6) and solving, yielding:

$$\bar{r}_A \left(\frac{A}{E}\right) - r_D \left(\frac{D}{E}\right) - \lambda \left(\frac{A}{E}\right)^2 \sigma^2 A = \bar{r}_{Ai} \left(\frac{A}{E}\right) - r_D \left(\frac{D}{E}\right) - \frac{P_i}{E} - \lambda \left(\frac{A}{E}\right)^2 \sigma^2 Ai \tag{7}$$

Solving to get:

$$P_i^* = (\bar{r}_{Ai} - \bar{r}_A) - \lambda A \left(\frac{A}{E}\right) - (\sigma^2 Ai - \sigma^2 A) \tag{8}$$

Equation 8 illustrates that the premium condition is contingent on the producer's risk aversion level, wealth, financial leverage, and the respective effects those have on the mean and

variability of returns associated with production assets. Assuming that the variance with insurance is less than without it, we observe that:

$$\frac{\partial \mathrm{P_i}}{\partial \mathrm{E}} < 0, \quad (9)$$

$$\frac{\partial P_i}{\partial \bar{r}_{Ai}} > 0, \text{ and} \quad (10)$$

$$\frac{\partial P_i}{\partial \sigma^2 Ai} < 0, \quad (11)$$

Furthermore, the total combined effect of any factors influencing both $\bar{r}_{Ai}$ and $\bar{r}^{\,2}Ai$ hinges on leverage and λ through the utility rate of substitution between $\bar{r}_E$ for $\sigma^2 E$. A greater increase (or decrease) in the mean return from insurance is expressed as ($\bar{r}_{Ai} - \bar{r}_A$), leads to a higher (or lower) willingness to pay. Likewise, a larger (or smaller) reduction in variability from the prior returns distribution as represented by ($\sigma^2 Ai$-$\sigma^2 A$) correlates with a greater (or lesser) eagerness to invest in insurance.

The framework further illustrates that perception may impact insurance utilisation. Consequently, socioeconomic and demographic elements that could indicate variations in λ, including age, company size, plans for growth, and indicators of diversification, should be taken into account as factors influencing insurance use (Smith & Goodwin, 1996).

2.6. The role of credit in agricultural development

Credit is the cornerstone of agricultural development through providing farmers with much-needed financial resources in order to invest in farm inputs, technology and infrastructure, thereby improving productivity, income and sustainability. Various studies conducted across highlighted that access to credit, both formal and informal boosts farm output, encourages adoption of new technology and strengthens the value chain (Jonas & Christian, 2025).

Access to credit increases farm income, accumulation of assets and adoption of modern agricultural practices such as insurance while encouraging economic and social development goals (Joao & De Castro, 2023). Despite all this, many smallholder farmers still face barriers such as lack of collateral, high interest rates, information asymmetry and gender disparities when accessing credit, which limits their potential in driving agricultural transformation (Moahid & Maharjan, 2020). Both institutional (supply) and behavioural (demand) constraints are important (Moahid & Maharjan, 2020).

Informal credit remains dominant, yet it is often insufficient or costly, especially in Sub-Saharan Africa (Balana & Oyeyemi, 2022), while formal credit generally has a stronger impact on productivity (Haryanto et al., 2023). The effectiveness of credit is further improved when it is combined with other factors such as extension service and targeted policy intervention (Chaiya et al., 2023). Overall, previous studies underscore that a well-planned credit system is important to ensure sustainable agricultural growth and rural development (Magazzino et al., 2021).

2.7. Smallholder farmers' access to credit in South Africa

Credit helps smallholder farmers improve their welfare and boost productivity by making it easier to invest in people and equipment (Baiyegunhi & Fraser, 2014). Still, many smallholder farmers in developing countries, including South Africa, have faced ongoing challenges in getting financing (Manganhele, 2010). Primary agriculture in South Africa accounts for about 3% of the country's GDP, which is lower than in other sectors. Researchers link this to issues such as unpredictable rainfall, limited land, out-dated technology, and poor management (Chisasa, 2015).

Chisasa and Makina (2013) found that agriculture receives less credit from formal banks than other sectors of the private sector. They also found a strong link between bank credit and higher agricultural output. Credit is important for running farms especially during planting and harvest. When farmers cannot access credit, productivity drops. Olagunju and Ajiboye (2010) argue that agriculture's small share of Gross Domestic Products (GDP) is partly due to a lack of credit institutions to support farmers. Because rural banks are often absent or unwilling to lend, farmers in rural areas rely more on informal lenders.

2.8. Previous studies on credit access

According to the study conducted by Manganhele (2010), results indicate that despite decades of experience with finance schemes, smallholder farmers have had minimal success in gaining access to financing. Previous attempts by the government in Mozambique to improve access to credit for smallholder farmers have failed; as a result, the government is looking for other viable techniques to improve smallholder farmer access to credit (Manganhele, 2010).

A study in Pakistan found that farmers with larger farms, higher incomes, better access to information, and more physical assets had an easier time getting credit. However, more

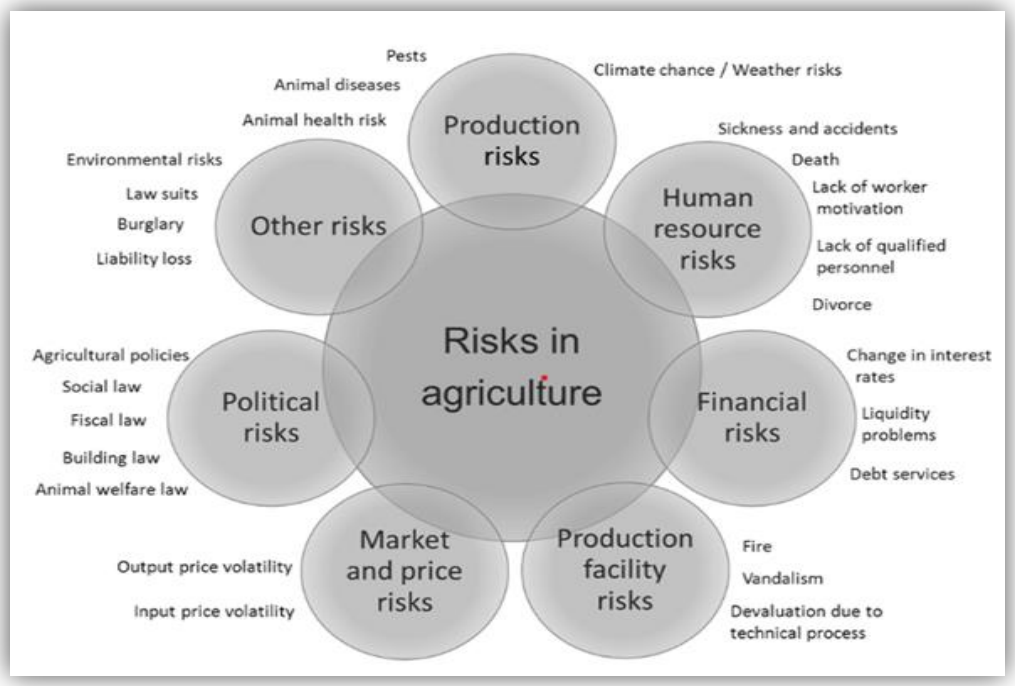
farming experience actually made it harder for farmers to get agricultural loans. The study also showed that farmers with greater assets, agricultural knowledge, and information tended to use banks rather than input providers or informal lenders. In contrast, older, more educated farmers with larger farms and higher incomes were more likely to borrow from input providers than from banks (Ullah et al., 2020).

A study done by Ijirshar indicated that rural farmers have only moderate access to credit, and the credit they receive is often not enough. Most farmers who do not benefit from formal credit rely on informal financial institutions for their main income. Factors like gender, age, marital status, household size, main job, off-farm work, membership in farmers' groups, years of farming, crop yield, land size, education level, and interest rates all play a significant role in how farmers access credit in the area studied (Asom & Ijirshar, 2017)

Lack of usable collateral, high transaction costs due to clients' remoteness, dispersed demand for financial services, the lag between investment needs and expected revenues, lack of irrigation, pests and diseases, small farm and individual transaction sizes, underdeveloped communication and transportation infrastructure, and high covariate risks due to variable rainfall and price risks are all reasons given by financial institutions (Adesina et al., 2014).

2.9. Risks in agriculture

Agriculture has always been prone to risk such as pest and disease attacks, unpredictable weather events, and market volatility. Global environmental, social, and economic development is currently exacerbating several dangers, including the ongoing population growth, the scarcity of productive land, land degradation, and climate change (Theuvsen, 2013). Risk means facing negative outcomes, such as lower yields and incomes, and sometimes even serious events like financial bankruptcy, food insecurity, or health problems. Farmers face multiple risks simultaneously, and these risks can have compounding effects (Wauters et al., 2014).



Source: Theuvsen (2013)

Figure 2.1: Risk in agriculture

According to Theuvsen (2013) as illustrated in figure 2.1, agricultural risks come from multiple sources and are experienced to varying degrees across geographic and political scales. Farmers come from a range of socio-economic backgrounds, including differences in age, education, culture, religion, farming practices, income, peer pressure, and community values. These differences shape how they perceive risk and influence their economic behaviour and decision-making. Research shows that farmers' ability to adopt management strategies and handle risks is often limited by a lack of clear information, weak institutional support, and not enough capital (Theuvsen, 2013).

Recent studies show that insurance encourages farmers to take risks and make more investments in productive inputs through agricultural insurance (Masiza et al., 2021). However, a key question is how farmers and others adjust their management and decision-making processes to account for these economic and political uncertainties. Hence, in many regions, agriculture has become less attractive to younger people, making it more difficult to find adequately trained and motivated farm workers and young farmers willing to continue farming businesses.

Risk management mechanisms encompass all measures that help identify and manage possible risks that can put a farm or a firm at risk (Wolke, 2017). The main goal is to find, measure, manage, and control possible sources of loss. General risk management addresses all kinds of risks, while specialised risk management focuses only on risks that insurance companies can cover, such as fire or hail (Theuvsen, 2013). Once farmers have identified and assessed the risks they face, they need to choose how to handle them. Usually, they have four main options: avoiding the risk, transferring it to others, reducing it by using longer-term contracts or diversifying their activities, or accepting the risk, which is most common when the chances of problems and potential losses are low (Theuvsen, 2013).

2.10. The state of agricultural insurance in South Africa

Agricultural insurance uptake among smallholder farmers in South Africa remains low, largely due to a lack of suitable, affordable products. While commercial farmers have higher participation, the absence of government subsidies makes crop insurance costly and often unaffordable (Njue et al., 2018). Agriculture plays a vital role in South Africa's economy by providing employment, supporting food security, and fostering rural development. However, farmers continue to face significant challenges, including unpredictable weather, pests and diseases, volatile market prices, and economic instability (Ahmed et al., 2022).

A major challenge for South Africa's smallholder farmers is the lack of insurance against extreme weather events, which increasingly threaten agricultural production as climate change intensifies these risks (Smart Agri Project Consortium, 2015). Current insurance products are not tailored to the needs of smallholders (Fin Mark Trust, 2013). Developing effective insurance options would make agriculture more attractive and support agrarian reform in rural areas (Partridge & Wagner, 2016).

Over the last decade and a half, initiatives have been launched to assist smallholder farmers through Agricultural Index Insurance (AII), which acts as a financial cushion against the negative impacts of weather-induced crop losses. This indicates that when farmers are guaranteed financial compensation for losses caused by uncontrollable factors, they are more likely to allocate their resources to maximise profits. Additional research indicates that insurance can facilitate access to credit for farmers, as AII mitigates the risk for lenders (Masiza et al., 2021).

2.11. Previous studies on willingness to pay for insurance

Researchers have studied agricultural insurance in countries including Benin, Burkina Faso, Cameroon, Ethiopia, Ghana, Kenya, Malawi, Mali, Morocco, Mozambique, Niger, Nigeria, Rwanda, Senegal, Syria, Tanzania, and Zimbabwe. The review found that several types of agricultural insurance are being tested or used in Sub-Saharan Africa. In 2015, Agriculture and Climate Risk Enterprise Ltd. (ACRE) provided insurance to about 400,000 farmers in Kenya, Rwanda, and Tanzania, which had a significant business impact (Global Index Insurance Facility, 2017). A study conducted by Greatrex et al. (2015) revealed that the increase in insurance uptake can be linked to the diverse range of products provided by ACRE, its function as an intermediary among insurance companies, reinsurers, and distribution channels or aggregators, as well as its connection to mobile money providers (Ntukamazina et al., 2017)

As a response to the unpredictable nature of climate affecting their livelihoods, farmers in the North West province of South Africa have implemented various adaptation strategies. However, even with these strategies, the inputs and outputs of their farming practices remain significantly impacted by the challenges brought about by climate change, largely because very few farmers have opted for insurance coverage. The use of insurance as a unique approach to mitigate the damages caused by climate change is fraught with issues, such as complicated indemnity payment processes that can lead to production setbacks and high administrative expenses, as insurers often do not settle claims in a timely manner (Oduniyi et al., 2020).

A study conducted by Jiba et al. (2024) in the Eastern Cape found that key elements affecting willingness to pay (WTP) for index-based crop insurance include age, gender, and marital status. Interestingly, a significant number of those ready to participate had never faced substantial losses, indicating that perception of value and confidence in the product may be just as crucial as direct experience with risk.

According to the research carried out by Chauke et al. (2013), it was indicated that to close the gap between lenders and borrowers, it is important to implement effective training programs that provide access to insurance and incorporate modern technologies such as mobile phones, as it was found that farmers tend to be risk-averse and heavily dependent on their own resources. The analysis conducted by Njue et al. (2018) using descriptive statistics

showed that most households with insurance had access to financial services, experienced better success in obtaining credit, utilised hired labour, and participated in farmer groups.

2.12. Policy and institutional context in South Africa

Access to credit and insurance for smallholder farmers is influenced by the policy environment and institutional framework in South Africa. The National Credit Act (NCA), established in 2005, is designed to encourage equitable lending practices, avoid over-indebtedness, and enhance access to formal credit for marginalised groups. However, Makina and Malobola (2004) pointed out that smallholder farmers frequently find themselves excluded due to factors such as insufficient collateral, limited financial understanding, and stringent risk assessment processes set by commercial banks and other formal financial entities.

Institutions such as the Land Bank play a significant role in agricultural credit in South Africa by providing credit and financial offerings to both commercial and smallholder farmers. While the Land Bank and microfinance organisations do provide credit options, studies reveal that smallholders in rural areas, such as Bushbuckridge, often do not benefit from these services because of geographical barriers, a lack of awareness, and bureaucratic hurdles.

The Department of Agriculture, Forestry and Fisheries (DAFF) has initiated pilot programs for index-based crop insurance and risk management aimed at enhancing the resilience of smallholders. Nonetheless, the uptake of these programs remains low, attributed to insufficient awareness, perceptions of high premiums, distrust in formal financial offerings, and a lack of local institutional support. Hill et al. (2013) noted that cooperatives, non-governmental organisations (NGOs), and farmers' associations act as vital intermediaries in spreading information, promoting group insurance arrangements, and reducing transaction costs.

Smallholder maize farmers in Bushbuckridge encounter numerous challenges, including vulnerability to climate change, poor infrastructure, and reliance on subsistence and semi-commercial farming. These issues, alongside limited access to formal financial services, highlight the urgent need for tailored credit and insurance policies. Evidence suggests that even with relevant programs in place, rural smallholders are often left out due to inefficiencies in institutions and socioeconomic obstacles.

In summary, while South Africa has put policies in place and created institutions to enhance agricultural finance, significant challenges continue to impede smallholder maize farmers in rural regions. Understanding the interplay between policy frameworks, institutional structures, and local socioeconomic factors is crucial for formulating strategies that improve credit access and promote greater willingness to invest in insurance, thereby enhancing resilience and productivity.

2.13. Knowledge gap identified

While there is an increasing amount of research focused on smallholder farmers' access to credit and their willingness to invest in agricultural insurance, significant gaps still exist. Most investigations concerning credit access tend to examine financial inclusion broadly without specifically linking it to the use of insurance in South Africa. Insights from international research, particularly from countries like Kenya, Ethiopia, and Nigeria, provide valuable information on the factors influencing the willingness to pay for crop insurance

However, there is a lack of data concerning smallholder farmers in South Africa, where the agricultural sector faces distinct challenges. Few studies apply behavioural theories such as Credit Rationing Theory to explain how farmers make decisions amid uncertainty, which creates a gap in understanding the elements affecting their willingness to pay. Additionally, there is a notable absence of local research in regions like Bushbuckridge, despite the area being particularly vulnerable to climate-related shocks, having limited financial services, and relying heavily on maize production. These gaps highlight the necessity for further localised research to inform policies aimed at reinforcing the resilience of smallholder farmers.

2.14. Conclusion and summary of the chapter

This chapter examines research regarding credit access and the willingness to pay for insurance among smallholder farmers. The findings suggest that factors such as socio-economic status, institutional influences, and risk perceptions impact credit access, while factors including income, education, and awareness shape the willingness to pay for insurance. The chapter also explores significant theoretical frameworks, including Credit Rationing Theory and the Expected Utility Theory Framework. Both local and international studies indicate that smallholders appreciate the benefits of credit and insurance but face obstacles such as collateral demands, high premiums, lack of awareness, and inadequate institutional support.

In South Africa, particularly in the Bushbuckridge area, these challenges are compounded by a history of exclusion and limited access to formal financial services. The review uncovers critical gaps, including a lack of research that addresses credit and insurance as interconnected issues, insufficient behavioural analysis, and a shortage of localised studies. By addressing these gaps, this study aims to clarify the association between credit access and the willingness to pay for crop insurance, as well as to evaluate how both mechanisms contribute to resilience and sustainable maize production.

CHAPTER 3: RESEARCH METHODOLOGY

3.1. Introduction

This chapter outlines the study area and the research design that was used to address the objectives of the study. It also includes the explanation of the sampling procedure, sampling size, data collection methods and analytical techniques employed in the study. Furthermore, it includes the way in which the analyses were conducted in order to provide suitable responses for the hypothesis made and the objectives of the study.

