

Assessing the Role of Crop Insurance in Mitigating Household Food Insecurity among Smallholder Maize Farmers in Goromonzi District, Zimbabwe.

A dissertation submitted in partial fulfillment of the requirements of the Master of Science Degree in Food Security and Sustainable Agricultural Production.

Bindura University of Science Education



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DECLARATION

I hereby declare that the research project entitled “**Assessing the Role of Crop Insurance in Mitigating Household Food Insecurity among Smallholder Maize Farmers in Goromonzi District, Zimbabwe**” submitted to Bindura University of Science Education, Department of Agricultural Economics, Education and Extension is a record of an original work done by me under the guidance and supervision of **Mr. Govere** and this work is submitted in partial fulfilment of the requirements for the award of a Master of Science Degree in Food Security and Sustainable Agriculture. The results embodied in this thesis have not been submitted to any University or Institute for the award of any degree of diploma.

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DEDICATION

I dedicate this piece of work to my late parents whose love and strength have been my greatest strength and to my beloved family whose encouragement and understanding have made this achievement possible.

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ABSTRACT

Achieving food security is a major objective in developing countries like Zimbabwe, whose economy largely depends on agriculture. However, the growing effects of climate change are making it more difficult to accomplish this goal due to the decline of agricultural output. Agricultural insurance is one of the most important enabling conditions for implementing, accelerating, and sustaining climate change adaptation into practice. Despite its importance, there is little empirical data on agricultural insurance, especially in smallholder farming communities that are more vulnerable to climate change risks. This study sought to investigate the role of crop insurance in mitigating household food insecurity among smallholder maize farmers in Goromonzi District. The study used a mixed-methods methodology, collecting data using partially arranged questions directed to smallholder farmers and comprehensive interviews with extension officers. Data was collected from 82 (48 insured and 34 non-insured) smallholder maize farmers and one extension officer. The results from the conducted interviews pointed to 13.7% ranking improving access to financial services number, followed by increase on crop yield (13.6%), improve in household food security (12.5%), peace of mind (10.9%), value change linkage benefits (10.9%) and crop price protection (8.5%). However, the participants indicated that the insurers are providing only multi-peril crop insurance, for drought and poor compensation was done without a proper assessment. The insured participants (54%) indicated that crop insurance is not effective in mitigating household food security among smallholder farmers. About 51% of the participants indicated that they had not heard of crop insurance, contrary to the expectation, since 58.54% of the participants were insured. Thus, the majority of the farmers had limited understanding of the concept of crop insurance due to the generally complicated nature of insurance and the lack of awareness by insurance providers to inform smallholder farmers about the significance and advantages of crop insurance. There is a need for intense awareness and demanding training. The study suggests developing an integrated index

instead of just using weather index insurance that shields smallholder farmers from a larger proportion of their primary agricultural risks, such as weather-related and non-weather-induced risks, allowing them to bear the remaining risks alone.

Keywords: Crop insurance, climate change, adaptation, food security, smallholder farmers,

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CHAPTER 1

INTRODUCTION

1.1 Background

Agriculture is the dominant sector in most Sub-Saharan African countries, contributing significantly to the Gross Domestic Product (GDP) and employment, hence its ability to boost economic growth and alleviate poverty in the region (Njue et al., 2018). In Zimbabwe, smallholder farmers have dominated the sector since the Fast Track Land Reform 1 (FTLR) in 2000, which now accounts for up to 70% of the total agricultural production (Makate, 2014). Munyavhi. Rukasha (2023) claims that smallholder farmers produce 80% of Zimbabwe's maize output, highlighting the significant contribution of smallholder farmers to ensuring food security in Zimbabwe. Although agriculture is the primary source of employment and income generation for many rural households, especially in developing countries, this sector is associated with inherent risks, particularly rainfall unpredictability and other weather-related hazards such as hailstorms and floods (Malhi et al., 2021). This has resulted in a decline in maize production. According to a report published by the Zimbabwe National Climate Change Response (Government of Zimbabwe, 2017), projections suggest that maize production will decrease by a large percentage, from 75% to an estimated low of 55% by the year 2080. Moreover, given the overdependence of most smallholder farmers on rain-fed farming, which is compounded by a lack of irrigation, climate change, and weather variability have caused production losses and exacerbated food insecurities (Maireva, 2023; Akuribire et al., 2024; Tambol et al., 2025).