3.2. Study area

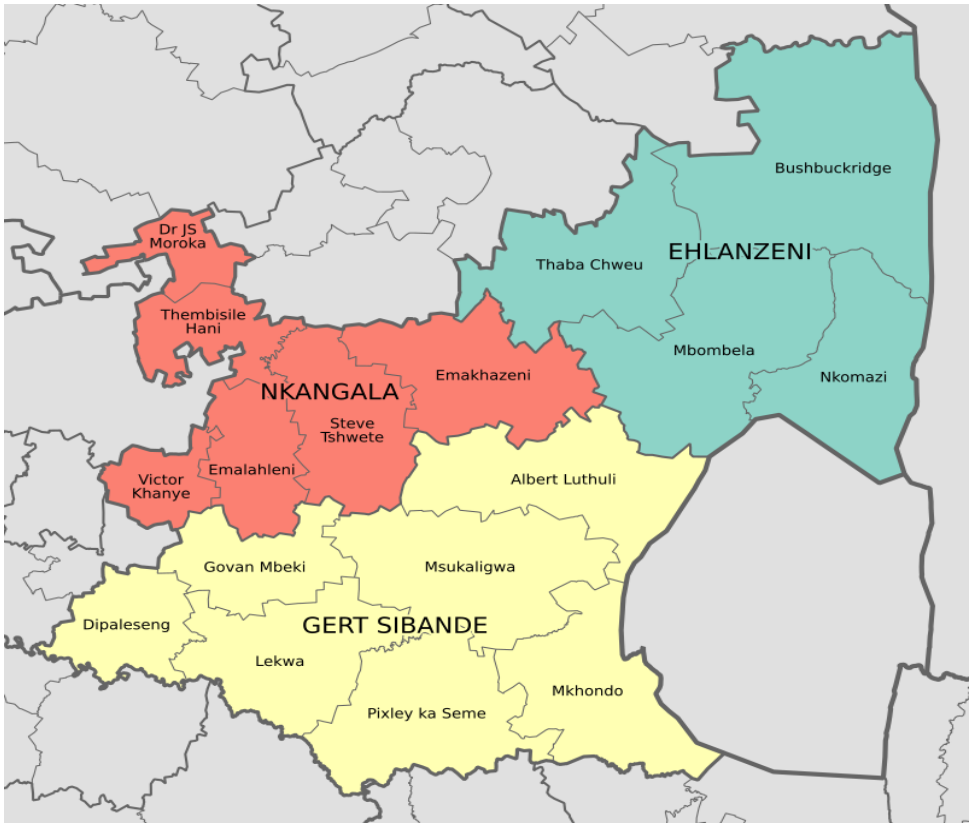


Figure 3.1: Map of Bushbuckridge

Source: Htonl (2016)

The study on credit access and willingness to pay for insurance among smallholder maize farmers was carried out in Bushbuckridge Local Municipality, Bohlabela District, in Mpumalanga Province of South Africa. The municipality is a Category B municipality and presidential nodal point in the Ehlanzeni District of Mpumalanga Province, in the north-eastern corner of the country. It holds the distinction of being the largest among the four municipalities in the district, encompassing over a third of the total land area.

Statistics South Africa (2011) highlighted that the municipal area connects Lydenburg and Lowveld cities, including Hoedspruit, Pilgrim's Rest, and Graskop. As a result, Bushbuckridge Local Municipality can be considered the gateway to the major tourist attractions in Mpumalanga and the eastern part of Limpopo. It falls under the Lowveld region with mild winters and a subtropical climate, where agriculture and tourism are the two primary and/or major economic activities (Intergrated Development Plan, 2017).

According to Khwidzhili and Worth (2020), 60% of the total land area is used for agriculture, which forms part of the two leading sectors in the province. Mpumalanga produces more than 30% of the total amount of maize produced in South Africa, making it one of the two provinces with the highest annual production of tonnes of maize (Department of Agriculture Forestry and Fisheries, 2017).

The research area is divided into 34 wards and consists of 135 villages. Nearly two-thirds (64.6%) of the 71 272 economically active youth in the municipality between the ages of 15 and 34 are jobless, while more than half (52.1%) of the 128 862 economically active persons in the municipality are unemployed (StatsSA, 2016).

3.3. Research design

Corvette (2021) defined research design as the overall approach that one selects to combine the many elements of a study in a logical and cohesive manner, in order to successfully address the research problem. Furthermore, research has highlighted that there are three established approaches for carrying out research, which are quantitative, qualitative, and mixed methods (Creswell, 2021). The study conducted by Leavy (2020) defined quantitative research as an approach that focuses largely on numbers, which often entails conducting a survey of a sizeable population using a standardised questionnaire that consists primarily of closed-ended or forced-choice items, while qualitative research seeks more in-depth, free-form answers from respondents either in person or via open-ended responses. The study further highlighted that this type of research is usually carried out with small groups and takes the form of in-person focus groups, telephone interviews or detailed surveys with free text responses (Leavy, 2020).

A mixed methods research approach was used to analyse credit access and willingness to pay for insurance and ascertain if there is any relationship between these two important aspects in the study area. Mixed methods research involves incorporating both qualitative and

quantitative data in order to resolve research questions in an appropriate and ethical manner, including collecting, analysing, interpreting and reporting the data (Bryman, 2016). Moreover, Fetters et al. (2013) revealed that the approach offers numerous benefits when handling complex research issues, as it integrates the philosophical frameworks of both post-positivism and interpretivism, thereby allowing the intertwining of qualitative and quantitative data so that research problems are explained in more meaningful ways. Additionally, it provides a sound foundation, methodological flexibility, and a thorough comprehension of more manageable problems (Bowleg et al., 2016).

The mixed methods technique used in this study included survey questionnaires and face-to-face interviews. This method was selected for a number of reasons. Employing mixed methodologies enables researchers to address their research questions comprehensively and promotes the generalisation of results and their implications for the entire population (Enosh et al., 2015).

3.4. Sampling procedure

According to Elfil and Negida (2017), sampling is an important component of most studies because it is the cornerstone of almost all research. Sampling refers to an approach of selecting a representative sample from a population so as to observe and analyse the characteristics of the whole population. Research revealed two primary sampling techniques: probability and non-probability sampling (Shorten & Moorley, 2014). When respondents cannot be selected with equal likelihood for a study, non-probability sampling techniques are recommended. These methods are typically faster and more cost-efficient compared to probability sampling. However, non-probability sampling is susceptible to selection bias and does not allow for nearly unbiased estimation of population sizes (Rahman, 2023).

On the contrary, probability sampling is regarded as the ideal approach in sampling methods, ensuring that study results can be generalised to the broader target population. This technique involves giving every individual in the population an equal opportunity to be chosen for the study (Acharya et al., 2013). The discussion surrounding the advantages and drawbacks of probability and non-probability sampling techniques highlights that both methods are equally valid when appropriately aligned with their intended purpose. By recognising this equivalence, researchers can enhance the rigour of their studies by effectively combining the strengths of both approaches (Pace, 2021). Hence, a mixed approach combining purposive (non-probability) and simple random (probability) sampling was used for the study.

Acharya et al. (2013) defined purposive sampling as a technique used by researchers to identify individuals with specific characteristics that are crucial to the study. Participants selected through this method can provide valuable insights into the research question, although the sample is unlikely to be representative of the entire population. The study conducted by Thomas (2020) defines simple random sampling as a method that guarantees every individual in a population has an equal likelihood of being selected as a respondent. Purposive sampling was employed to identify the specific group of farmers targeted by the study: smallholder maize farmers in Bushbuckridge Local Municipality (BLM), Mpumalanga, South Africa. Additionally, simple random sampling was used to ensure that every maize farmer had an equal opportunity to be selected and participate in the study, based on their availability and willingness. As a result, the sample quality remained unaffected, as each participant had an equal chance of being chosen.

3.4.1. Population of the study

The study population consisted of all smallholder maize farmers in Bushbuckridge Local Municipality.

3.4.2. Sample size determination

A study conducted by Rahman (2023) revealed that having a sufficient sample size is essential for ensuring that the findings can be generalised when conducting research. Sekaran and Bougie (2010) define sample size as the subset of the population needed to provide adequate information for generalising research results. Choosing an appropriate sample size involves considering factors such as budget, time constraints, the number of items, the number of variables, and the complexity of the research model.

The study used a sample size of 213 smallholder maize producers, derived from the total smallholder maize farmers' population of 473 provided by the Department of Agriculture, Land Reform, and Rural Development in the study area.

The sample size (n) was calculated using the Raosoft software and was given by:

$$n = {}^{N\,x}/_{((N-1)\,E^2 + x)}$$

$$x = Z({}^{c}/_{100})^2\, r\,(100-r)$$

$$E = \mathrm{Sqrt}\,[{}^{(N-n)\,x}/_{n\,(N-1)}]$$

Where:

N is the population proportion to size assumed to have a probability of 0.5.

r is the degree of accuracy, in this case, 50% response distribution.

Z(c/100) is the critical value for 1 degree of 95% confidence level.

3.5. Data collection instruments

In order to accomplish the objectives of the study, pretested structured questionnaires were designed as a tool for collecting primary data. The questionnaire was divided into four main sections as listed below:

Section A: Socioeconomic characteristics of the farmer
Section B: Land holding and production information
Section C: Access to credit and support services
Section D: Climate-related risk and management strategies
Section E: Insurance Practices and willingness to pay for insurance

The questionnaire was validated by selecting and interviewing 10 random smallholder maize farmers from the study area to ensure that the questions effectively measured the intended variables. A pilot test was conducted with these farmers to enhance the reliability of the questionnaire. Based on their feedback, ambiguous and open-ended questions were revised to minimise the frequency of responses categorised as ‘others’.

Data collection was conducted over a two-month period by the research student, with assistance from local extension officers, to access smallholder maize farmers in the study area. The process involved face-to-face interviews primarily with smallholder maize farmers. When the farmer was unavailable or unable to respond, the interview was conducted with the spouse or another family member actively involved in farming. To minimise misunderstandings and ensure clarity, the questionnaires were administered in Xitsonga during the interviews. This approach facilitated effective communication and a better understanding of the responses from the smallholder maize farmers.

3.6. Ethical consideration

This research study was conducted in accordance with the ethical standards of Northwest University. All information obtained from participants will remain strictly confidential, and participation in the study was entirely voluntary.

3.7. Analytical techniques

3.7.1. Descriptive Statistics

The first objective, which was to determine the socio-economic characteristics of smallholder maize farmers in Bushbuckridge Local Municipality, Mpumalanga Province, South Africa, was addressed using descriptive statistics, including but not limited to frequency, percentage, mean and standard deviation.

3.7.2. Multinomial Logistic Regression

To address the second objective, which was to examine factors affecting credit access among smallholder maize farmers, the study used the Multinomial Logistic Regression Model. According to Solutions (2019), the Multinomial Logistic Regression is used to analyse an objective of the study where the dependent variable is nominal with more than two independent variables that cannot be measured in order of importance.

The main aim of the multinomial logistic model is to predict categorical data (Greene et al., 2022). Therefore, the Multinomial Logistic Regression model was used for this study because the dependent variable, which is credit access, is categorical in nature, with 0 for no credit access, 1 for access to formal credit, and 2 for access to informal credit

According to Greene (2006), the multinomial logistic regression model specification is:

$$\text{Prob}(y_i = j\,|x_i) = P_{ij} = \frac{\exp(\beta_j' x_i)}{1+\sum_{k=1}^{j}\exp(\beta_k' x_i)},\ \text{Where; } j = 0, 1, 2, \ldots, J;\ \beta = 0.$$

y_i is a parameter that represents the alternative credit accessibility

x_i is a vector of all the explanatory variables of the ith observation.

β_j is a vector of all coefficients in the jth regression.

j is the identified outcome, and j′ is the reference outcome.

The functional Multinomial Logistic Regression model is expressed as:

$$\log \frac{P_r(Y=j)}{P_r(Y=j)'} = \alpha+\beta_1 FS+\beta_2 FR+\beta_3 AGE+\beta_4 LE+\beta_5 EMPS+\beta_6 EXS+\beta_7 ACI+ \beta_8 MSI+\beta_9 GEF+ \beta_{10} LTS$$

Table 3.1: Variables that were used in the Multinomial Logit Regression model

Dependent				
Y1	CA	Credit access	0 = No access to credit; 1=Access to formal credit; 2 = Access to informal credit	Categorical
Independent				
X1	FS	Farm size	Number of hectares.	Continuous
X2	FR	Farm revenue	Total farm revenue in Rands	Continuous
X3	AGE	Age group of farmer	Age group of the farmer	Categorical
X4	LE	Level of education	1 = No schooling; 2 = Primary school; 3 = Secondary school; 4 = Tertiary school	Categorical
X5	EMPS	Employment status	1 = Full-time farmer; 2 = Employed (non-farming); 3 = Unemployed; 4 = Self-employed; 5 = Retired; 6 = Other	Categorical
X6	EXS	Extension service	1, Yes; 0, Otherwise	Dummy
X7	ACI	Access to credit information	1, Yes; 0, Otherwise	Dummy
X8	MSI	Main source of income	1 = Salary; 2 = Business; 3 = Farming; 4 = Pension; 5 = Child grants; 6 = Remittances; 7 = No income; 8 = Other	Categorical
X9	GEF	Gender of farmer	0, Female; 1, Otherwise.	Dummy
X10	LTS	Land tenure system	1 = Private lease; 2 = Permission to Occupy (PTO); 3 = Communal land; 4 = Customary tenure; 5 = Other	Categorical

3.7.3. Contingent Valuation Method (CVM)

To address objective three, which was to investigate smallholder maize farmers' willingness to pay for insurance, the study employed the Contingent Valuation Method (CVM). Kopsidas and Batzias (2019) defined Contingent Valuation Method (CVM) as a survey-based technique usually utilised in experimental economics to place a value upon non-market goods, resources and services by an individual.

The study further highlighted that the technique uses the following basic dependent variables: (i) willingness to pay (WTP), which denotes the maximum amount of money that a person would spend to gain or preserve a good, and (ii) willingness to accept (WTA) compensation, which is the minimum amount of money required to give up the good. Consequently, WTP gives the buying price, relevant for valuing the projected gain of the good, whereas WTA offers a selling price that is relevant to valuing the proposed loss of the good (Kopsidas & Batzias, 2019).

The study conducted by Zhang et al. (2003) indicated that there has been a shift in Contingent Valuation Method (CVM) practice from open-ended questions to closed-ended question formats. In the latter approach, respondents indicate their willingness to pay (WTP) with a simple “yes” or “no” rather than specifying an exact monetary amount. To estimate WTP from these binary responses, a statistical model is applied to link the responses to the different monetary amounts offered in the survey.

In light of the above, for the purpose of this study, the latter approach was used. The respondents were provided with a brief overview of the insurance concept, emphasising its requirements, benefits, and challenges. Following that, farmers were asked if they were willing to pay for insurance, if it were introduced to them. Those who responded "no" were asked no further questions about insurance, other than their vital reasons for their decision. Those who responded "yes" were asked additional questions to determine their level of willingness to pay for insurance.

Table 3.2: Contingent Valuation Method (CVM) questionnaire

Would you be willing to pay for insurance that covers 100% of your maize production? 1: Yes 2: No If '**No'** to **(a),** why? Explain
If **'Yes'** to **(a),** if premiums increase by 10%, would you still pay for insurance to cover for 100% of your stock? 1: Yes 2: No
If you answered **'No'** to **(b),** would you accept if the government covered the 10% premium increase, so you would pay insurance for 90% of your stock value? 1: Yes 2: No

Source: Survey (2025)

The responses to the above questions were classified as follow: Y = 0 when respondents are not willing to participate in insurance; Y = 1 when they are willing to participate, but not willing to cover 100% of their produce (Less willing); Y = 2 when they are willing to participate and pay insurance to cover for 100% of their produce (moderately willing); Y = 3 when they are willing to participate and pay insurance to cover for 100% of their produce even with a 10% increase in premium (More willing). The results were therefore presented using descriptive statistics.

3.7.4. Ordered Logistic Regression model

To address the fourth objective of the study, which was to identify factors influencing smallholder maize farmers' willingness to pay for insurance, the study used the Ordered Logistic Regression model. According to section 3.7.3 above, the dependent variable, willingness to pay for insurance, is discrete and has more than two ordered categories; thus, for achieving objective four, the Ordered Logit Regression model was adopted as explained below:

According to Scott Long (1997), the Ordered Logistic Regression model is associated with the proportion odds hypothesis, which states that the effects of each independent variable are proportional with respect to each threshold of the dependent variable. Eluru and Yasmin (2015) highlighted that it is assumed that the discrete levels of insurance willingness to pay

(yi) are linked to a continuous, latent variable (yi*) that has a naturally specified linear function.

$yi* = Xi\beta + \varepsilon i$ for i = 1, 2,....., n (1)

Where:

i (i = 1,2.....n) denotes the individual;

Xi denotes the vector of independent variables;

β denotes the vector of coefficients to be estimated;

ε denotes the random disturbance term assumed to be standard logit.

Let j (j = 1, 2,....., j) the level of farmers' willingness and

τj = the threshold associated with these levels.

The unknown thresholds are assumed to partition the propensity into j-1 intervals. The unobservable latent variable $yi*$ is related to the observable yi by the τs with a response mechanism of the following form:

$yi = j, if\ \tau j{-}1 < yi* < \tau j, for\ j = 1, 2, \ldots\ldots\ldots\ldots, J$ (2)

The thresholds will be assumed in ascending order to ensure well-defined intervals and natural ordering such that $\tau 0 < \tau 1 \ldots\ldots\ldots\ldots < \tau j$

Where $\tau 0 = -\infty$ and $\tau j = +\infty$.

The probability was expressed as: $\pi ij = (yi = j|) = \emptyset(\tau j - Xi\beta)\emptyset(\tau j{-}1 - Xi\beta)$

Where

$\emptyset$ (.) is the standard normal cumulative distribution function such that the sum of the probabilities is equal to one.

The probability took the following form after applying transformation in Eq. (3).

$$\pi ij = Pr(yi = j|Xi) = \frac{\exp(\tau j - Xi\beta)}{(1+\exp(\tau j - Xi\beta))} - \frac{\exp(\tau j - 1 - Xi\beta)}{(1+\exp(\tau j - 1 - Xi\beta))} \quad (3)$$

The marginal effects of the ordered logit model will be calculated. The significance of marginal effects is that they determine how much of each independent variable changes the probability of respondents falling under each of the four categories (Y=0; Y=1; Y=2; Y=3) of the dependent variable. The marginal effects will be expressed as:

$$\frac{\partial P(R = y)}{\partial xk} = \left[\emptyset\left[\mu_{j-1} - \sum_{k-1}^{k}\beta_k x_k\right] - \emptyset\left[\left[\mu_j - \sum_{k-1}^{k}\beta_k x_k\right]\beta_k\right]\right.$$

Where: $\frac{\partial P(R=y)}{\partial xk}$, indicates the partial derivation of the probability with respect to the independent variable xk.

According to Boz et al. (2011), a positive sign of a marginal effect suggests that the probability of respondents falling under a specific category of the dependent variable increases with xk. An ordered logistic regression model was used to examine factors influencing farmers' willingness to pay for insurance. However, before interpreting ordered logistic regression results, a brant test was conducted to ascertain whether or not the proportional odds assumption would be violated.

Table 3.3: Variables for Ordered Logistic Regression (OLR) model

Dependent				
Y1	WPI	Willingness to pay for insurance	0, if not willing to pay; 1, less willing to pay; 2, moderately willing to pay; 3, more willing to pay.	Categorical
Independent				
X1	AGE	AGE	Age group of the farmer	Categorical
X2	GEN	GENDER	0, Female; 1, Male	Dummy
X3	HHS	Household size	The number of people in the household.	Continuous
X4	FEX	Farming experience	Number of years involved in maize farming	Continuous
X5	LED	Level of education	1 = No schooling; 2 = Primary school; 3 = Secondary school; 4 = Tertiary school	Categorical
X6	CAC	Credit access	0, no access to credit; 1, access to formal credit; 2, Access to informal credit	Categorical
X7	MSI	Main Source of income	1 = Salary; 2 = Business; 3 = Farming; 4 = Pension; 5 = Child grants; 6 = Remittances; 7 = No income; 8 = Other	Dichotomous
X8	FI	Farm revenue	Aggregate farm income per cycle	Continuous
X9	FSI	Farm size	Number of hectares	Continuous
X10	AES	Access to extension service	1, Yes; 0, Otherwise	Dummy
X11	AIA	Agricultural insurance awareness	1, Yes; 0, Otherwise	Dummy
X12	IPI	Interest in purchasing insurance	1, Yes; 0, Otherwise	Dummy

3.7.5. Chi-square test

To address the fifth objective, which was to test if there is an association between credit access and willingness to pay for insurance in Bushbuckridge Local Municipality, Mpumalanga Province, South Africa, the study employed the chi-square test. According to Ugoni and Walker (1995), the chi-square test is a statistical test which examines the association between two categorical variables. Hence, chi-square test will be used for this study because both variables are categorical in nature, that is credit accessibility (0 No credit, 1 access to formal credit, 2 access to informal credit) and willingness to pay for insurance (0, not willing to pay; 1, less willing to pay; 2, moderately willing to pay; 3, more willing to pay).

The formula or model for calculating a Chi-square statistic is:

$$X^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i}$$

Where:

X^2 = is the chi-square test statistic

Σ = is the summation operator

O is the observed frequency

E is the expected frequency"

If the P value is less than the conventionally accepted significance level of 0.05 (i.e., $P \leq 0.05$) we accept our null hypothesis and conclude that there is a significant association between credit accessibility and willingness to pay for insurance. If the P value is greater than the conventionally accepted significance level of 0.05 (i.e., $P > 0.05$), we reject our null hypothesis and conclude that there is no significant association between credit accessibility and willingness to pay for insurance.

Table 3.4: Variables for chi-square test

Independent		
Credit access	0, no credit access, 1 access to formal credit, 2 access to informal credit	Categorical
Dependent		
Willingness to pay for insurance	(0, if willing to pay; 1, less willing to pay; 2, moderately willing to pay; 3, more willing to pay).	Categorical

3.8. Summary of the chapter

This chapter explained the research methods used to meet the study's goals. It covered the research design, study area, target population, sampling process, how the sample size was determined, data collection methods, and how the structured questionnaire for collecting primary data was developed. The primary data was collected from smallholder maize farmers in Bushbuckridge Local Municipality.

The chapter further described the measurement and coding of the study variables and outlined the analytical techniques used to analyse the data. Descriptive statistics were employed to summarise the socio-economic characteristics of the respondents. A Multinomial Logistic Regression (MLR) model was used to identify the factors affecting credit access, while the Contingent Valuation Method (CVM) was applied to assess farmers' willingness to pay for agricultural insurance.

The Generalised Ordered Logistic Regression (GOLR) model was used to determine the factors influencing willingness to pay for agricultural insurance after the proportional odds assumption of the Ordered Logistic Regression model was violated. In addition, the Pearson Chi-square test was employed to determine the association between credit access and willingness to pay for agricultural insurance. The next chapter presents and discusses the empirical findings obtained from these analytical procedures.

CHAPTER 4: RESULTS AND DISCUSSION

4.1. Introduction

This chapter presents the results, discussion and interpretation of descriptive statistics conducted among smallholder maize farmers in Bushbuckridge Local Municipality. It starts by describing the socioeconomic characteristics of the sampled smallholder maize farmers, such as age, gender and farm size. Descriptive statistics like means, frequencies, minimum and maximum values, standard deviation and percentiles were used to analyse and explain the data.

4.2. Descriptive statistics results

4.2.1. Age distribution of the farmer

Age is an important socio-economic characteristic that may influence farmers' credit access farming decisions and willingness to pay for insurance. Table 4.1 presents the age distribution of the sampled smallholder maize farmers in Bushbuckridge Local Municipality. The table shows the frequency and percentage distribution of respondents across the different age groups.

Table 4.1: Age distribution of the farmer

Age range	**Frequency**	**Percentages**
20 to 29	16	7.5%
30 to 39	48	22.5%
40 to 49	61	28.6%
50 to 59	47	22.1%
60 to 69	25	11.7
70 to 79	15	7.0%
80 and above	1	0.5%
Total	**213**	**100%**

Source: Survey data (2025)

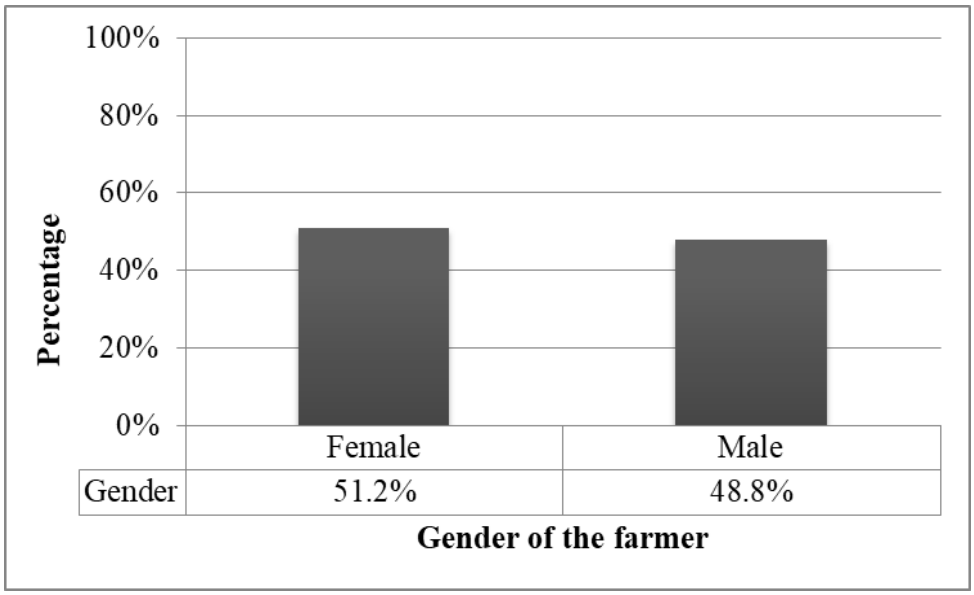
The results indicate that the majority of respondents (28.6%) were between 40 - 49 years old, followed by those aged 30-39 years (22.5%) and 50-59 years (22.1%). These suggest that maize production in the study area is dominated by participants in their economically active years. This age group often has the strength and experience to be effective farmers. About

11.7% of respondents were 60 – 69 years, followed by those aged 70-79 years (7.0%) and 80 and above (0.5%), while 7.5% of the respondents were aged 20-29 years.

The low participation of youth may be due to job seeking in cities or limited access to land and resources, which often discourage them from farming. The findings of this study are similar to those of Mukwevho et al. (2023) in Vhembe district, who noted that agriculture in developing countries is managed by middle-aged adults, not young people. Mbonane (2018) also noted that younger farmers are more open to adopting new ideas, such as new technologies, while older farmers are more risk-averse and less likely to change their old practices.

4.2.2. Gender distribution of farmers

Figure 4.1 presents the gender distribution of the smallholder maize farmers who participated in the study. The figure illustrates the proportion of male and female respondents in the sample.



Source: Survey data (2025)

Figure 4.1: Gender of the farmer

The results from Figure 4.1 above indicate that 51.2% of the respondents were female farmers, while 48.8% were male farmers. These findings suggest an increase in women's participation in maize production and highlight their growing role in smallholder farming. While women play significant and diverse roles in agriculture, they continue to face dire gender disparities in access to resources, including credit, land and agricultural inputs.

Quisumbing et al. (2014) observed that women frequently have unequal access to resources compared to men and that insufficient data remain on their contributions, decision making and resource utilisation in farming. Addressing these gender inequalities would not only benefit women but would also enhance agricultural productivity and household welfare.

These results are in line with those of Doss (2018), who noted an increase in women involved in farming in Sub-Saharan Africa, indicating a shift towards more inclusive rural livelihoods. Similarly, Oduniyi et al. (2020) found that most women in South Africa are assuming more active roles in farming and farm management, despite disparities in access to credit and institutional support persisting.

4.2.3. Descriptive statistics of farm size

Table 4.2 presents the descriptive statistics for farm size among the sampled smallholder maize farmers. The table reports the minimum and maximum farm sizes, mean farm size and standard deviation.

Table 4.2: Farm size (hectares)

	Minimum	**Maximum**	**Mean**	**Std. Deviation**
Farm size (ha)	1	16	1,793	1,4031

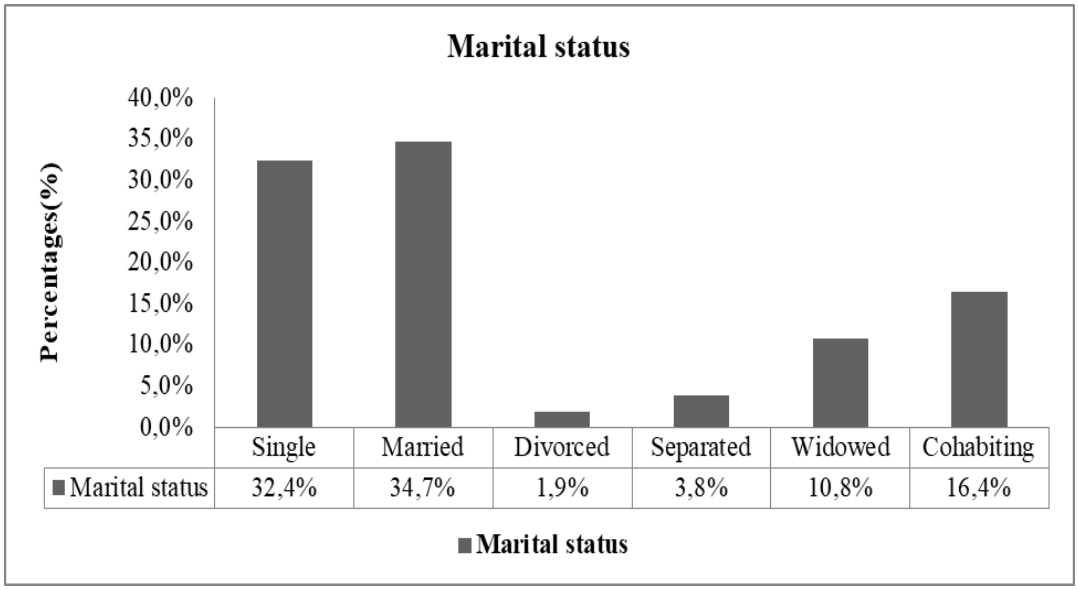
Source: Survey data (2025)

The farm sizes among respondents in the area ranged from 1 to 16 hectares, with an average (mean) of 1.79 hectares and a standard deviation of 1.40 hectares. These results indicate that the majority of the smallholder maize farmers operate on very small plots of land, consistent with the characteristics of smallholder farming systems in South Africa. The relatively high standard deviation in farm size suggests that while the majority are smallholder maize farmers, there is some variation, with a minority managing larger hectares up to 16ha or more.

These finding aligns with those of Sigigaba et al. (2021) who reported that smallholder maize farmers in South Africa operate on very small plots, with some variation but most remaining within the smallholder category. This pattern is a characteristic of smallholder maize farmers in the study area.

4.2.4. Marital status distribution of the farmer

Figure 4.2 presents the marital status distribution of the sampled smallholder maize farmers. The figure shows the proportion of respondents according to their respective marital status categories.



Source: Survey (2025)

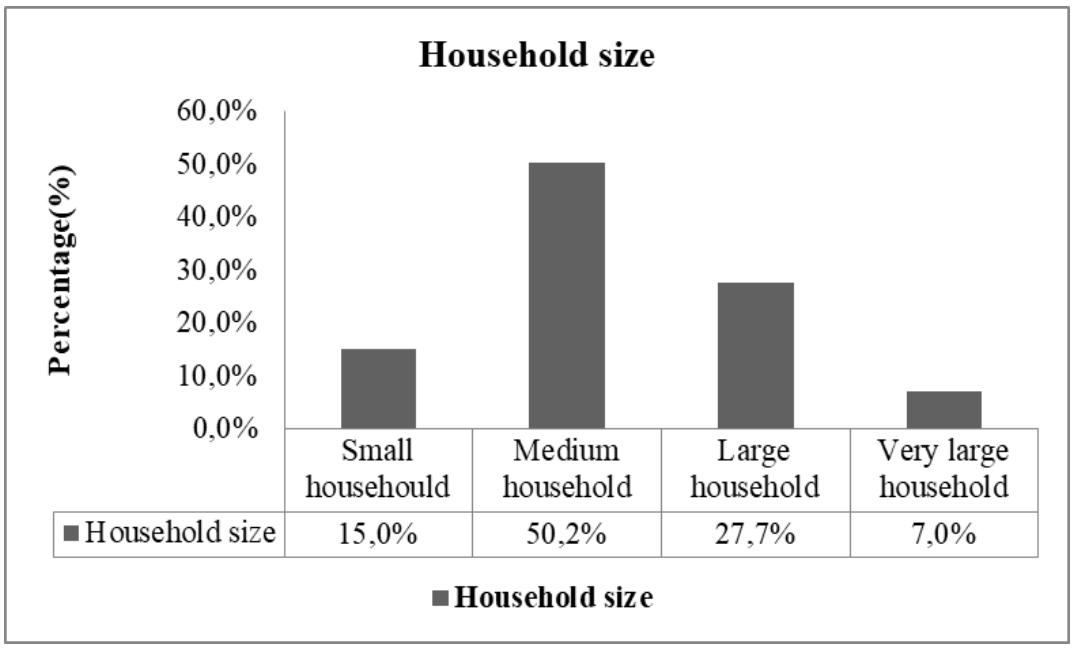
Figure 4.2: Marital status distribution of the farmer

The majority of the farmers in the study area are married (34.7%), closely followed by single farmers (32.4%), suggesting that these two groups dominate the farming population. Cohabiting farmers (16.4%), reflecting a notable number of farmers living with their partners without being formally married, may imply changing family dynamics in rural areas. Widowed farmers account for 10.8%, which may suggest an ageing farming population and the absence of younger replacements in agricultural activities. Separated and divorced farmers constitute 3.8% and 1.9% respectively, which could be due to cultural norms that discourage formal separation or divorce.

These results suggest that marital status plays a vital role in farmers' lives and may influence their decisions, how they manage their households and access support or resources. This result concurs with those of a study by Cele and Mkhize (2025), who found that marital status affects farmers' autonomy, access to resources, and household support. Married farmers often benefit from greater social and economic support, shared labour and joint decision making, which can enhance their ability to adopt new farming practices. Badstue et al. (2020) and Wineman (2019) further reported that single and widowed farmers may have greater autonomy but often face greater challenges in accessing resources and support networks.

4.2.5. Household size

Household size provides an indication of the number of people dwelling together in one household. Figure 4.3 presents the distribution of respondents according to household size. The figure illustrates the different household size categories represented among the sampled farmers.



Source: Survey (2025)

Figure 4.3: Household size

The results indicate that most farming households fall into the medium-sized category (50.2%), making up half of the sample, suggesting that half of the farmers live with a moderate number of family members. About 27.7% of farmers live in larger households, suggesting that extended-family living is still common for some. Small households account for 15.0%, indicating that only a few farmers live alone or with just one or two dependents. Meanwhile, very large households (7.0%) are the least common setting in the study area, showing that only a small portion of farmers live in extended family structures with many members. This distribution shows that the majority of the households are moderate to large in size, which may influence labour availability and decision-making in farming activities.

These finds are consistent with those of studies done by Hlatshwayo et al. (2021) and Manyike et al. (2025), which highlighted that most farming households are medium to large, supporting moderate to extended family structures. This distribution shapes labour availability and decision making, both critical for smallholder farm productivity and resilience.

4.2.6. Descriptive statistics of farm revenue

Table 4.3 presents the descriptive statistics of farm revenue among the sampled farmers. The table provides the minimum and maximum revenue, mean farm revenue and standard deviation.

Table 4.3: Farm revenue (Rands)

	Minimum	Maximum	Mean	Std. Deviation
Farm Revenue (R)	1200	45000	9788,50	5327,861

Source: Survey (2025)

The results indicate that farmers' revenue in the study area ranged from R1200 to R45000, with an average income of R9788.50 and a standard deviation of R5327.86. This suggests that while some farmers earn significantly more, most operate at lower income levels. The variation in farm revenue may be attributed to differences in farm size, productivity, access to markets and availability of resources.

The findings reflect those of Sibanda et al. (2018), who noted that modest income levels, typical of smallholder systems in South Africa, are limited by land constraints, input constraints, and market barriers that restrict earning potential and investment capacity.

4.2.7. Farming experience

Farming experience is an important characteristic that may influence farmers' knowledge of agricultural production, financial services and risk management practices. Table 4.4 presents the descriptive statistics for the number of years that respondents have been involved in farming. The table reports the minimum and maximum years of farming experience, mean and standard deviation.

Table 4.4: Farming experience (years)

	Minimum	Maximum	Mean	Std. Deviation
Farming experience (years)	1	40	10,40	7,808

Source: Survey (2025)

On average, farmers had an average of 10.40 years of farming experience and a standard deviation of 7.81. The results indicate that farmers ranged from 1 and 40 years of farming experience. This shows that, while the sample was diverse, it included both new and experienced farmers. This implies that farmers with more experience may be reluctant to

adopt new practices and technologies, while new farmers may be more open to exploring new practices.

These results align with those of Rapholo and Makia (2020), who revealed that more experience in farming is often related to better perception of climate variability and soil quality, but may also be linked to slower adoption of new practices unless they are supported by extension services

4.2.8. Maximum premium willingness to pay

Table 4.5 presents the descriptive statistics of the maximum premium that respondents were willing to pay for agricultural insurance. The table reports the minimum and maximum premium amounts, mean premium and standard deviation.

Table 4.5: Premium costs

	Minimum	**Maximum**	**Mean**	**Std. Deviation**
Premium cost	30	500	170,23	84,928

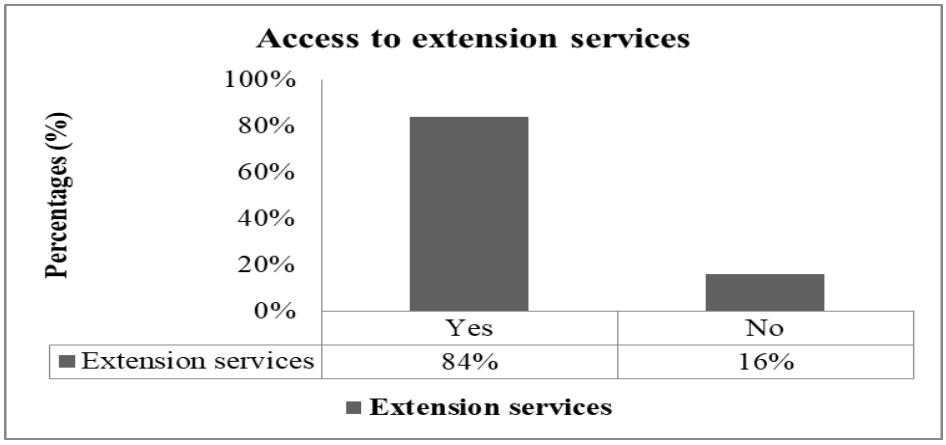
Source: Survey (2025)

The results reveal that the maximum amount farmers were willing to pay for agricultural insurance premiums ranged from R30 to R500, with an average willingness of R170.23 and a standard deviation of R84.93. This indicates that while some farmers preferred relatively low amounts, others demonstrated a greater willingness to invest more, reflecting differences in income levels, perceived risk exposure, trust in insurance providers and benefit of coverage.