Smallholder farming communities are facing weather-induced hazards such as droughts, floods, pests, hailstorms, windstorms, and fires, negatively impacting agricultural productivity and the welfare of livelihoods of those who depend on farming (Berhanu et al., 2024; Touch et al., 2024). Several studies have demonstrated that the frequency and severity of agriculture production losses have resulted from weather-related hazards and are rapidly increasing, especially with climate change (Bhatti et al., 2024; Omotoso et al., 2024; Toromade et al., 2024; Yanagi, 2024). For example, a study conducted in Pakistan by Mahmood et al. (2021) on the effects of the 2010 floods in Muzaffar Garh district found that total agricultural losses accounted for 4.5 million US dollars. Soulibouth et al. (2021) also found that floods experienced in Champhone District of the

Lao People's Democratic Republic in 2015 destroyed one-third of the cropland. Moreover, a study conducted in China by Hou et al. (2021) found that an increase in mean temperature by 1 degree Celsius resulted in a maize yield reduction of 5.8% (0.83 t/ha). Kaunda and Chowa (2022) indicated that Zambia's Second National Agricultural Policy report of 2016-2020 indicated that climate change caused a 16% decrease in maize production between the 2017–18 and 2018–19 growing seasons. Besides the direct effects of weather-related hazards and climate-change hazards on agricultural production, increased unpredictability of climatic conditions can have negative effects by decreasing the demand for agricultural investment, resulting in lower yields, increasing food insecurity, and weakening the resilience of households that rely on rain-fed agriculture (Maireva, 2023; Njue et al., 2018). Although the main goal of farming is the realization of food security, Zimbabwe, among other Southern African countries, has been facing food insecurity issues, especially among smallholder farmers, due to the unpredictability of climatic conditions leading to years of severe droughts (Mushore et al., 2021; Mpala and Simatele, 2024).

Traditionally, farmers have been using various mitigation measures against food insecurity, including the use of drought-resistant cultivars, growing early-maturing varieties, practicing conservation agriculture, selling livestock, and diversifying their crop or income portfolio (Fischer et al., 2016; Mustafa et al., 2019). However, studies (Nnadi et al., 2013; Carter et al., 2014; Njue et al., 2018; Maireva, 2023) have demonstrated that these traditional mitigation measures are currently unable to completely cover farmers from the resulting economic shocks, which results in a poverty trap. Therefore, it was observed that formal insurance as a risk-coping mechanism was a suitable way to transfer agricultural hazards to a third party, such as an insurance firm. This promotes investment and helps smallholder farming communities eliminate their fear of agriculture-related risks. Additionally, it uses risk-pooling to disperse covariate hazards (such as droughts) over a larger geographic area, something that farmers and their pre-existing risk-sharing programs, like farmer cooperatives, are incapable of (Aidoo et al., 2014). In addition to stabilizing farmers' incomes and shielding them from the effects of devastating crop failures, agricultural insurance also encourages farmers to embrace technologies that boost output and lower the risk of loan default, which enables farmers to obtain better credit terms (Nyathi and Tshuma, 2024). Thus, a well-crafted agricultural insurance policy can lessen the effects of systemic risks by offering much-needed protection and facilitating prompt recovery in

the event of a disaster (Mbonane, 2018; Mwangi, 2019). This could help smallholders invest for the future and as a result, prevent extreme poverty.

Before Zimbabwe's independence in 1980, only 1,500 commercial farmers had access to agricultural insurance; however, 70% of that land is now owned by smallholder farmers, mainly growing maize (Mandizha, 2014). About 80% of the smallholder farmers in Zimbabwe have no insurance coverage at all. Agricultural insurance in Zimbabwe is provided by the private sector. When compared to other countries, such as India, where the crop insurance loss ratio was 686.53 percent in the 1990s, Zimbabwe's loss ratio of 20.65 percent was low, unsustainable, and required government assistance (UNCTAD Secretariat, 1994). There are now 23 insurance companies that offer agriculture insurance, thanks to the low loss ratio that allowed the private sector to provide a competitive, unsubsidized, and reasonably priced insurance package (Nyathi and Tshuma, 2024). Thirteen insurance companies remained in the market as a result of the insurance revenue from farmers declining from USD 4.9 million in 2012 to USD 1.9 million in 2013, a 68% decrease in premiums (demand), and the fact that these insurance companies were primarily covering losses against fire, hailstorms, and other disasters (Takawira, 2013). Despite this, the increase in climate change awareness in most developing countries has made a major step towards developing mitigation strategies for food insecurity, which has caused demand for farm insurance to rise. Thus, some companies in Zimbabwe have ventured into livestock and crop insurance, especially the Named Peril Crop Insurance and Multi-Peril Crop Insurance, which are indemnity-based agricultural insurances.

The literature that is currently available (Maireva, 2023; Nyathi and Tshuma, 2024) indicates that agricultural insurance may be able to unlock other crucial services in the agricultural sector that are crucial for increasing productivity. However, smallholders cannot be adequately insured by indemnity-based crop insurance because of the associated moral hazard and adverse selection weaknesses, as well as the confusing costs of insurance administration, especially when dealing with a population of smallholders that is overly dispersed. Thus, most smallholders cannot access agricultural insurance services, forcing them to rely on traditional strategies to minimize the risks, which are insufficient for them to cover the effects of reduced agricultural productivity and income losses (Ankrah et al., 2021; Okpukpara et al., 2021). In response, index-based weather insurance (IBWI) has been developed to provide risk-hedging products for smallholder

producers, but not much has been done about the quality of indexed products (Njue et al., 2018; Azahra et al., 2024), and most IBWI products for both livestock and crop insurance are still in the piloting phase. Access to reasonably priced private or public agricultural insurance might significantly lessen smallholder farmers' susceptibility to drought risk, encourage resource efficiency, and lessen their reliance on costly and frequently ineffectual food assistance programs, thereby ensuring food security (Ghimire and Chapagain, 2023; Madaki et al., 2023; Lawi et al., 2024).

Despite research attempts to increase smallholder farmers' knowledge of and access to formal insurance, the literature showed that crop insurance uptake has been extremely low, despite encouraging findings on its demand and effects on significant household farmers' indicators. According to Nyathi and Tshuma (2024), smallholder farmers in Zimbabwe have a very low adoption rate for crop insurance, and a greater percentage are not aware of the insurance programs provided by insurance companies. Therefore, this study aims to assess the role of crop insurance in mitigating household food insecurity among smallholder maize farmers.

1.2. Problem statement

Smallholder farmers produce 80% of maize output in Zimbabwe, with more than 60% practicing rain-fed agriculture production, which is easily affected by climate change-related hazards such as droughts, leading to a decline in agricultural productivity. Consequently, this undermines food access and availability among the vulnerable, leading to food insecurity. In the past, Zimbabwe, like most Southern African nations, has implemented ad hoc emergency food aid programs in response to food insecurity. However, historically, there have been numerous problems with these government-run programs, such as the high cost of delivery, abuse by politicians leading to unequal distribution and mismanagement, and the absence of proper distribution infrastructure (Makaudze and Miranda, 2009). Conventionally, farmers have been using various mitigation measures against food insecurity, including the use of drought-resistant cultivars, growing of early maturing varieties, practicing conservation agriculture, selling livestock, and diversifying their crop or income portfolio (Fischer et al., 2016; Mustafa et al., 2019). However, studies (Nnadi et al., 2013; Carter et al., 2014; Njue et al., 2018; Maireva, 2023) have demonstrated that traditional risk reduction mechanisms are currently unable to completely cover farmers from the resulting economic shocks, which results in a poverty trap. According to UNCTAD (1994),

while farmer-implemented mitigation strategies are beneficial, they are not sufficient to address catastrophic effects on climate change-related hazards such as drought, floods, disease, and pest outbreaks. The variety of hazards smallholder farmers occasionally encounter makes traditional risk management techniques less effective; therefore, to improve food security, farmers must explore alternatives like crop insurance (Masara and Dube, 2017).