This aligns with those of studies done by Muraya et al. (2024) and Zhllima et al. (2025) who reported that willingness to pay for insurance is influenced by a number of factors such as perceived risk exposure, trust and awareness, farm size and experience, and income level, to name a few.

4.2.9. Access to extension services

Figure 4.4 presents the distribution of farmers according to their access to extension services. The figure indicates the proportion of respondents who reported having access to extension services and those who did not.



Source: Survey (2025)

Figure 4.4: Access to extension services

The chart above illustrates the level of access to services among respondents. It reveals that a significant majority of 84% reported having access to these services, while 16% indicated they did not. These suggest that extension services are available and accessible to most individuals within the sampled population. Regardless of this, the 16% without access highlights the need for further efforts to ensure inclusivity and equal support, especially for those who may be in remote or underserved areas. The data reflects a positive trend when it comes to the dissemination of extension services, which is important for improving knowledge, productivity and sustainable practices.

These results are in line with those of a study by Loki et al. (2021), who found that the majority of smallholder farmers reported having access to agricultural extension services, while Akpalu (2013)also reported that a minority still lack access, especially those in remote areas. Both studies highlighted that having access to extension services is important for improving knowledge, productivity and sustainable practices.

4.2. 10. Type of farming method

Farming methods provide an indication of the production practices used by smallholder maize farmers and may reflect their level of adoption of modern agricultural practices. Table 4.6 presents the distribution of respondents according to the farming methods they use. The table distinguishes between traditional methods, modern methods and the use of both traditional and modern farming methods.

Table 4.6: Farming method

Farming method	**Frequency**	**Percentage (%)**
Traditional	9	4,2
Modern	8	3,8
Both	196	92
Total	**213**	**100**

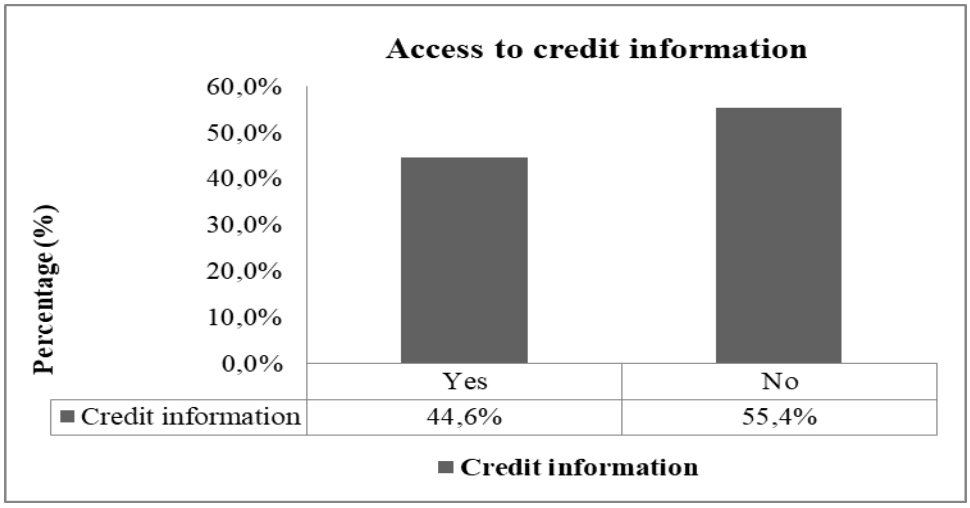
Source: Survey (2025)

The findings indicate that 92% of the smallholder farmers in the study used a combination of traditional and modern farming. This means they practice a hybrid production system that merges indigenous techniques, such as the use of manure, with modern techniques, such as the adoption of improved seeds. Such practices are common among farmers who face limitations in accessing resources; they partially embrace modern farming methods due to factors like cost, risk or limited access to technology.

Only 4.2% of the farmers relied solely on traditional methods, while 3.8 used modern farming methods. The small percentage of farmers opting for modern methods suggests that the full integration of modern technology remains limited. This could be due to financial constraints, inadequate training, or risk-related concerns. Thus, the smaller number of farmers using traditional practices suggests a gradual transition from purely indigenous practices to more modern practices, which offer improved yield and resilience. These results point to a shift in farming systems, with smallholder farmers blending both elements of modernisation while preserving traditional practices.

4.2.11. Access to credit information

Access to information regarding available credit can influence farmers' ability to identify, understand and apply for suitable financial products. Figure 4.5 presents the distribution of sampled farmers according to their access to credit information. The figure shows the proportion of farmers who had access to information about credit and those who did not.



Source: Survey (2025)

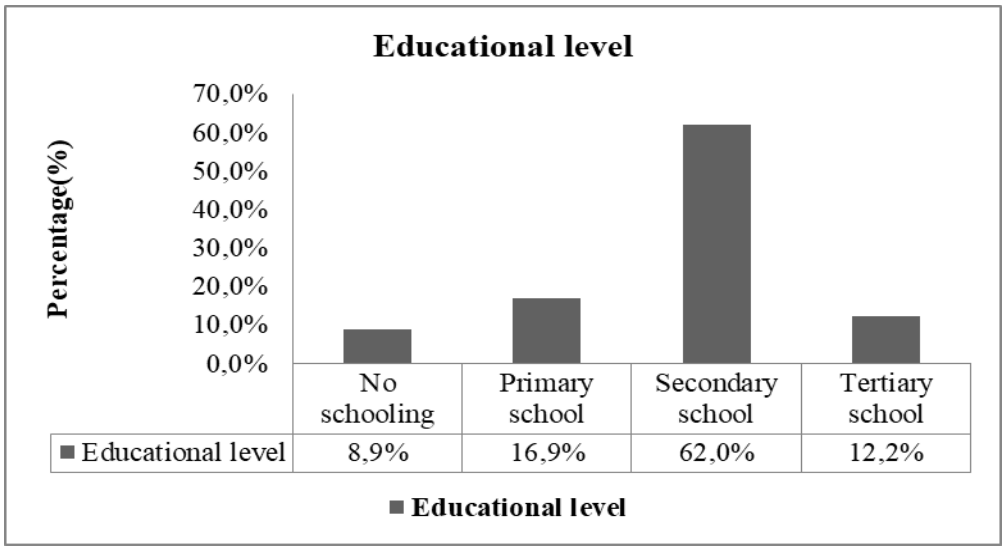
Figure 4.5: Access to credit information

The figure above shows the distribution of respondents based on whether they have access to credit information or not. According to the chart, 44.6% of the respondents reported having access to credit information, while a majority of 55.4% indicated they do not. This reveals a concerning gap in the availability or dissemination of credit information, which could hinder financial inclusion and limit the ability of individuals to make informed financial decisions or access funding, especially in rural or agricultural sectors. Bridging this information gap is important to empower communities with the knowledge needed to take advantage of financial services and improve their economic resilience.

The findings are backed by those of Akande et al. (2023) who reported that the lack of credit information lessens opportunities for investment, the adoption of technology, and income growth. Ultimately, this limits economic resilience and sustainable development, especially in rural areas.

4.2.12. Educational level

Education may influence farmers' ability to understand financial information, complete application procedures and make informed decisions regarding credit and agricultural insurance. Figure 4.6 presents the educational level distribution of the sampled smallholder maize farmers. The figure illustrates the proportion of respondents across the different educational levels.



Source: Survey (2025)

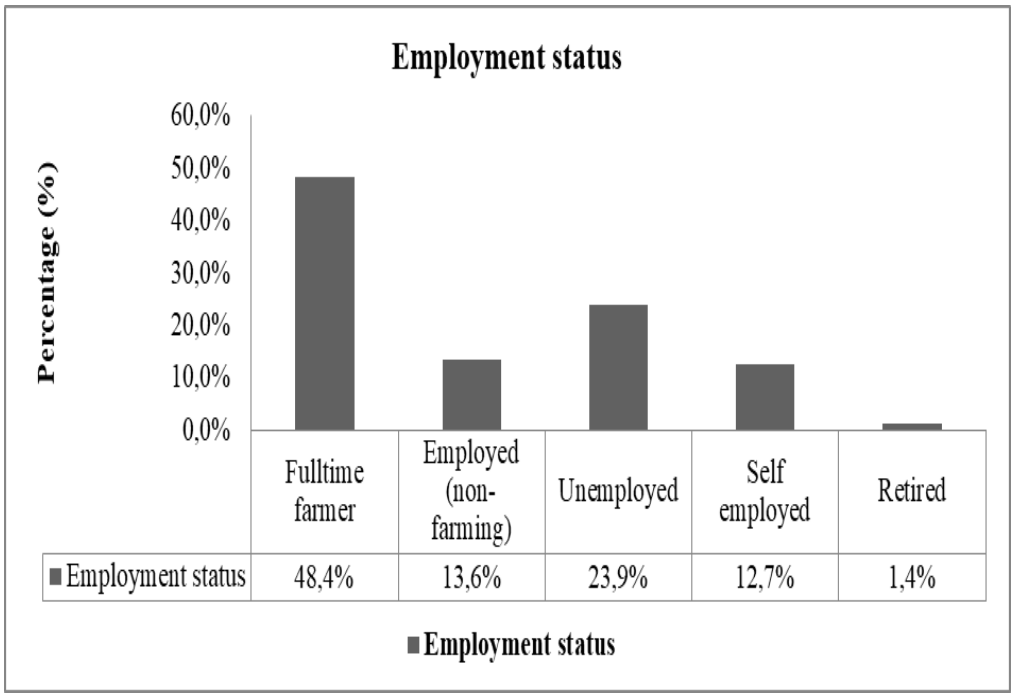
Figure 4.6: Educational level

The results from Figure 4.6 above show that the majority (62.0%) of the respondents in the study area had attained secondary education. This suggests that most respondents have acquired essential literacy and numeracy skills, which are likely to enhance their ability to engage with agricultural information and make informed decisions. Additionally, 16.9% of the respondents reported having primary education, while 12.2% had obtained tertiary education, reflecting a smaller notable group with advanced training. Conversely, 8.9% of the respondents indicated that they had no formal schooling, highlighting the ongoing inequalities in accessing education within the study area. Overall, the findings suggest that although most respondents possess a foundational level of education, opportunities for higher education remain limited for many, possibly affecting their access to resources and life-changing opportunities.

These results reflect those of Myeni et al. (2019) who reported that higher educational levels are associated with greater adoption of sustainable and innovative practices, while lower education levels restrict awareness and uptake of new technologies.

4.2.13. Employment Status

Figure 4.7 presents the employment status of the sampled farmers. The figure shows the distribution of respondents across different employment statuses.



Source: Survey (2025)

Figure 4.7: Employment Status

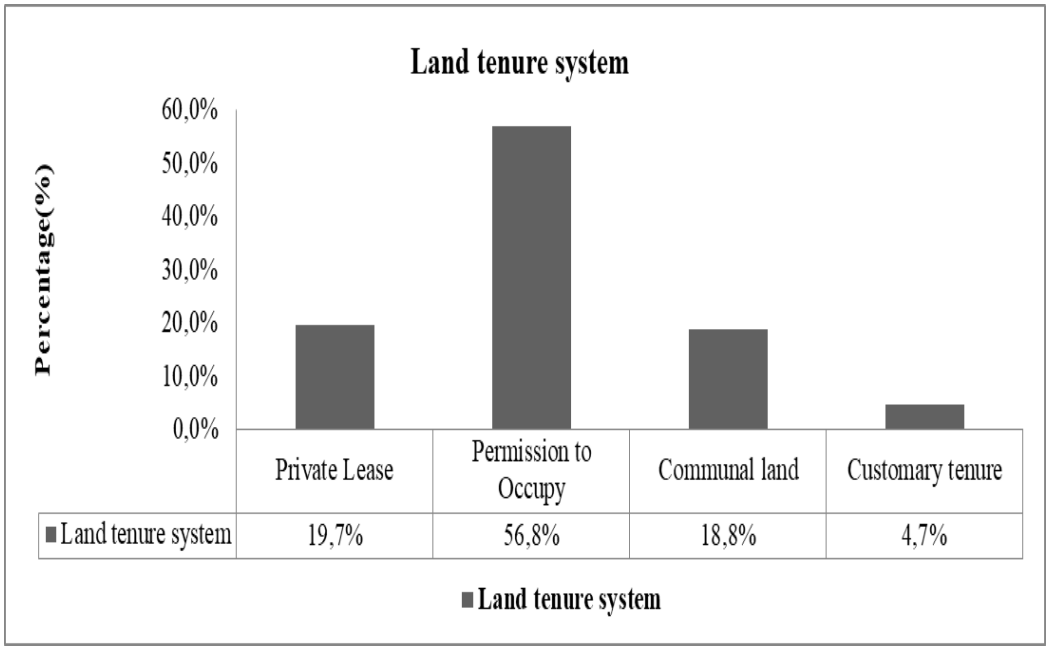
Nearly half of the respondents (48.4%) were full-time farmers, implying that agriculture is the primary activity and source of livelihood for the majority of farming households in the study area. This is followed by 23.9% who reported being unemployed, reflecting a considerable portion of the population that does not have a stable income. A further 13.6% were employed in non-farming sectors, while 12.7% were self-employed, most likely involved in small businesses or informal economic activities to sustain their livelihood. Only a small portion, accounting for 1.4% highlighted that they were retired. These results suggest that agriculture is the primary source of livelihood while also revealing a lack of diverse employment opportunities. This situation may affect household income stability and limit their ability to invest in agricultural activities.

The results are consistent with those of Mdiya et al. (2025), who reported that agriculture remains the backbone of rural livelihoods in South Africa, with the majority of farming households being full-time farmers. Despite this, a significant portion is unemployed, and a minority are employed in non-farming or self-employed. Hajdu et al. (2020) further

highlighted that this pattern shows the limitations of diverse employment opportunities outside agriculture

4.2.14. Land tenure system

Figure 4.8 below presents the distribution of smallholder maize farmers according to their land tenure systems. The figure illustrates the proportion of respondents under the different tenure arrangements identified in the study.



Source: Survey (2025)

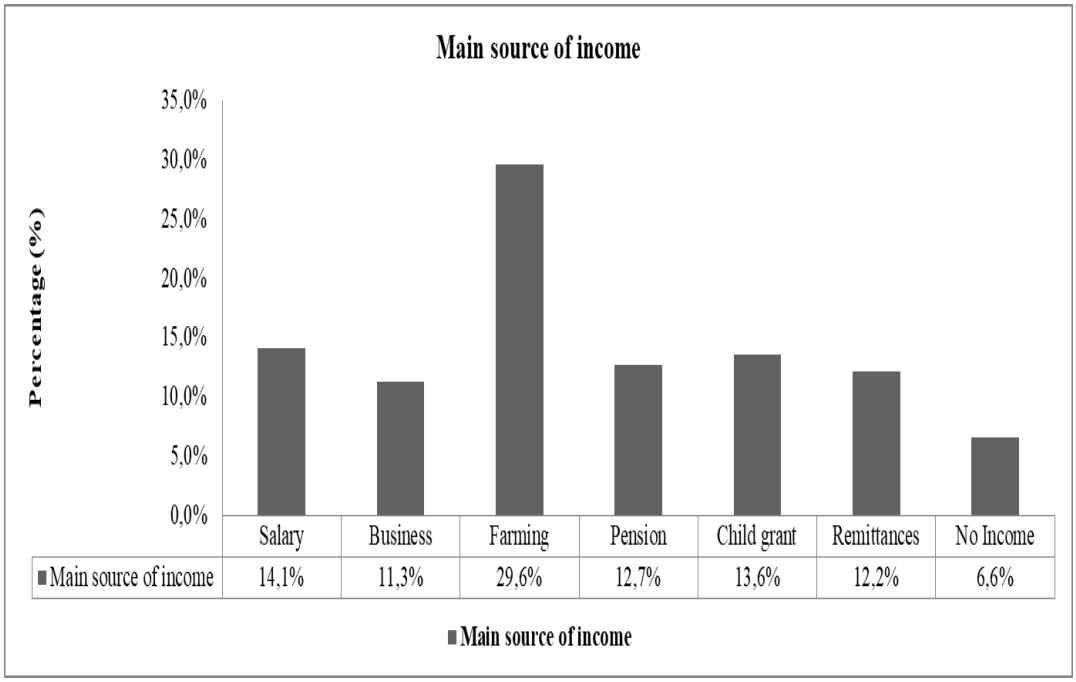
Figure 4.8: Distribution of farmers by land tenure system

The results from Figure 4.8 above show that the majority of farmers (56.8%) operated under Permission to Occupy (PTO) arrangements. This was followed by private lease (19.7%) and communal land (18.8%), while a small proportion (4.7%) reported that they were farming under customary tenure. The dominance of the Permission to Occupy (PTO) system indicates that most farmers in the study area do not have formal land ownership but rather temporary or conditional rights to use land. This type of tenure arrangement may limit farmers' ability to use land as collateral for credit or investment purposes. The smaller proportion of farmers under private lease and customary tenure suggests varied access to secure land rights, which may influence agricultural productivity and willingness to adopt risk management tools like insurance.

These findings are similar to those of a study by Lawry et al. (2017), who revealed that the lack of formal landownership, such as PTO and communal systems, restricts farmers' ability to use land as collateral, limiting access to credit and reducing the incentive for long-term investments.

4.2.15. Main source of income

Figure 4.9 presents the distribution of respondents according to their main source of income. The figure shows the proportion of farmers whose primary income was derived from the different sources identified in the questionnaire.



Source: Survey (2025)

Figure 4.9: Main source of income

Figure 4.9 illustrates that farming (29.6%) is the dominant source of income among respondents, followed by salary (14.1%), child grants (13.6%), pensions (12.7%) and remittances (12.2%). A smaller proportion relies on business activities (11.3%), while 6.6% reported having no income. These finds highlight the centrality of farming as a livelihood source, reinforcing its importance not only as a means of food production but also as a primary economic activity for rural households.