According to Nyathi and Tshuma (2024), smallholder farmers in Zimbabwe have a very low adoption rate for crop insurance, and a greater percentage are not aware of the insurance programs provided by insurance companies. This is not surprising as Nshakira-Rukundo et al. (2021) found that only 1 percent of the smallholder farmers are insured in Africa, compared to 15.8% in Latin America and the Caribbean and 46.2% in Asia. According to Heenkenda (2012), insurance is a crucial instrument for reducing risk for farmers in developing nations that are at risk. Thus, crop insurance aims to reduce the risks of vulnerability to shock effects. Crop insurance can help smallholder farmers to improve development and reduction of poverty through income-smoothing and consumption. Thus, crop insurance helps smallholder farming communities mitigate their vulnerability as they replace the uncertainty of future events with regular, small payments in exchange for a significant level of assurance. Furthermore, the factors influencing the adoption of crop insurance are not clearer in Zimbabwe, especially among the smallholder farmers due to the absence of sufficient data and overdependence on theoretical evidence that appears to support the theoretical viability of crop insurance but the empirical evidence from pilot programs reveals conflicting outcomes regarding the effectiveness of agricultural insurance. Therefore, it is important to investigate the effectiveness of crop insurance in mitigating climate change insurance risks among smallholder farmers.

1.3. Objectives of the study

1.3.1 Main objective

The main objective of the study is to investigate the role of crop insurance in mitigating household food insecurity among smallholder maize farmers in Goromonzi District.

1.3.2 Specific objectives

1. To investigate the effects of climate change on maize production and food security among smallholder farmers in Goromonzi District.

2. To identify the insurance schemes available for the smallholder maize farmers
3. To investigate how crop insurance helps smallholder farmers enhance their resilience to climate-related shocks and food security.
4. To identify factors affecting the adoption of crop insurance among smallholder maize farmers in Goromonzi District.
5. To evaluate the effectiveness of crop insurance in mitigating household food security among smallholder maize farmers in Goromonzi District.

1.4. Research questions

1. How does climate change affect maize production and food security among smallholder farmers in Goromonzi District?
2. What are the types of insurance schemes available for the smallholder maize farmers
3. What is the role played by crop insurance in enhancing the resilience of smallholder farmers to climate-related shocks and food security?
4. What are the factors affecting the adoption of crop insurance among smallholder maize farmers in Goromonzi District?
5. How effective is crop insurance in mitigating household food security among smallholder maize farmers in Goromonzi District?

1.5 Significance of the study

Understanding the views of smallholder farmers on the role of crop insurance in mitigating food insecurity is important because it will have an impact on how insurance companies can design tailor-made crop insurance schemes for smallholder farmers and enhance the existing methods of risk reduction from a farmer-centric perspective. Agricultural insurance companies operating in Zimbabwe, and those in similar low-income countries with common demographic, biophysical, and socioeconomic traits may benefit immensely from this research's development. Moreover, agricultural insurance may help farmers deal with their climate change-related agricultural risks, even though they have used various mitigating strategies to handle such risks.

Additionally, this study aims to encourage policymakers to consider crop insurance support policies as awareness of crop insurance demand would help insurance service providers tailor-make policies to suit farmers' needs. The study will add to the body of knowledge on how smallholder farmers can utilize crop insurance in mitigating climate change-induced risks in maize production, especially in Zimbabwe, where the crop insurance sector is still underdeveloped.

1.6 Limitations of the study

The study is likely to face financial constraints as there are no adequate funds for research. The study focused only on smallholder maize farmers in the Goromonzi district, since maize is the staple crop in Zimbabwe; however, due to the nature of the study, as crop insurance uptake is barely affected by environmental conditions, the results can be generalized among smallholder maize farmers across the country.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The study investigates the role of crop insurance in mitigating household food insecurity among smallholder maize farmers. Maize is the staple crop in Zimbabwe, with more than 80% of Zimbabweans, especially in the rural areas, relying on it to ensure household food security. However, the crop is under attack by weather-induced/climate change-related hazards, exposing all these vulnerable populations to food insecurity. Indications from the Zimbabwe National Climate Change Response report (Government of Zimbabwe, 2017) are that there will be a decline in the area dedicated to maize farming in Zimbabwe. Specifically, the area suitable for maize production is anticipated to decrease from an estimated 75% to 55%. For instance, the Goromonzi district, situated in Natural Region II, is expected to experience this substantial decrease in viable maize-growing land. Moreover, the high temperatures experienced make food less nutritious (WFP 2021). More regions in Zimbabwe are facing food shortages as maize yields decline due to climate change-related abiotic stress (Machara, 2010). Thus, this study suggested that crop insurance can help smallholder farmers mitigate household food insecurity under such climate change conditions. This chapter presents a relevant literature review, addressing the objectives of the study, and discusses theories that guide the study.