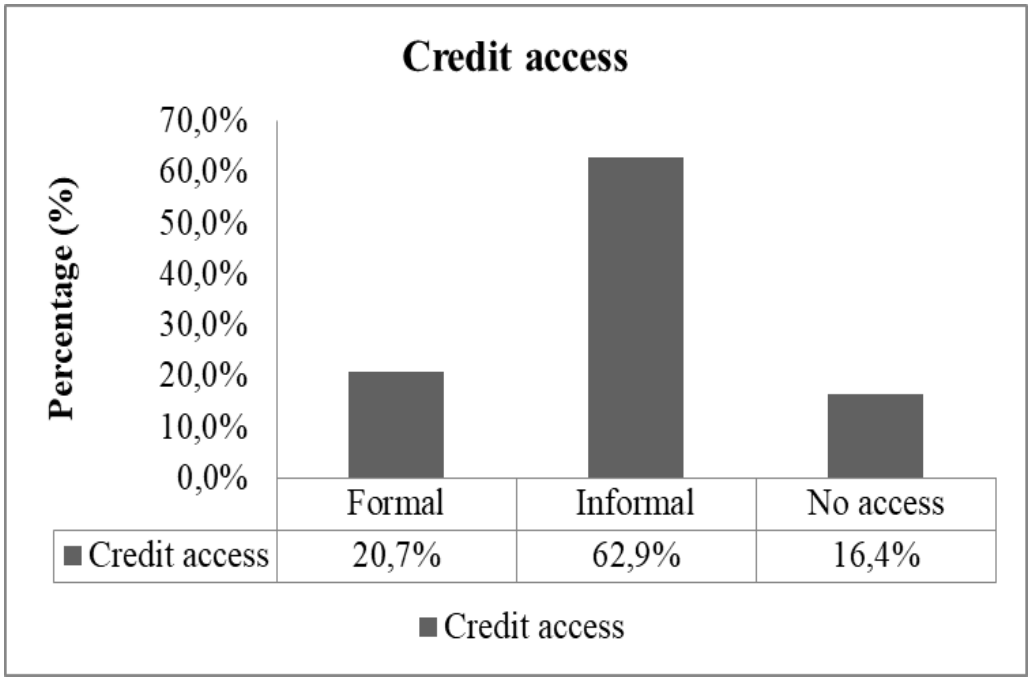
The high proportion of respondents who depend on social grants and remittances indicates limited formal employment opportunities, suggesting that non-farm income diversification

remains constrained. This income structure may also affect farmers' capacity and willingness to invest in agricultural innovations insurance schemes, as disposable income is often limited.

These findings are similar to those of a study by Danso-Abbeam et al. (2020), who revealed that, despite agriculture being the main source of income for rural livelihoods, some farming households still rely on social grants, remittances, and pensions. Iqbal et al. (2021) further reported that reliance on these sources of income is high, especially where there is scarcity of formal employment; this reflects limited income diversification and vulnerability to shocks.

4.2.16. Credit access

Figure 4.10 presents the distribution of sampled smallholder maize farmers according to their access to credit. The figure illustrates the proportion of respondents who had access to credit and those who did not.



Source: Survey (2025)

Figure 4.10: credit access

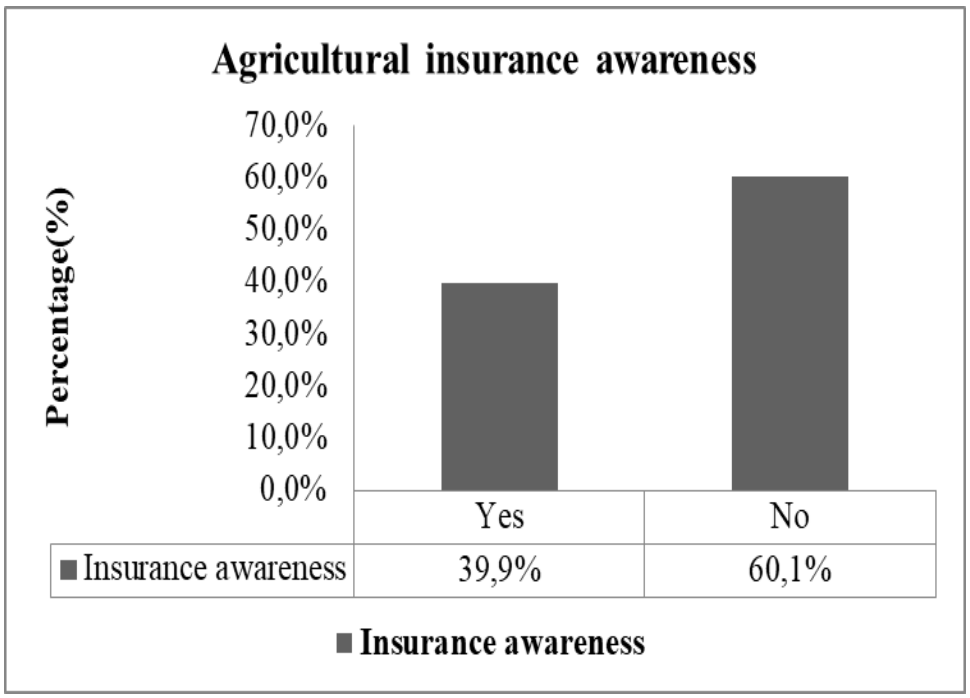
The result from Figure 4.10 above shows that 62.9% of respondents in the study area had access to informal credit, such as loan sharks, friends, and family. Only 20.7% obtained credit from a formal institution such as banks, cooperatives or microfinancial entities, while 16.4% indicated that they had no access to credit at all. This finding reflects a common reality among smallholder farmers in rural South Africa, where limited collateral, strict lending requirements and high transaction costs often make it difficult to obtain formal credit.

Consequently, most farmers turn to informal credit sources, which are more flexible and accessible, even though they may involve higher interest rates or smaller credit amounts.

These findings are similar to those of studies conducted by Myeni et al. (2019) and Chisasa (2015), who highlighted that credit access is a persistent challenge for smallholder farmers in South Africa. The study reported that most farmers turn to informal credit sources such as loan sharks, friends, and family because formal credit is often inaccessible due to strict lending requirements, a lack of collateral and high transaction costs.

4.2.17. Agricultural insurance awareness

Awareness of agricultural insurance is an important consideration in understanding farmers' potential participation in insurance markets. Figure 4.11 presents the level of awareness of agricultural insurance among the sampled smallholder maize farmers. The figure shows the proportion of respondents who were aware of agricultural insurance and those who were not aware of it.



Source: Survey (2025)

Figure 4.11: Agricultural insurance awareness

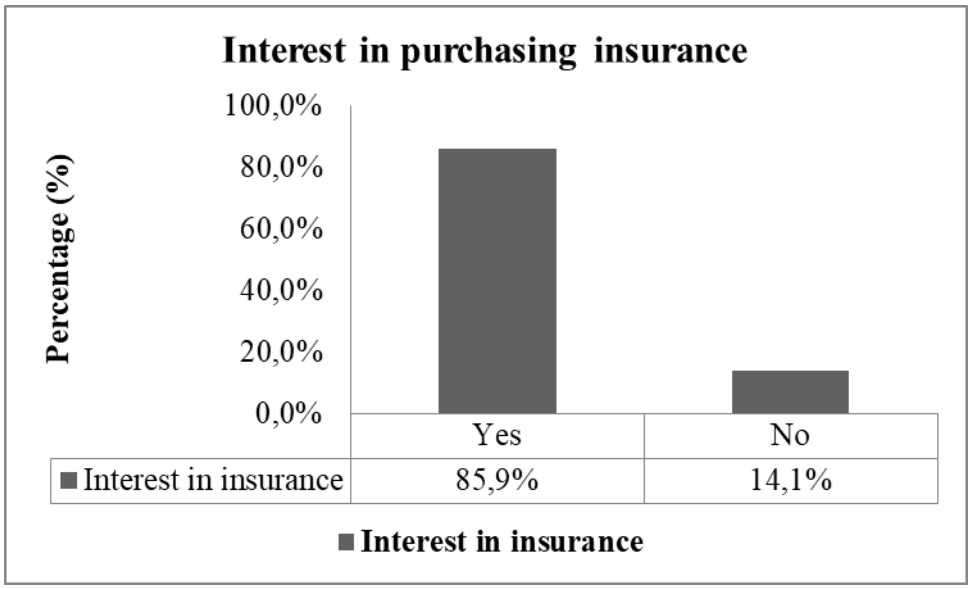
As illustrated in Figure 4.11 above, only 39.9% of the respondents in the study in the area indicated awareness of agricultural insurance, while the majority had no knowledge of insurance. These findings highlight a significant information gap among smallholder farmers

regarding risk management tools such as crop or livestock insurance. Limited awareness could lead to weak information dissemination channels, less engagement between insurers and rural farmers and low exposure to financial education initiatives. As a result, many farmers remain uninformed about how agricultural insurance works, its benefits, and how to access it. This lack of awareness often contributes to low participation rates and may partly explain the reluctance or inability of farmers to insure their agricultural activities.

Mukwevho et al. (2023) reported that the majority of farmers are familiar with other types of insurance, such as car or life insurance, but lack awareness of agricultural insurance as a risk management tool. Jiba et al. (2024) further highlighted that farmers who lack knowledge of how insurance works are less likely to adopt it, leaving them vulnerable to climate and production risks.

4.2.18. Interest in purchasing insurance

Figure 4.12 presents the distribution of respondents according to their interest in purchasing agricultural insurance. The figure illustrates the proportion of farmers who expressed interest and those who did not.



Source: Survey (2025)

Figure 4.12: Interest in purchasing insurance

A substantial proportion of 85.9% farmers revealed that they had an interest in purchasing agricultural insurance, while 14.1% reported no interest. This strong willingness to participate suggests that the majority of the farmers recognise the value of insurance as a tool for

reducing production risks and stabilising income in the face of uncertainties such as drought, pest and fluctuating yields.

These findings align with those of Nshakira-Rukundo et al. (2021), who highlighted that farmers are usually reluctant due to distrust in insurance and concerns about affordability. Awareness and campaigns to bridge the gap between interest and actual participation are recommended.

4.2.19. Skipped planting season

Skipping a planting season may reflect production constraints, financial limitations, climatic risks or other challenges affecting farmers' ability to undertake agricultural production. Table 4.7 presents the distribution of respondents according to whether they skipped a planting season during the previous five years. The table shows the frequency and percentage of farmers who reported skipping planting seasons, those who did not, and those who reported farming for less than five years.

Table 4.7: skipped planting season (5 years)

Skipped planting season (5 years)	Frequency	Percentage (%)
Yes	117	54,9
No	87	40,8
Less than 5 years	9	4,2
Total	**213**	**100**

Source: Survey (2025)

The findings show that 54.9% of the smallholder farmers in the study area reported that they had skipped at least one planting season over the past five (5) years. This indicates that a considerable number of smallholder farmers encounter obstacles that occasionally hinder their planting activities. Some of the reasons highlighted by the farmers included erratic rainfall, lack of inputs, financial limitations, and previous crop failure. Meanwhile, 40.8% of the farmers indicated that they had not skipped any planting season during that timeframe. This group represents relatively stable farmers who may have better access to resources, more reliable income or enhanced resilience strategies, enabling them to plant every year. Additionally, 4.2% of the farmers reported having farmed for less than 5 years.

The overall results suggest that skipping planting seasons is a common occurrence among smallholder farmers. This trend can have major implications on factors such as food security,

household income, willingness to pay for insurance and credit access, as those who frequently skip planting seasons may be more susceptible to shocks and risk-averse.

4.2.20. Type of collateral used when accessing credit

Collateral is an important consideration in credit markets because lenders may require security to reduce the risk associated with lending. Table 4.8 presents the different types of collateral used by smallholder maize farmers when accessing credit in the study area. The table provides the frequency and percentage of respondents using land, farm equipment, infrastructure, cooperative shares or membership and other forms of collateral.

Table 4.8: Type of collateral

Type of collateral	**Frequency**	**Percentage (%)**
Land	19	8,9
Farm Equipment	27	12,7
Infrastructure	34	16
Cooperative shares or membership	6	2,8
Stored produce	19	8,9
Crop in the field	37	17,4
Vehicle	14	6,6
No collateral required	24	11,3
No access to credit	33	15,5
Total	**213**	**100**

Source: Survey (2025)

The findings from Table 4.7 reveal a range of collateral requirements among smallholder farmers, showcasing the diverse lending arrangements they use. The most used form of collateral in the study area was crop in the field (17.4%), which signifies that a majority of farmers depended on production-based collateral, where lenders secure credits against expected harvests rather than fixed assets. This practice is common in smallholder farming, as most farmers often lack access to formal assets such as land. Infrastructure (16%) and farm equipments (12.7%) also emerged as important collateral types, suggesting that some farmers have physical assets that can be used to secure credit, likely through formal or micro financial institutions. Likewise, land (8.9%), although not the most dominant, indicates that a portion of farmers have recognised land rights or ownership documents that enable them to use as security. Other forms of collateral include stored produce (8.9%) and vehicles (6.6%),

which correspond to agricultural and household assets that lenders may accept in flexible collateral arrangements. Cooperative shares or memberships (2.8%) make up a small percentage, suggesting that group-based lending schemes exist, but are not widely used.

Interestingly, 11.3% of the farmers noted that they did not need to provide any collateral to access credit, which may suggest access to microfinancial programmes, informal lenders or government support initiatives that offer unsecured credit. A significant 15.5% reported having no access to credit, underscoring ongoing financial exclusion. This group likely comprises farmers who are unable to meet collateral requirements, confront high transactional costs, or lack the trust and financial knowledge necessary to engage lenders.

4.2.21. Reasons for no credit application

Table 4.9 presents the reasons reported by respondents for not applying for credit. The table shows the frequency and percentage of farmers reporting barriers such as lack of information, fear of debt, high interest rates, collateral requirements and difficulties associated with the application process.

Table 4.9: Reasons for no credit application

Reasons for no application	**Frequency**	**Percentage (%)**
Lack Information	67	31,5
Fear of debt	28	13,1
High interest rates	30	14,1
Collateral requirements	48	22,5
Application process too complex	8	3,8
Applied for before	32	15
Total	**213**	**100**

Source: Survey (2025)

The results in Table 4.8 show some of the key barriers that hinder smallholder farmers in the study area from applying for credit. The most commonly reported reason is lack of information (31.5%), indicating that many farmers do not have a clear understanding of available credit options, eligibility criteria, or application processes. This information gap points to shortcomings in extension services, financial literacy initiatives, and financial institution campaigns. The second major barrier is collateral requirements (22.5%),

suggesting that many farmers feel discouraged by the necessity to provide assets they may lack, such as valuable equipment.

This reflects the systematic challenges of asset-poor households that struggle to fulfil traditional lending requirements. High interest rates (14.1%) also pose a considerable obstacle, as many farmers view borrowing as too costly or financially risky. Closely related to this is fear of debt (13.1%), indicating psychological barriers and risk aversion stemming from uncertainty about agricultural yields and vulnerability to crop failures.

A smaller share of farmers (3.8%) reported the application process being too complex, suggesting that bureaucratic procedures or paperwork may overwhelm those with lower literacy levels or limited administrative experience. Notably, 15% reported that they had previously applied, suggesting they chose not to reapply, possibly because of past experiences, unsuccessful applications or dissatisfaction with prior credit terms. These results emphasise that the barriers faced are not solely financial but also psychological and informational factors.

4.3. Summary of the chapter

The descriptive results showed that the study comprised 213 smallholder maize farmers with diverse socio-economic and farming characteristics. The respondents differed in terms of age, gender, marital status, household size, education level, employment status, land tenure and main source of income. The results also showed variation in farm size, farm revenue and farming experience among the farmers. The findings further indicated differences in farmers' access to extension services and credit information, as well as their access to credit.

Farmers used different farming methods and reported different experiences regarding skipped planting seasons and the use of collateral when accessing credit. The results also showed that farmers had varying levels of awareness of agricultural insurance and different levels of interest in purchasing insurance. The descriptive results provide an overview of the socio-economic, farming and financial characteristics of smallholder maize farmers in Bushbuckridge Local Municipality.

CHAPTER 5: EMPIRICAL RESULTS

5.1. Introduction

This chapter presents the results, interpretation and discussions of the empirical findings of the study. It includes results from the Multinomial Logistic Regression (MLR) used to analyse factors affecting credit. It also involves the Contingent Valuation Method (CVM), which was used to investigate farmers' willingness to pay for insurance, the Ordered Logit Regression (OLR) model, which was employed to analyse factors affecting willingness to pay for insurance and chi-square results used to test for an association between credit access and willingness to pay for insurance.

5.2. Multinomial Logistic Regression results

Table 5.1 shows the results of the multinomial logistic regression analysis that were obtained using Statistical Package for the Social Sciences (SPSS) version 27. It gives analytical information on factors affecting credit access among smallholder maize farmers in Bushbuckridge Local Municipality, Mpumalanga Province, South Africa. The study found that farm size, age of the farmer, access to extension services, gender of the farmer, and access to credit information are directly proportional to formal credit access compared with no access to credit. While informal credit access is directly linked to farm size, the main source of income and gender of the farmer when compared to no access.

The –2 log likelihood of 258.451 indicates the probability at which the null hypothesis will be rejected. The model chi-square is 130.955, derived from the likelihood, and it indicates that the model that has been fitted is accurate. The Cox and Snell R-square is 0.459, which indicates that 45.90% of the variation in the dependent variable is explained by the Multinomial Logistic Regression model. Nagelkerke is 0.547, which indicates a moderately strong relationship of 54.70% between the predictors and prediction. Nagelkerke is higher than the Cox and Snell, indicating a more reliable measure of the relationship.

Table 5.1: Multinomial Logistic Regression results

The reference category: no access					
Type of credit access		**B**	**Std. Error**	**Wald**	**Sig.**
Formal	Farm size (ha)	1.230	.457	7.250	.007**
	Farm Revenue (Rands)	.000	.000	.685	.408
	Age group of the farmer	7.952	2.335	11.600	<.001***
	Education level	-2.575	2.513	1.050	.306
	Employment status	-12.611	2206.537	.000	.995
	Extension service	3.352	1.532	4.785	.029**
	Access to credit information	1.561	.736	4.499	.034**
	Main source of income	-2.590	1.849	1.963	.161
	Gender	2.456	.877	7.847	.005**
	Land tenure system	-1.707	1.474	1.340	.247
Informal	Farm size (ha)	.922	.433	4.539	.033**
	Farm Revenue (Rands)	.000	.000	1.290	.256
	Age group of the farmer	18.372	7191.961	.000	.998
	Education level	- 1.291	1.722	.562	.453
	Employment status	-13.797	1532.487	.000	.993
	Extension service	.523	.787	.441	.507
	Access to credit information	.551	.590	.872	.350
	Main source of income	3.551	1.551	5.244	.022**
	Gender of the farmer	2.733	.778	12.335	<.001***
	Land tenure system	1.998	1.218	2.691	.101
Model summary					
-2 Log Likelihood		258.451			
Chi-Square		130.955			
Pseudo R-Square					
Cox and Snell R square		.459			
Nagelkerke		.547			

Source: Survey (2025)

Note: significant at 1%***, 5% ** 10%* probability level

5.2.1. No access vs. formal credit access

5.2.1.1. Farm size

Farm size has been found to be positive and statistically significant at 5% level, when formal credit access was compared to no access. The findings suggest that an increase in farm size will positively influence the likelihood that a smallholder maize farmer currently with no access to credit will have access to formal credit. This is because financial institutions perceive farmers with bigger land as less risky borrowers, as their land can serve as collateral or an indicator of productive potential.

These findings are similar to those of Chandio et al. (2021), who found that an increase in cultivated land leads to increased demand for formal agricultural credit, as larger farms require more inputs and thus more financing. The results from the study show that farm size is a key factor in determining credit access, with larger landowners being more capable of obtaining credit from formal sources due to their collateral and higher income levels. Borena (2021) and Alabi et al. (2016) also reported that farm size increases the likelihood of accessing formal credit.

5.2.1.2. Age of farmer

Age is a vital factor in determining the credit access of smallholder farmers. The age of the farmer has been found positive and statistically significant at 1% level, when the outcome variable from formal credit access was compared to the outcome variable no access. With reference to the base category an increase in age increases the probability of formal credit access *ceteris paribus*. This implies that older farmers are more likely to access formal credit than younger farmers. This is due to their greater farming experience, social capital and reputation, which improve their credibility with lenders. However, in some contexts, it can also reflect the risk aversion of older farmers who may prefer secure credit sources.

These findings concur with those of a study conducted by Mishra (2021), who reported that age is positively and significantly associated with formal credit access. The results show that, if all other factors are kept constant, each added year of age increases the probability that the respondent will have access to formal credit. This may be attributed to older smallholder farmers' preference for borrowing from formal credit institutions rather than individuals, and to their having accumulated more capital, access to land, or inherited property, which makes it easier for them to access formal credit.

5.2.1.3. Access to extension services

Access to extension services has been found positive and statistically significant at 5% level for formal credit access when compared to no access. This positive coefficient implies that, while holding other factors constant, farmers who reported no access to extension services had higher odds of accessing formal credit compared with those who had access to extension services. This finding suggests that formal credit access among farmers in the study area may also depend on alternative sources of financial information and support..

These findings differ from Dube et al. (2015), who reported that contact with extension services significantly and positively influences the probability of smallholder farmers accessing formal credit. The study further highlighted that each additional day of extension contact increases the likelihood of obtaining formal credit, confirming the importance of extension in reducing credit risk perception and improving access. Ogouvide et al. (2022) also reported that providing training and information improves farmers' skills and confidence in managing credit.

5.2.1.4. Gender of the farmer

The gender of the farmer is significant at 5% affecting access to formal credit. The positive coefficient for gender indicates that being female increases the likelihood of accessing formal credit. This implies that, in some cases, women are more creditworthy than men, who tend to access larger credit amounts or have higher approval rates (Nduka et al., 2019).

These findings are contrary to those of Ukoha et al. (2024), who noted that women tend to be more reliable with repayments, but this does not always translate into greater access or a larger credit size.

5.2.1.5. Access to credit information

Access to credit information has been found positive and statistically significant at 5% level for formal credit access. This suggests that farmers with better access to credit information are more likely to obtain formal credit. Awareness of available credit products, application processes, interest rates and eligibility criteria enhance participation in the formal credit market. Information reduces asymmetric information problems and transaction costs, which are key barriers in rural finance.

These results are similar to those of studies by Ogouvide et al. (2022) and Silong and Gadanakis (2020), who found that farmers who are informed about available credit products,

application procedures, interest rates, and eligibility criteria are more likely to participate in the formal credit market. This knowledge enables them to navigate complex application processes and meet lender requirements. Benson and Faguet (2023) and Jiang et al. (2024) also noted that access to information reduces the gap between lenders and borrowers, addressing key barriers such as moral hazard and adverse selection. This makes lenders more willing to extend credit and improves farmers' bargaining power. Thanh et al. (2022) also highlighted that information regarding credit sources, requirements and processes helps farmers curb unnecessary travel, paperwork and delays, making formal credit more accessible and less costly to obtain.

5.2.2. Summary of results for no access vs. formal credit access

The Multinomial Logistic Regression model indicated that farm size, age, access to extension services, gender and access to credit information significantly differentiated formal credit access from no credit access. Farm size, age and gender were positively associated with formal credit access, while the positive coefficients for extension services and credit information, given their coding, indicate that farmers reporting no access had higher odds of formal credit access than those reporting access. These findings suggest that farm characteristics and demographic characteristics play an important role in differentiating formal credit access from no access. However, the unexpected positive associations for extension services and credit information suggest that access to these institutional and informational channels does not necessarily translate into greater formal credit uptake in the study area and may require further evaluation.

5.2.3. No access vs. informal credit access

5.2.3.1. Farm size

Farm size positively influences informal credit access at 5% significant level. This implies that an increase in farm size will likely increase the probability of farmers accessing informal credit. Even in informal arrangements such as borrowing from friends, relatives or loan sharks, landholding serves as collateral for repayment ability. Larger land owners are perceived as reliable borrowers, which increases their chance of obtaining informal credit.

These results are in line with the study by Falola et al. (2022), which reported that larger farm size increases the likelihood of obtaining informal credit, as it signals higher income and repayment capacity to lenders, even in arrangements without formal collateral. Migheli

(2024) also found that land serves as an indirect form of collateral, improving informal credit access, especially where formal credit is limited.

5.2.3.2. Main source of income

Main source of income was included in the Multinomial Logistic Regression (MLR) model as a categorical variable, using farming (3) as the reference category. The categories were coded as 1 = Salary, 2 = Business, 3 = Farming, 4 = Pension, 5 = Child grants, 6 = Remittances, 7 = No income, and 8 = Others. Thus, the coefficients for the other income categories indicate the difference in the odds of accessing credit compared with farmers whose main source of income was farming, while holding other factors constant.

The results showed that main source of income was statistically significant for informal credit access relative to no credit access. This indicates that the source of income plays an important role in distinguishing farmers who access informal credit from those who have no credit access. These results are consistent with Moahid and Maharjan (2020), who found that household income sources influence participation in informal credit markets The study highlighted that households with stable agricultural income were more likely to access informal credit, while those with irregular or non-agricultural income face greater barriers.

5.2.3.3. Gender of the farmer

Gender plays a major role in informal credit access. It has been found to be positive and statistically significant at 1% level for informal credit access compared to no access. Therefore, the positive coefficient indicates that male farmers have higher odds of accessing informal credit than female farmers, holding other factors constant. This suggests that gender plays an important role in informal credit access among smallholder maize farmers in the study area. The finding may reflect differences in social networks, economic activities and relationships with informal lenders. While women may access informal finance through savings groups and community networks, men may rely more on peers, local traders and business networks.

These findings are consistent with Silong and Gadanakis (2020) and Kadafur and Shehu (2023), who highlighted that women often have access to informal credit through saving groups and community networks, while men usually have access through peers, friends, local traders, and business networks. Kede Ndouna and Zogning (2022) further reported that, regardless of these social networks, women continue to face constraints when accessing

credit. This can be attributed to limited asset ownership education and gender disparities; however, informal channels can partially offset these barriers.

5.2.4. Summary of results for no access vs. formal credit access

The Multinomial Logistic Regression model indicated that farm size, main source of income and gender significantly differentiated informal credit access from no credit access. Farm size was positively associated with informal credit access, indicating that farmers with larger farms had higher odds of accessing informal credit. Main source of income was also statistically significant. Gender was positive and statistically significant, the results indicate that male farmers had higher odds of informal credit access than female farmers, relative to no credit access. The findings suggest that farm characteristics, income source and gender were important factors distinguishing informal credit access from no credit access among smallholder maize farmers.

5.3. Contingent Valuation Method results

The study investigated smallholder maize farmers' willingness to pay for insurance in Bushbuckridge Local Municipality. To achieve this objective, smallholder maize farmers were questioned about their willingness to pay for insurance if it were introduced to them. Those who answered "no' were not asked any additional questions, except for the reason behind their decision, which is reported in Table 5.3. For those who answered "yes", their level of willingness was classified into three (3) different categories: less willing, moderately willing and more willing. The findings were presented using descriptive statistics as shown in Figure 5.1 below.

Table 5.2: Willingness to pay for insurance

Table 5.2 presents the proportion of farmers willing and not willing to pay for agricultural insurance.

Willingness to pay	**Percentage**
Yes	77.5%
No	22.5%

Source: Survey (2025)

Table 5.2 above indicates that 77.5% of smallholder maize farmers in the study area were willing to pay for insurance, while 22.5% were not. These results align with those of a study

conducted by Mukwevho et al. (2023), which reported that the majority of the smallholder farmers were willing to pay for insurance if it were to be introduced to them.

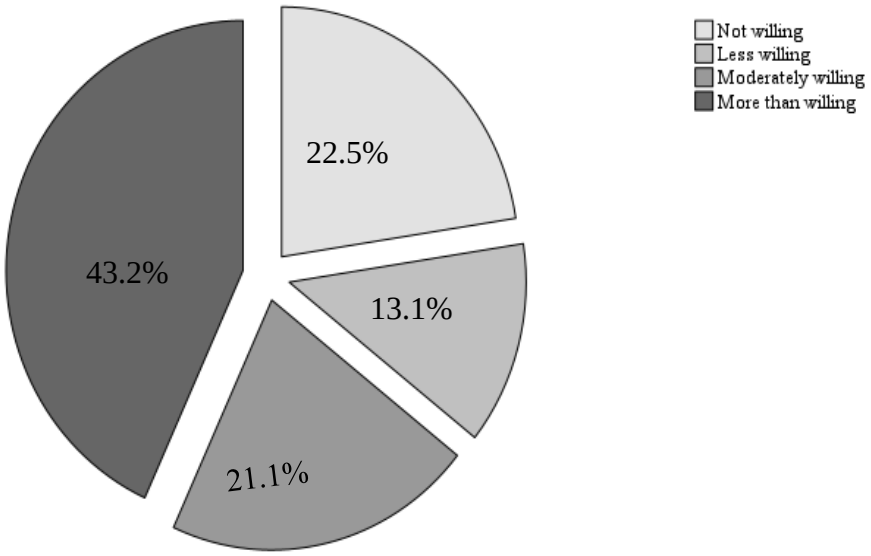


Figure 5.1: The extent to which farmers were willing to adopt insurance

The figure presents the distribution of the extent to which smallholder maize farmers were willing to pay for insurance. The results show that around 43.2% of the farmers indicated that they were more than willing to pay for insurance. The implications are that there is a strong interest or awareness and demand for agricultural insurance as a tool for risk management, especially among farmers who recognise risks associated with climate variability.

Furthermore, 21.1% of the respondents indicated that they were moderately willing to show their openness to insurance; however, their willingness may be influenced by other factors such as premium costs, coverage scope, trust and others. A smaller share of farmers contributed to the less willing and not willing categories, with 13.1% being less willing and 22.5% not willing to pay for insurance. This highlights that although some farmers remain hesitant, the overall attitude or perception towards insurance is positive. These findings align with those of a study by Nguyen (2013), which revealed that the majority of farmers were willing to pay for insurance to safeguard themselves against unforeseen disasters.

Table 5.3: Reasons why other farmers were not willing

Reasons for not willing to adopt insurance	Frequency	Percentage (%)
Lack of trust from insurance providers	3	6,3
I can manage the risks without insurance	5	10,4
I am not happy with the coverage scope	3	6,3
I rely on my own capital for coverage	4	8,3
I am not making enough money from my produce	12	25
Application process is complicated	5	10,4
Total	**48**	**100**

Source: Survey (2025)

The findings indicate that the main barrier to the uptake of agricultural insurance is low farm profitability, with 25% of the respondents indicating that they were not making enough money from their produce in order to cover insurance premiums. This underscores how financial constraints significantly affect risk management choices for smallholder farmers. When operating on under tight profit margins, insurance is often viewed as a low-priority cost, regardless of its potential long-term advantages.

A total of 20.8% of respondents mentioned that they can manage the risks without insurance (10.4%) or consider the application process to be complicated (10.4%). This implies that, in addition to financial issues, farmers encounter procedural and administrative hurdles, and some depend on their own strategies, such as saving money and diversifying their crops.

Concerns about low trust in insurance (6.3%) and dissatisfaction with insurance coverage (6.3%) also emerged as major issues. These responses suggest problems with credibility and a mismatch of products, where the insurance available does not adequately address the specific threats farmers encounter, or where farmers feel that insurance providers fail to offer value for their costs. Furthermore, 8.3% of farmers depend on personal funds to offset losses, showing a preference for self-insurance.

The overall results reveal that financial challenges, lack of trust, dissatisfaction with products, and administrative obstacles collectively hinder the willingness to adopt insurance. These challenges emphasise the necessity for more affordable, transparent, and farmer-focused insurance options, along with enhanced extension services to foster awareness and trust among smallholder farmers.

5.4. Ordered Logistic Regression results

The ordered logistic model was used to identify factors affecting smallholder maize farmers' willingness to pay for insurance. An approximate likelihood-ratio test of the proportional odds assumption, commonly known as the Brant test, was conducted to determine whether the ordered logistic regression satisfies the proportional odds (parallel lines) assumption. However, the Brant test indicated chi-square (28) = 79.62, p = 0.0000, as shown in Table 5.4, suggesting that the proportional odds assumption was violated, as the p value was less than 0.05.

These results implies that the effects of the explanatory variables differ across levels of willingness (not willing, less willing, moderately willing and more than willing to pay for insurance). Because of this, the ordered logistic model does not fit the data well, and its results are not reliable. To solve this problem, the generalised ordered logistic regression model was conducted instead. This model allows the effects of predictors to change across response categories, giving a more accurate analysis.

Table 5.4: Ordered Logistic Regression results

Ordered logistic regression estimates				
Number of observation		213		
LR $chi^2(14)$		26.29		
Prob > chi^2		0.0238		
Log likelihood		-262.38707		
Pseudo R^2		0.0477		
Willingness to pay for insurance	**β**	**Std. Err.**	**Z**	**P>z**
Gender	-.2460636	.2800405	-0.88	0.380
Age group of the farmer	.0446938	.1253103	0.36	0.721
Employment status	-.0352456	.1221335	-0.29	0.773
Main source of income	-.0180503	.0787312	-0.23	0.819
Access to land	-2.384667	1.24644	-1.91	0.056*
Farm size	.1320042	.1145539	1.15	0.249
Farming experience	.0422199	.0246355	1.71	0.087*
Farm revenue	-.0000619	.0000273	-2.27	0.023**
Extensions services	-.5225233	.4416702	-1.18	0.237
Access to credit	.2115286	.2417701	0.87	0.382
Agricultural insurance awareness	-.5159182	.3378874	-1.53	0.127
Interest in purchasing insurance	.9903243	.5066464	1.95	0.051*
Premium cost	.0028546	.0018389	1.55	0.121
Household size	1745861	.1877984	0.93	0.353
cut1 -2.84483 1.676869 (Ancillary parameters)				
cut2 -2.148932 1.669375				
cut3 -1.203664 1.668683				
Approximate likelihood-ratio test of proportionality of odds across response categories:				
$chi^2(28)$ = 79.62				
Prob > chi^2 = 0.0000				

Note: significant at 1%*, 5% ** 10%* probability level**

As established above, the proportional odds assumption for the ordered logistic model was violated. When this assumption does not hold, the model becomes restrictive and may yield misleading estimates. By contrast, the generalised ordered logistic regression model relaxes

this constraint, allowing parameter estimates to differ across categories of the dependent variable. This approach offers a more flexible and reliable framework for analysing the determinants of willingness. Since the proportional odds assumption was not met, using the generalised ordered logistic regression model allowed for a more accurate understanding of how the explanatory variables relate to different levels of willingness to pay.

5.4.1. Generalised ordered logistic model

The generalised ordered logistic regression model was estimated to address the violation of the proportional odds assumption identified in the ordered logistic regression model. The model produces separate sets of coefficients for each level of willingness to pay for insurance. This structure allows each explanatory variable to have different effects across categories, providing greater flexibility than the constrained ordered logistic regression model.

Table 5.5: Generalised ordered logistics results

Willingness to pay for insurance		**β**	**Robust Std. Err.**	**Z**	**P > z**
Not willing to pay (Y=0)					
Gender of the farmer	Male	-57.45677	28.98172	-1.98	0.047**
Age group of the farmer	30 to 39	27.67372	14.47723	1.91	0.056*
	40 to 49	42.43138	21.74169	1.95	0.051*
	50 to 59	-5.046737 3	.462068	-1.46	0.145
	60 to 69	11.32088	5.433802	2.08	0.037**
	70 to 79	106.9363	43.99735	2.43	0.015**
Main source of income	Business	-34.48013	17.43934	-1.98	0.048**
	Farming	-44.73273	22.77066	-1.96	0.049**
	Pension	-1.924382	2.029815	-0.95	0.343
	Child grant	.227138	1.287258	0.18	0.860
	Remittances	-44.1051	22.63168	-1.95	0.051*
	No Income	-44.05933	21.95519	-2.01	0.045**
Access to land	No	-7.293599	16.13699	-0.45	0.651
Farm size		15.15639	7.539054	2.01	0.044**
Farming experience		-.3182375	.1597228	- 1.99	0.046**
Farm revenue		.0036431	.0018379	1.98	0.047**
Extension services	No	-91.95209	45.95378	-2.00	0.045**
Access to credit	Informal	10.2164	6.555533	1.56	0.119
	No access	33.49438	17.57813	1.91	0.057*
Insurance awareness	No	-60.13956	30.54312	-1.97	0.049
Interest in insurance	No	-27.38372	14.14293	-1.94	0.053*
Premium costs		-.0455997	.0254584	-1.79	0.073*
Constant		**4.086063**	**1.72732**	**2.37**	**0.018****
Less willing to pay (Y=1)					
Gender	Male	.4305675	.9396961	0.46	0.647
Age group of the farmer	30 to 39	1.11052	1.736179	0.64	0.522**
	40 to 49	1.18109	1.874619	0.63	0.529
	50 to 59	3.45497	.339904	1.48	0.140

	60 to 69	3.194199	2.413117	1.32	0.186
Main source of income	Business	-.4967625	1.174705	-0.42	0.672
	Farming	-1.510035	1.211238	-1.25	0.213
	Pension	24.31274	2.250801	10.80	0.000***
	Child grant	-3.458128	1.372187	-2.52	0.012**
	Remittances	-1.853438	1.111701	-1.67	0.095*
Farm size		-1.321937	.5898208	-2.24	0.025**
Farming experience		-.1083369	.1744553	-0.62	0.535
Farm revenue		-.0001555	.000103	-1.51	0.131
Extension services	No	26.90722	1.188002	22.65	0.000***
Access to credit	Informal	.2431697	.7513417	0.32	0.746
	No access	1.221872	2.074546	0.59	0.556
Insurance awareness	No	.7075474	.6208494	1.14	0.254
Interest in insurance	No	72.77032	3.200728	-22.74	0.000***
Premium costs		.0037117	.0061283	0.61	0.545
Constant		**4.596706**	**2.182492**	**2.11**	**0.035****
Moderately willing to pay (Y=2)					
Gender of the farmer	Male	-1.179571	.5667093	-2.08	0.037**
Age group of the farmer	30 to 39	2.360157	1.407828	1.68	0.094*
	40 to 49	1.642734	1.351947	1.22	0.224
	50 to 59	1.222146	1.383774	0.88	0.377
	60 to 69	1.453027	1.771175	0.82	0.412
Main source of income	Business	-.9909684	.8556077	-1.16	0.247
	Farming	.5457019	.7464812	0.73	0.465
	Pension	.8719922	1.415637	0.62	0.538
	Child grant	-1.618384	1.024858	-1.58	0.114
	Remittances	-1.00192	.7475363	-1.34	0.180
Farm size		.6559043	.1967893	3.33	0.001***
Farming experience		.0235314	.0519221	0.45	0.650
Farm revenue		-.0001662	.0000719	-2.31	0.021**
Extension services	No	.9497845	1.02168	0.93	0.353
Access to credit	Informal	1.627648	.5924743	2.75	0.006***

	No access	2.91764	1.007453	2.90	0.004***
Insurance awareness	No	-.0080763	.5452991	-0.01	0.988
Premium costs		-.0005906	.0033365	-0.18	0.860
Constant		**-2.020037**	**1.63939**	**-1.23**	**0.218**
Model summary					
Number of observation		213			
Log pseudo likelihood		-105.74209			
Pseudo R^2		0.6162			

Note: significant at 1%*, 5% ** 10%* probability level**

The results from Table 5.5 demonstrate that several variables exhibit coefficients that vary substantially across the willingness categories, confirming the presence of non-parallel relationships. For example, factors such as age group and gender, economic characteristics such as main source of income and farm revenue, and farm-related characteristics such as farm size and access to extension service display differing directions and magnitudes across the three equations. This pattern reinforces the need for a model that allows threshold-specific effects rather than assuming a uniform influence across all levels of willingness.