2.2 Definition of key terms

2.2.1 Food insecurity

Food insecurity is defined by the FAO (2016) as the state in which individuals do not have secure access to enough safe and nourishing food for normal growth and development as well as an active and healthy life. Thus, according to Muzerengi et al. (2023), "food insecurity" is characterized by a lack of access, inappropriate use, a lack of food, and instability for a time. USDA (2023) posits that food insecurity means households are occasionally unable to purchase enough food for one or more family members due to a lack of funds and other resources. Beyene (2023) asserts that millions of people live in food insecurity across the globe. Approximately 9.2% of the global population was severely food insecure in 2018. Countries in Sub-Saharan Africa (SSA) exhibit the highest levels of food insecurity globally, with approximately one-third

of their populations living in conditions of severe food insecurity (Roser and Ritchie, 2013). Similarly, SSA countries continue to share a significant percentage of undernutrition, with 11% (820 million) of the global population suffering from it in 2018 (Roser and Ritchie, 2013). Although the number of individuals worldwide facing hunger has been reduced since 1990, however, the number of people experiencing food insecurity has been on the upward trend, particularly after 2015. The SDGs of achieving zero hunger by 2030 would be extremely difficult (Word Count, 2020). The increasing food insecurity globally has been on an upward trend in this climate change error and has been significantly affecting households, especially in developing countries (Beyene, 2023).

2.2.2 Crop insurance

FAO (1992) defined crop insurance as "an instrument that protects against loss or damage to growing crops against specified or multiple perils, such as hail, windstorm, fire, and floods". An effective crop insurance plan can: (1) shift risk to a third party, in this case an insurer, which will reduce risk aversion and promote investment; and (2) disperse covariate risks, such as disease outbreaks and drought, over a larger geographic area by combining risks that neither individual farmers nor regional risk-sharing programs like farmer groups or cooperatives can handle (Njue et al., 2018). Crop insurance can be purchased by farmers to safeguard their operations against losses brought on by weather-related hazards like hail, floods, and drought, as well as possible revenue loss from falling agricultural commodity market prices (Insurance Fact Book, 2017). The two main categories of crop insurance are indemnity-based and index-based insurance.

Indemnity-based insurance

Indemnity-based insurance comprises of multi-peril crop insurance, which consists of yield and peril insurance. This kind of insurance guarantees that claim repayments are made in proportion to the loss and concentrates on the real loss suffered by a farmer. To ensure a corresponding indemnity computation, the damage must be carefully inspected. A certain classification determines the insurance coverage, which may include coverage for multiple dangers or just one. Multi-peril crop insurance covers all risks influencing output, except those risks not specified in the insurance policy, whereas single peril insurance offers protection against a single peril (Ellis, 2016). According to Tsikirayi et al. (2013), the amount insured is often determined by either the anticipated crop revenue or the production expenses. However, there are issues with moral

hazard, adverse selection, high administration expenses, and transaction costs related to indemnity-based insurance (Binswanger-Mkhize, 2012). Literature suggests that indemnity-based insurance has failed in the majority of both developed and developing nations (Kwadzo et al., 2013). Farmers who purchase single or multiple-peril insurance receive payouts that are proportionate to the amount of crop loss the farm has sustained as a result of the period.

Multi-peril crop insurance protects crops from lower yields and losses brought on by disease, fire, flooding, hail, frost, drought, and insect damage. Among farmers, this is the most common kind of crop insurance. Farmers in hail-prone locations typically obtain crop hail insurance, which is less common. To augment multi-peril crop insurance, many farmers buy crop-hail insurance (Insurance Fact Book, 2017).