Conversely, the raw coefficients from the generalised ordered logistic model represent changes in log-odds, which are not directly meaningful for practical interpretation. The signs and magnitudes vary across categories, but they do not directly indicate how each variable affects the probability of belonging to a given willingness category. Because of this limitation, interpreting the generalised ordered logistic model coefficients alone would not provide clear or intuitive insights into how the explanatory variables influence willingness.

For this reason, the analysis of this study does not rely on the generalised ordered logistic model coefficients for substantive interpretation. Instead, marginal effects were computed to translate the model estimates into changes in predicted probabilities. These marginal effects provide a more intuitive and policy-relevant understanding of how each variable influences the likelihood of falling into each willingness category. Accordingly, the next section presents the marginal effects from the generalised ordered logistic model, which served as the basis for interpreting and discussing the findings of the study.

5.4.2. Generalised Ordered Logistic Regression with marginal effects

The marginal effects from the Generalised Ordered Logit Model show how a one-unit increase in each predictor changes the probability of respondents falling into one of the four willingness-to-pay categories, defined as Y=0 (not willing to pay), Y=1 (less willing), Y=2 (moderately willing), and Y=3 (more willing). These changes demonstrate the influence of demographic, economic, and farm-related characteristics on attitudes toward agricultural insurance. It highlights, in particular, that an increase in a predictor may shift probability from lower to higher categories, or vice versa, depending on the direction of its effect. The following discussion provides a detailed explanation of these effects and discusses their practical implications. The marginal effects demonstrate that each variable alters the probability distribution of farmers' willingness to pay across categories, maintaining the total probability at 100%. Gender, age, income source, farm size, land access, extension services, credit, and insurance awareness emerge as the most influential factors. Continuous variables are interpreted as per-unit changes in probability, while categorical variables are assessed relative to reference groups..

Table 5.6: Generalised Ordered Logistics Regression marginal effects

Variable	P(Y=0) dy/dx	Std. Error	P>|z|	P(Y=1) dy/dx	Std. Error	P>|z|	P(Y=2) dy/dx	Std. error	P>|z|	P(Y=3) dy/dx	Std. error	P>|z|
Gender (male)	.3342968	.0131436	0.000***	-.3657433	.069889	0.000***	.1806994	.0947887	0.057*	-.1492529	.0701019	0.033**
Age (30-39)	-.1514365	.0228852	0.000***	.0468816	.1657131	0.777	-.1939545	.188132	0.303	.2985093	.1424824	0.036**
Age (40-49)	-.2703763	.0093345	0.000***	.1599927	.1776009	0.368	-.0930324	.1838153	0.613	.203416	.1364304	0.136
Age (50-59)	.0371929	.0183671	0.043**	-.2764292	.1763565	0.117	.0925354	.1925748	0.631	.1467009	.1472197	0.319
Age (60-69)	-.047125	.0063004	0.000***	-.1828242	.1829078	0.318	.0522294	.2327239	0.822	.1777199	.1989606	0.372
Age (70-79)	-.6195741	.0508688	0.000***	1.116801	.174614	0.000***	-1.084898	.1765883	0.000***	.5876715	.129566	0.000***
Age (80-89)	0	-	-	-.502773	.1683656	0.003***	.9151016	.1765883	0.000***	-.4123285	.129566	0.001***
Source of income (business)	.1815096	.0078697	0.000***	-.1548241	.0618373	0.012**	.1129032	.1182746	0.340	-.1395886	.1143097	0.222
Source of income (farming)	.2497726	.0127304	0.000***	-.1449116	.0829912	0.081*	-.1795087	.1146171	0.117	.0746478	.1026403	0.467
Source of income (pension)	.0116895	.0161149	0.468	-.096787	.0404722	0.017**	-.0311366	.1813664	0.864	.1162341	.1823805	0.524
Source of income (child grant)	-.0015962	.0092304	0.863	.3134143	.0894817	0.000***	-.091816	.1236318	0.458	-.2200021	.1241075	0.076*
Source of income (remittances)	.2441638	.0107053	0.000***	-.1059415	.0799761	0.185	.0028558	.1131251	0.980	-.1410782	.1020124	0.167
Source of income	.2437624	.0158957	0.000***	.4502008	.0350247	0.000***	-1.05536	.0797146	0.000	.3613971	.080978	0.000***

(no Income)												
Access to land (No)	.069752	.117721	0.554	-.069752	.117721	0.554	-.3665166	.0272768	0.000***	.3665166	.0272768	0.000***
Farm size	-.1709893	.027791	0.000***	.2665309	.0480393	0.000***	-.178419	.0434423	0.000***	.0828742	.0238528	0.001***
Farming Experience	0035903	.0009774	0.000***	.00424	.0125369	0.735	-.0108034	.0132257	0.414	.0029732	.0065559	0.650
Farm Revenue	.0000411	6.97e-06	0.000***	.0000523	9.90e-06	0.000****	9.76e-06	.0000107	0.360	-.000021	8.61e-06	0.015**
Extension Services (No)	.4388438	.017337	0.000***	-.6362565	.0412175	0.000***	.077217	.1239372	0.533	.1201957	.1246287	0.335
Credit access (Informal)	-.073551	.0270525	0.007***	.0552729	.0552076	0.317	-.1929975	.0763927	0.012**	.2112756	.0720027	0.003***
Credit access (No access)	-.2107444	.0414651	0.000***	.1356776	.1035024	0.190	-.297759	.1317174	0.024**	.3728258 .	.0976715	0.000***
Insurance Awareness (No)	.4475481	.0245433	0.000***	-.4968992	.046509	0.000***	.0503709	.0724068	0.487	-.0010198	.0688142	0.988
Interest in Agricultural (No)	.196004	.0230873	0.000***	.5051918	.0436084	0.000***	-1.119995	.0368656	0.000***	.418799	.0345308	0.000***
Premiums costs	.0005144	.0001304	0.000***	-.0007827	.0004229	0.064**	.0003429	.0005517	0.534	-.0000746	.0004216	0.860
Note: significant at 1%*, 5% ** 10%* probability level** **Note: dy/dx for factor levels is the discrete change from the base level**.												

5.4.1.1. Gender of the farmer

The generalised ordered logistic regression results indicate that gender significantly affects farmers' willingness to pay for insurance. Male farmers are more likely than female farmers to occupy the extreme ends of the willingness spectrum. Being male increases the probability of not being willing to pay (Y=0) by 33.4 percentage points and decreases the probability of being less willing to pay (Y=1) by 36.6 percentage points. The probability of being moderately willing to pay (Y=2) increases by 18.1 percentage points, while the probability of being more willing to pay (Y=3) decreases by 14.9 percentage points.

These findings suggest that male farmers tend to exhibit more polarised responses, whereas female farmers are more evenly distributed across moderately and more than willing categories. This suggests that when insurance programs targets male farmers, they may need to address factors such as trust issues or perceived value to shift them towards higher willingness.

5.4.1.2 Age group of the farmer

Age demonstrates a complex, non-linear association with willingness to pay. Farmers aged 30–39 years, experience a 15.1 percentage points reduction in the probability of not willing to pay (Y=0) and a 29.9 percentage points increase in the probability of being more than willing (Y=3), with minimal changes in the less willing (Y=1) and moderately willing (Y=2) categories. A similar pattern is observed among those aged 40–49 years, who show a 27.0 percentage-point decrease in Y=0 and a 20.3 percentage-point increase in Y=3.

In contrast, older farmers, particularly those aged 70–79, display pronounced shifts, the probability of being not willing to pay decreases by 61.96 percentage points, the probability of being less willing increases by 111.7 percentage points, moderately willing decreases by 108.5 percentage points, and more willing increases by 58.8 percentage points Farmers aged 80–89 concentrate more strongly in Y=2, with a 91.5-point increase, showing moderate but cautious willingness, possibly due to fixed incomes and high vulnerability to risk. These findings suggest that the influence of age on willingness to pay is highly non-linear and differs across categories.

5.4.1.3. Main source of income

Income source significantly influence willingness to pay for insurance. Farmers whose primary income is derived from business, experience an 18.2 percentage-point increase in the probability of not willing to pay (Y=0) and a 15.5 percentage-point decrease in the

probability of being less willing (Y=1). The probability of being moderately willing increases by 11.3 percentage points, while the probability of being more willing decreases by 13.9 percentage points. Similarly, depending on farming income increases Y=0 by 24.9 percentage points, decreases Y=1 by 14.5 percentage points, decreases Y=2 by 17.9 percentage points, and slightly increases Y=3 by 7.5 percentage points. Recipients of child grants are 31.3 percentage points more likely to be less willing (Y=1) and 22.0 percentage points less likely to be more willing (Y=3), with minimal change in the probability of being not willing (Y=0). Income from remittances also increases unwillingness (Y=0 increases by 24.4 points), likely because they prioritise immediate household necessities. Farmers with no income display substantial shifts: a 24.4 percentage-point increase in Y=0, a 45.0 percentage-point increase in Y=1, a 105.5 percentage-point decrease in Y=2, and a 36.1 percentage-point increase in Y=3. These results indicate that both stable and unstable income sources significantly influence willingness, often resulting in polarisation toward low or high willingness categories.

5.4.1.4. Access to land

Access to land and other farm characteristics also shape willingness patterns. Farmers without access to land are significantly less likely to be moderately willing (Y=2 decreases by 36.7 percentage points) and more likely to be highly willing (Y=3 increases by the same amount). This suggests that farmers who do not have access to land may feel more exposed to risk and therefore more eager to purchase insurance.

5.4.1.5. Farm size

A one-unit increase in farm size (e.g., one more hectare) reduces the probability of not willing (Y=0) by 17 points but increases the probability of being less willing (Y=1) by 26.7 points, indicating that larger farm owners may perceive insurance as beneficial but still weigh costs carefully.

5.4.1.6. Farming experience

Each additional year of farming experience slightly increases both Y=0 (not willing) and Y=1 (less willing) while reducing Y=2 (moderately willing), with small increases in Y=3 (more willing). This implies that experienced farmers appear more doubtful but also more responsive to high-value insurance offerings, producing a split between less and more willingness.

5.4.1.7. Access to extension services

Access to extension services is a key determinant of willingness to pay. Absence of extension services increases the probability of not willing to pay (Y=0) by 43.9 percentage points and decreases the probability of being less willing (Y=1) by 63.6 percentage points, with only minor increases in the moderately willing (Y=2) and more willing (Y=3) categories. This implies that lack of extension services strongly increases reluctance. Outreach and training are essential to improve insurance uptake.

5.4.1.8. Credit access

Farmers lacking credit access are 21.1 percentage points less likely to be not willing (Y=0), 29.8 percentage points less likely to be moderately willing (Y=2), and 37.3 percentage points more likely to be more willing (Y=3), suggesting that insurance may function as a substitute for formal credit. These results underscore that informal access helps farmers adopt insurance while lack of formal credit shifts farmers toward extremes in willingness

5.4.1.9. Agricultural insurance awareness

Lack of insurance awareness increases the probability of being not willing (Y=0) by 44.8 percentage points and decreases the probability of being less willing (Y=1) by 49.7 percentage points, with negligible effects on higher willingness categories. This implies that awareness is critical. Educating farmers about insurance benefits can greatly reduce unwillingness.

5.4.1.10. Premium costs

Premium costs exert minimal practical influence on willingness to pay. A one-unit increase in premiums raises the probability of being not willing (Y=0) by only 0.05 percentage points and reduces the probability of being less willing (Y=1) by 0.08 percentage points, with negligible effects on the moderately willing and more willing categories. These findings indicate that price is a relatively minor factor compared to socio-economic, demographic, and farm-level characteristics.

5.4.1.11. Farm revenue

Farm revenue, measured as a continuous variable, has relatively small effects, but the direction suggests that increases in revenue slightly lower the probability of high willingness (Y=3), possibly because better-off farmers diversify their risk through alternative means. This suggests that revenue has minor influence; willingness is less tied to income and more to perceived risk.

5.4.1.12. Interest in purchasing insurance

Farmers with no interest in agriculture exhibit huge reductions in moderately willingness (Y=2 decreases by 112 points) and increases in unwillingness and high willingness. This unusual pattern suggests that disengaged farmers react inconsistently to risk and insurance, making them a challenging group to target.

5.5. Summary of Ordered Logistic Result results

The marginal effects show that demographic factors (gender, age), economic factors (main source of income, farm revenue) and farm-related and institutional factors (farm size, access to extension services, access to credit) each shift the probability of farmers falling into different willingness to pay categories, sometimes in counter-intuitive directions. This implies that farmers' willingness to pay for agricultural insurance is shaped by a combination of demographic circumstances, economic security and access to credit and extension support, and that insurance promotion strategies may need to be tailored to these different sub-groups rather than applied uniformly.

5.5. Chi-square results

This section presents the chi-square test of association between type of credit access and willingness to pay for insurance. Table 5.7 cross-tabulates credit access (formal, informal, no access) against the four willingness-to-pay categories, followed by the results of the Pearson chi-square test.

Table 5.7: The association between credit and willingness to pay for insurance

Type of credit	Not willing	Less willing	Moderately willing	More than willing	Total
Formal	3 (6.8%)	9 (20.5%)	20 (45.5%)	12 (27.3%)	44 (100%)
Informal	35 (26.1%)	18 (13.4%)	19 (14.2%)	62 (46.3%)	134 (100%)
No Access	10 (28.6%)	1 (2.9%)	6 (17.1%)	18 (51.4%)	35 (100%)
Total	48 (22.5%)	28 (13.1%)	45 (21.1%)	92 (43.2%)	213 (100%)

Chi-square tests			
	Value	**df**	**Asymptotic significance (2-sided)**
Pearson chi-square	29,843	6	<,001
Likelihood ratio	30,355	6	<,001
Linear-by-linear association	,016	1	,899

Source: Survey data (2025)

The results reveal an association between credit access and willingness to pay for insurance among smallholder maize farmers in the study area. Although the analysis is correlational, the pattern suggests that certain forms of credit access may influence willingness to pay for insurance. For instance, among farmers with access to formal credit, such as commercial banks and government institutions, 45.5% were moderately willing, 27.3% were more than willing, and only 6.8% were not willing to pay for insurance.

This suggests that access to formal credit helps farmers improve their financial stability and increase their confidence in investing in risk management tools such as insurance. These findings are consistent with Ai et al. (2023), who found that there is a correlation between agricultural insurance and credit, with each supporting the development of the other; the relationship has strengthened over time. Improved access to credit enables farmers to obtain insurance, while expanded insurance coverage improves financial stability and creditworthiness.

Moreover, these farmers may view insurance as a reliable protection against potential financial instability, owing to prior experiences of more efficient recovery from losses when insured. For example, consider a farmer who once faced severe drought but managed to sustain operations through an insurance payout, reinforcing their belief in insurance as a necessary investment. This indicates that these farmers likely associate credit access with enhanced security, through boosting their psychological readiness to invest in insurance as a risk management tool.

Farmers who had access to informal credit, such as borrowing from friends, relatives, and loan sharks, also demonstrated a strong willingness to pay, 46.3% being more than willing, while 14.2% were moderately willing, and a noticeable 26.1% were not willing. This may be due to the inconsistent income flows and the high interest rates charged by informal lenders. Interestingly, among farmers with no access to credit, 51.4% were more than willing to pay for agricultural insurance, while 28.6% were not willing.

This suggests that financially excluded farmers may perceive insurance as a form of protection against unexpected losses. These results are similar to those of Marr et al. (2016) who found that in developing countries, smallholder farmers with limited access to credit may use insurance as a substitute for financial security. This suggests that when credit is unavailable or difficult to obtain, insurance may help overcome investment obstacles.

The chi-square test confirms that these differences are statistically significant (Pearson chi-square = 29.843, df = 6, $p < 0.001$), indicating a significant relationship between credit access and willingness to pay for insurance. This suggests that credit access not only affects farmers' ability to borrow but also influences how farmers view and use insurance. Credit and insurance usually go hand in hand. Farmers who borrow money are more likely to insure their farms, while those who cannot borrow may want insurance even more because they are financially vulnerable.

These results are consistent with the credit rationing theory as defined by Stiglitz and Weiss (2000) , who stated that credit access not only shapes one's borrowing capacity but also influences farmers' perception of financial security. This suggests that future policies should promote credit-linked insurance schemes and improved access to both credit and insurance, with more focus on smallholder financial exclusion.

CHAPTER 6: SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1. Introduction

This chapter provides the overall findings of the study and offers conclusions derived from the empirical results. It is also necessary to revisit the initial objectives and hypothesis of the study to evaluate whether they were achieved or supported by the data. Furthermore, this chapter summarises the key results of the study, and it also outlines practical and theoretical recommendations that emerge from the study. These recommendations are meant to guide policy-makers, practitioners and future researchers in addressing the challenges identified and bridging the gap identified in the study.

6.2. Research summary

The study was conducted in Bushbuckridge Local Municipality, Mpumalanga Province, South Africa. The aim of the study was to analyse credit access and willingness to pay for insurance and ascertain if there is any relationship between these two important aspects. The specific objectives of the study were: (i) to determine the socio-economic characteristics of smallholder maize farmers in Bushbuckridge Local Municipality, Mpumalanga Province, South Africa; (ii) to examine factors affecting credit access among smallholder maize farmers; (iii) to investigate smallholder maize farmers willingness to pay for insurance; (iv) to identify factors influencing smallholder maize farmers' willingness to pay for insurance; and (v) to test if there is association between credit access and willingness to pay for insurance in the study area.

Primary data were collected through face-to-face interviews using a structured questionnaire with a sample of 213 smallholder farmers. The mixed method approach was employed. Purposive sampling was used to identify the targeted group, which comprised smallholder maize farmers, and simple random sampling ensured that every maize farmer had an equal chance of being selected and participating in the study. The study used a range of analytical techniques to address the objectives of the study. Statistical Package for Social Sciences (SPSS) Version 27 and Stata version 14.5 were used for data analysis.

Descriptive statistics was used to determine the socio-economic characteristics of smallholder maize farmers. Multinomial Logistic Regression (MLR) to examine factors affecting credit access among smallholder maize farmers, while the Contingent Valuation Method (CVM) investigated smallholder maize farmers' willingness to pay for insurance. Ordered Logistic

Regression (OLR) model examined factors influencing insurance payment by smallholder maize farmers, and a chi-square test evaluated the association between credit access and willingness to pay for insurance in the study area.

6.3. Research conclusion

Most respondents (28.6%) were aged 40 to 49 years, followed by those aged 30 to 39 years (22.5%) and 50 to 59 years (22.1%). This shows that maize production in the study area is dominated by individuals in their economically active years. Among the respondents, 51.2% were female and 48.8% were male, suggesting increased female participation in smallholder maize farming. The results show that 62.9% of respondents had access to informal credit, 20.7% obtained credit from formal sources, and 16.4% reported no access. The results indicate that access to formal credit is still limited. Most farmers faced limitations such as collateral requirements (22.5%), lack of information (31.5%), high interest rates (14.1%), fear of debt (13.1%), and complex applications. Collateral ownership is limited, with only 8.9% of farmers using land and 12.7% using farm equipment as security. Many farmers report that low income from produce restricts both their access to credit and their ability to pay for agricultural insurance. Insurance uptake remains low, with main barriers including low income (25%), self-insurance (10.4%), dependence on personal capital (8.3%), dissatisfaction with coverage (6.3%), lack of trust in providers (6.3%), and complex application processes (10.4%).

The Multinomial Logistic Regression results showed that farm size, age of the farmer, access to extension services, gender, and access to credit information are directly associated with formal credit access relative to no credit access. Informal credit access is associated with farm size, main source of income and gender compared with no access. Results from the Contingent Valuation Method (CVM) showed that most smallholder farmers were willing to pay for insurance if it were introduced. Specifically, 43.2% of farmers were more than willing to pay for insurance, 21.1% were moderately willing, 13.1% were less willing, and 22.5% were not willing to pay. Ordered Logistic Regression (OLR) results revealed that the gender of the farmer, age of the farmer, main source of income, access to land, farm size, access to extension services, and agricultural insurance awareness were the most influential factors affecting smallholder maize farmers' willingness to pay for insurance. The chi-square test confirmed a statistically significant relationship between credit access and willingness to pay for insurance (Pearson chi-square = 29.843, df = 6, $p < 0.001$).

In conclusion, the first null hypothesis of this study, stating that there is no statistically significant relationship between socio-economic characteristics and credit access among smallholder maize farmers in Bushbuckridge Local Municipality, Mpumalanga Province, South Africa, was rejected. The findings indicate that selected socio-economic characteristics significantly influence farmers' access to credit. Theoretically, this aligns with credit rationing theory, and reinforces the importance of these factors in credit access decisions among smallholder farmers.

The second null hypothesis which stated that socio-economic characteristics and other factors do not significantly influence smallholder maize farmers' willingness to pay for insurance in Bushbuckridge Local Municipality, Mpumalanga Province, South Africa, was rejected. The results indicated that socioeconomic characteristics, such as gender and age, can help explain farmers' willingness to pay for insurance. Since socio-economic characteristics affect how farmers adapt, these results highlight the need to incorporate them into strategies to build resilience for smallholder farmers. By considering these factors, rural development agencies such as extension officers can encourage farmers to participate in insurance and help them better manage economic shocks.

Finally, the third null hypothesis, stating that there is no statistically significant association between credit access and willingness to pay for insurance among smallholder maize farmers in Bushbuckridge Local Municipality, Mpumalanga Province, South Africa, was rejected. The findings indicate a statistically significant association between credit access and willingness to pay for agricultural insurance. The results suggest that improving credit access for smallholder farmers may be a key policy area to enhance willingness to pay for insurance. Providing better credit options could increase the likelihood that farmers participate in insurance, thereby aiding them protect their livelihoods against uncertainty.

6.4. Recommendations of the study

Recommendations of the study on credit access and willingness to pay for insurance among smallholder maize farmers in Bushbuckridge Local Municipality, South Africa were made based on the findings, several policies and the conclusion of the study.

6.4.1. Credit access

6.4.1.1. In light of gender being significant in determining access to formal credit, it is important for financial institutions and policymakers to create credit strategies that will

actively tackle the challenges that women face in obtaining credit. This could include credit packages designed to overlook collateral limitations and improve outreach through women-focused farmer cooperatives and saving groups.

6.4.1.2. It is also important to increase the presence of financial institutions in rural communities. Setting up rural banks, cooperatives, and mobile banking services can help farmers rely less on informal lenders. Stronger formal institutions in these areas would lower transaction costs and make financial services more accessible to smallholder farmers.

6.4.1.3. Improving farmers' financial literacy is essential. Training in financial management, record-keeping, budgeting, and credit applications can help farmers better understand formal financial systems. With stronger financial skills, farmers are better prepared for credit and have a better chance with lenders.

6.4.1.4. Introducing government-backed credit guarantee schemes can encourage commercial banks to lend to smallholder farmers, who are often seen as high-risk. These guarantees lower the risk for lenders, allowing them to offer credit without asking for too much collateral. This approach would make agricultural lending more supportive.

6.4.1.5. Better agricultural support services are also important for increasing farmers' productivity and creditworthiness. Improving extension services, offering technical training, and encouraging the use of modern technologies can help reduce production risks. As farmers become more efficient and productive, they are more likely to be seen as good clients by financial institutions.

6.4.2. Insurance

6.4.2.1. Initiatives aimed at boosting agricultural insurance adoption should focus on improving awareness and interest, highlighting its benefits in mitigating financial risk. Campaigns conducted by extension officers and local cooperatives should specifically target farmers who are uncertain about their decision.

6.4.2.2. Insurance companies should find a careful balance between keeping costs low and demonstrating value, ensuring that premium costs correspond with the quality of coverage and effectively communicate this to farmers. Subsidised programmes could focus on supporting the most vulnerable smallholder farmers, while premium products could attract farmers who are looking for extensive protection.

6.5. Limitations of the study

6.5.1. The study sample was confined to a specific geographic area and focused mainly on smallholder maize farmers. While this provides rich contextual information, it limits the generalisability of the findings to other regions or farming systems in South Africa. Differences in institutional support and socio-economic characteristics across regions may yield different outcomes.

6.5.2. Although the multinomial logistic regression, contingent valuation method, and ordered logit models are appropriate for the research objectives, they may not fully account for unobserved heterogeneity among farmers. There may be underlying factors such as risk preferences that were not captured in the survey but may influence credit access or insurance adoption decisions.

6.6. Suggested areas for further research

6.6.1. Researchers may consider conducting a study to assess the readiness of various stakeholders, such as financial institutions, the government, and insurance companies, to engage in agricultural insurance.

6.6.2. An impact assessment can be conducted to check if current efforts to improve both credit and insurance are working, and suggest ways to make them better.

6.6.3. Look into how digital financial services help rural farmers get credit and affect their willingness to pay for insurance.

6.6.4. Evaluate the influence of government policies and subsidy programs on integrating credit and insurance products tailored for smallholder farmers.

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ANNEXURE A: PARTICIPATION CONSENT FORM

Participation Consent Form

Title of the study: Credit access and willingness to pay for insurance among smallholder maize farmers in Bushbuckridge Local Municipality, Mpumalanga province, South Africa

Researcher: Ndzalama Comfort Dhlamini

Institution: North-West University

Email Address: raragem0505@gmail.com

Phone Number: 0728107369

Date:

Introduction: You are invited to participate in a research study on factors influencing credit access and attitudes towards insurance among smallholder farmers. Participation is voluntary. Before you decide, please make sure you understand the study, your role, and your rights as a participant.

Study procedures: If you agree to participate, you will be asked to provide information through a questionnaire. The questionnaire will include questions about your farming practices, credit history, and opinions on agricultural insurance. Your participation time is estimated to be approximately 10 minutes.

Confidentiality and Data Use: Your responses will be kept strictly confidential. Your responses will be anonymous and will be stored securely. Only the research team will have access to the data. Findings from this study may be published or presented at conferences, but your identity will remain confidential.

Voluntary Participation: Participation in this study is voluntary. You may refuse to participate or withdraw at any time without consequence.

Contact Information: If you have any questions about the study or your rights as a participant, contact Ms Ndzalama Dhlamini at raregem0505@gmail.com or 0728107369

Declaration: By signing below, you acknowledge that you have read and understood the information provided in this consent form. You voluntarily agree to participate in this research study and allow the use of your information for research purposes.

□ I have read the above information and voluntarily agree to participate in this study.

Participant's Reference Number: _____

Location: _____

Participant's Signature: _____

Date: _____

ANNEXURE B: QUESTIONNAIRE

Credit access and willingness to pay for insurance among smallholder maize farmers in Bushbuckridge Local Municipality, South Africa

Note: The information captured in this questionnaire is strictly confidential and will be used for research purposes at North-West University Mahikeng Campus . Participation is voluntary and respondents may withdraw at any time at their discretion.

Respondent reference:

Location:

Section A: Socio-economic characteristics of the farmer

1. Age	**2. Gender**	**3. Marital status**	**4. Household size**
	0: Female 1: Male	1:Single 2: Married 3:Divorced 4: Separated 5: Widowed 6: Cohabiting	
5. Educational level	**6. Employment status**	**7. Main source of income**	**8. Total household income per month**
1: No Schooling 2: Primary school 3: Secondary school 4: Tertiary school	1: Fulltime farmer 2: Employed (non-farming) 3: Unemployed 4: Self-employed 5: Retired 6: Others, Specify	1: Salary 2: Business 3: Farming 4: Pension 5: Child grants 6: Remittances 7: No income 8: Others, Specify	

Section B: Land holding and production information

9. Do you have access to land?	**10. Land tenure system**	**11. If your answer for 10 is Permission to Occupy, where did you get the permit?**
1:Yes 2: No	1: Private Lease 2: Permission to occupy 3: Communal Land 4: Customary tenure 5: Other, specify	1: Headmen 2: Local Tribal Office 3: Municipality 4: Government 5: Other, specify
12. Total farm size in hectares	**13. Total land area used for maize farming (in hectares)**	**14. How far is your farm from your home in kilometers?**
15. Main method of farming	**16. Number of years involved in maize production**	**17. Average annual maize yield (in tons)**
1: Traditional 2: Modern 3: Both		
18. Do you use any of the following agricultural inputs? (Check all that apply)	**19. Total farm revenue per cycle (season)**	**20. Have you ever skipped a season without producing in the past 5 years?**
1:Improved seed varieties 2: Fertilizers 3: Pesticides 4: Irrigation 5: None 6: Other, specify		1: Yes 2: No 3: Involved for less than 5 years If yes why?

Section C: Access to credit and support services

21. Do you have access to extension services?	**22. If yes to 21, Who provides the extension services?**	**23. Have you had access to credit information by agricultural credit officers**
1: Yes 2: No	1:Government department 2:Non-governmental organisation 3: Development agency 4: Others specify,	1: Yes 2: No
24. Who provides the agricultural credit information services?	**25. How do you normally finance your agricultural activities?**	**26. Have you ever received a credit?**
1: Government department 2:Non-governmental organisation 3: Land Bank 4: Development agent 5: Other specify,	1: Land Bank 2: Government assistance 3: Social grants 4: Off-farm income 5: Farm income 6: Other specify,	1: Yes 2: No
27. Source of credit	**28. Purpose of credit**	**29. If you have not applied for credit, what are the main reasons?**
1: Commercial bank 2: Land Bank 3: Microfinance institution 4: Friends and relatives 5: Government program 6: Loan sharks 7: Other specify,	1: Purchase of inputs 2: Land preparation 3: Labour 4: Machinery/equipment 5: Other specify,	1: Lack information 2: Fear of debt 3: High interest rates 4: Collateral requirements 5: Application process too complex 6: Applied for before 7: Others, specify

30. How do you normally finance your agricultural activities?	**31. When accessing credit, what did you use as collateral?**	**32. Credit Source**
1: Land Bank 2: Government assistance 3: Social grants 4: Off-farm income 5: Farm income 6: Other specify,	1: Land 2: Insurance 3: Farm equipment 4: Infrastructure 5: Cooperative shares or membership 6: Stored Produce 7: Crops in the Field 8: Vehicles 9: No collateral required 10: No access to credit 11:Other, specify	1: Formal 2: Informal 3: No access

Section D: Climate related risk and management strategies

33. Do you know of agricultural insurance?	**34. Have you ever taken any agricultural insurance?**	**35. Do you currently have any form of agricultural insurance?**
1: Yes 2: No	1: Yes 2: No	1: Yes 2: No
If yes, please answer the following:		
36. Type of insurance	**37. Main reason for purchasing insurance**	**38: Satisfaction level with current insurance**
1: Crop insurance 2: Livestock insurance 3: Weather index insurance 4: Other, specify:	1: Risk management 2: Credit requirement 3: Recommendation 4: Other, specify:	1: Very satisfied 2: Satisfied 3: Neutral 4: Dissatisfied 5: Very dissatisfied

39. Are you aware of any agricultural insurance scheme that provides insurances against the following risks?				
Risk Type	**Yes**	**No**	**If yes, do you have membership to the scheme**	**If no, why are you not participating in the scheme**
Weather Risks				
Price risks				
Production/technical risks				

40. What is your perception of the following climate related issues as sources of risk for your maize production? (Please indicate, 0 = Not a concern, 1=Very low, 2= Low, 3= Moderate, 4=High, and 5= Very high)

	0	**1**	**2**	**3**	**4**	**5**
High rainfall						
Low rainfall						
Flood						
Drought						
Very low temperature						
Very high temperature						
Strong winds						
Pests and diseases						

Section E: Insurance Practices and willingness to pay for insurance

41. Would you be interested in purchasing agricultural insurance specifically designed for maize farming?	**42. Do you think insurance is essential for agriculture?**
1: Yes 2: No	1: Yes 2: No
43. What factors would influence your decision to purchase maize farming insurance?	**44. What is the maximum amount you are willing to pay for maize farming insurance per season? In rands.**

1: Premium cost 2: Coverage scope 3: Compensation process 4: Trust in provider 5: Experience of peers 6: Other, specify	
45. Would you pay the insurance to cover 100% of your maize production?	
46. If Yes, Should the premium increase by 10%, would you still be willing to pay insurance to cover for 100% of your stock?	
1: Yes 2: No	
47. If No, would you accept if the government offers to pay for the 10% premium increase, allowing you to pay insurance for 90% of the value of your stock?	
1: Yes	
2: No	

ANNEXURE C: PERMISSION AND REQUEST FOR DATA COLLECTION

agriculture, rural development,
land & environmental affairs
MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

Samora Machel Building, No. 7 Government Boulevard, Riverside Park, Extension 2, Mbombela, 1200,
Mpumalanga Province, Private Bag X 11219, Mbombela, 1200
Tel: +27 (013) 766 6067/8, Fax: +27 (013) 766 8295, Int. Tel: +27 (13) 766 6067/8, Int. Fax: +27 (13) 766 8295

Litiko Letekulima, Kutfutfukiswa Kwetindzawo Tasemakhaya, Temhlaba Netesimondzawo | Departement van Landbou, Landelike Ontwikkeling, Grond en Ongewing Sake | umNyango weZelimo UkuThuthukiswa kweeNdawo zemaKhaya, iNarha neeNdaba zeBhoduluko

Ref.no : 3/2/1
Enquiries : Dr. MC Dagada
Tel.no : 076 503 6848

Ms. Ndzalama Dhlamini
Masters Student
Clo R40 White River Road and D725,
Riverside, Mbombela 1226
Private Bag X11283
Mbombela 1200

Subject: Request for Assistance from Extension Officer for Data Collection.

Dear Ms Dhlamini

Based on my review of the proposed research by yourself, I give permission for you to conduct a research study among the public extension officers in the province titled: "*credit access and willingness to pay for insurance among smallholder maize farmers in Bushbuckridge Local Municipality, Mpumalanga Province, South Africa*".
I authorize the researcher to work with the extension officer within the study area to carry out a voluntary and anonymous research collecting data from the local farmers.

The permission has been granted with understanding that individuals' participation will be voluntary and at their own discretion. Therefore, the researcher will have to obtain informed consent both from the Extension Officer and farmers prior to the subjects' participation. Upon presenting this letter to the District Director of any of our four districts, the Director will assist to connect the student researcher with relevant Agricultural Manager who will be the link to the Extension Officer/s working with farmers in the proposed study area.

We will provide the researcher with needed support to make the data collection process a success. We understand that the data collected will remain entirely confidential and may not

be provided to anyone outside of the research team and will only be used for the purpose of this study only.

Please feel free to contact our District Directors in the following office:

Ms B Shongwe - Director: Ehlanzeni North - Bohlabela District

Office number: (013) 773 1555

Email:bhekiwes18@gmail.com.

It will be appreciated if you could share your main findings and recommendations with the Department once the study is concluded to further improve the sector with knew empirical knowledge.

Kind Regards

MR. C.M. CHUNDA

HEAD: AGRICULTURE, RURAL DEVELOPMENT,

LAND AND ENVIRONMENTAL AFFAIRS

DATE: 31/Aug

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Agriculture Economics and Extension
Tel: 018 389 9023
Email: nkele.malahlela@nwu.ac.za

The Head of Department
Department of Agriculture, Rural Development, Land and Environmental Affairs
7 Government Boulevard, Building 6, Riverside Park,
Mbombela
1200

16 May 2024

Dear: Head of Department

Subject: Request for Assistance from Extension Officer for Data Collection

I hope this letter finds you well. I am Ndzalama Dhlamini, a Master of Science (Agricultural Economics) student enrolled with North-West University and Comprehensive Bursary holder from the Department of Agriculture, Land Reform and Rural Development for the academic year 2024.

I am writing to formally request the support and assistance of an extension officer from your department based in Bushbuckridge Local Municipality for an upcoming research data collection project aimed on investigating **credit access and willingness to pay for insurance among smallholder maize farmers in Bushbuckridge Local Municipality, Mpumalanga Province, South Africa.** The study aims to contribute valuable insights to agricultural finance and risk management strategies tailored to our farming community.

Given the expertise and experience of your extension officers in working closely with farmers, I believe their involvement would greatly enhance the quality and depth of our data collection efforts. Below are research activities that require assistance of the extension practitioners:

1. Assist when conducting interviews among smallholder farmers to ensure collection of pertinent information regarding their usage of credit, understanding of insurance, and inclination towards paying for insurance.

2. Offering perspectives on the farming methods employed locally, obstacles encountered, and the social interactions in the study area that could influence decisions regarding credit and insurance.

3. Facilitating introductions and building rapport with farmers to encourage participation and ensure the study's success.

We kindly request your assistance in assigning an extension officer who can work closely with us on this project commencing on 03 June 2024 to 28 June 2024. We are flexible with scheduling and logistics to accommodate the officer's availability and preferences.

For more information you can contact me on 0728107369 or raregem0505@gmail.com or contact my supervisor Dr N Malahlela on nkele.malahlela@nwu.ac.za to discuss this request further or to arrange a meeting at your convenience. Your support and partnership in this endeavour will be greatly appreciated.

Thank you for considering our request. We look forward to the opportunity to collaborate and contribute to the advancement of agricultural development in the study area.

Yours sincerely

Ndzalama Dhlamini
(Student)

ANNEXURE D: ORDERED LOGISTIC REGRESSION STATA COMMANDS

```
1   tab willingness
2   omodel logit willingness Gender AGEGROUP Employmentstatus
    Sourceofincome Acesstoland Farmsize Experience FarmRevenueRands
    Extensionservice Typeofcredi AgrInsuranceAwareness
    InterestinpurchasingAI MaxamountwillingtoPayRands Household_size
3   gologit2 willingness i.Gender i.AGEGROUP  i.Sourceofincome
    i.Acesstoland Farmsize Experience FarmRevenueRands
    i.Extensionservice i.Typeofcredi i.AgrInsuranceAwareness i.
    InterestinpurchasingAI MaxamountwillingtoPayRands, vce(robust)
4   margin,dydx(*)
```