Index-Based Insurance

Triggers are used by index-based insurance to calculate the true crop loss. A trigger is an index value that might be above or below a predetermined trigger, typically a rainfall total, that establishes the timing of payment. Either rainfall or crop yield data can be used to create triggers (Cole et al., 2012). Claims payments are determined by variations from the index, such as rain, soil moisture, and humidity, rather than by individual farm losses. Area yield insurance is one kind of insurance that uses crop yield as an index in a specific geographic area. Weather, vegetation, and satellite derivatives are examples of external indices used in indirect index insurance. When crop yields drop below a predefined threshold, payments are made. Insurance based on weather indices is intended to cover certain, erratic occurrences like floods or droughts, the data of which is typically captured by weather stations. When the index (amount of rainfall) falls or rises above a set threshold, which may result in crop loss, payments are given (Ellis, 2016).

According to Miranda (1991), index insurance may not always provide indemnities to farmers who experience revenue or crop losses on their farms, and the indemnity compensation they get may not always accurately reflect the magnitude of the loss they have endured. Farmers are less willing to pay for index-based insurance than multiple/single-peril insurance (Ellis, 2016). The accessibility of crop insurance and the range of crop insurance products determine the type of insurance that farmers are prepared to purchase.

2.3 Smallholder farmers' Agricultural Risks

Agriculture is the sole backbone of most developing nations (Lotze-Campen and Popp, 2012). A large percentage of the world's poorest individuals, approximately more than 70% live in rural areas, where agriculture is their predominant livelihood (IFAD, 2011). The World Bank (2015) further reported that the agricultural sector in low-income countries constitutes an estimated 28% of the GDP. The subsistence farmers produce an estimated 80% of the food consumed in Sub-Saharan Africa, and this plays a major role in the socio-economic development of these countries (Nnadi et al., 2013). In Zimbabwe, smallholder agricultural communities rely heavily on maize production for their livelihoods and food security. Maize is the most crucial commodity in terms of food security because it is a staple food for a large portion of the population. According to Mazvimavi et al. (2012), the majority of smallholder farmers cultivate maize mainly for subsistence. In Zimbabwe, the sector has been dominated by smallholders since the Fast Track Land Reform 1 (FTLR) in 2000, which now accounts for up to 70% (Makate, 2014). Mandizha (2014) claims that smallholder farmers produce 80% of maize output in Zimbabwe, demonstrating the importance of smallholder farmers in Zimbabwe in assuring food security. However, the FTLR affected maize production output through the unavailability and inaccessibility of inputs, which led to a decrease in maize production (Mutonodzo-Davies, 2010). As a result, since the FTLRP's inception, agricultural productivity has drastically decreased due to production inefficiencies among resettled smallholder farmers, widening the gap between the supply and demand of food, particularly for the main grain maize, and causing widespread food insecurity throughout the nation. Therefore, any challenge to maize production in Zimbabwe will have detrimental impacts on household incomes, food security, and livelihoods.

Although agriculture is the major contributor of employment and income generation for many, inherent risks have been associated with this sector (Malhi et al., 2021). To a greater extent, various methods were frequently used to classify agricultural risks in studies that addressed these issues. Agricultural risks have been divided into various categories by academia and organizations as per the following examples: physical, biological, biophysical, hydro-geological, and socioeconomic issues (Goel, 2013; Siebert, 2015). The main risk themes are weather-induced/environmental-related and non-weather-induced/climate-related challenges, with this study focusing on weather-induced/environmental-related hazards.

2.3.1 Climate-related risks

Climate change and variability have negatively affected many facets of the global economy, especially agricultural production (Walther et al., 2002). Moreover, models have demonstrated that climatic variability and change will affect many economic sectors worldwide (Stocker et al., 2013). The agriculture sector is negatively affected in developing countries with poor rainfalls (Kurukulasuriya and Mendelsohn, 2008). Additionally, given the overdependence of most smallholder farmers on rain-fed farming, which is compounded by a lack of irrigation, climate change, and variability have caused production losses and exacerbated food insecurities (Akuribire et al., 2024; Maireva, 2023; Tambol et al., 2025).

Agriculture productivity can be influenced by cross-border effects of climate variability, climate change, and extreme weather phenomena happening globally. Agriculture plays a significant role in global warming and climate change as it is a leading cause of greenhouse gas emissions (GHGs) (Pratibha et al., 2016). According to estimates, the sector contributes between 10% and 13.5% of greenhouse gas emissions (Aggarwal and Sivakumar, 2010; IPCC, 2007). These emissions are primarily caused by the use of chemical fertilizers based on nitrogen and unsustainable farming methods, such as intensive conventional tillage, the burning of crop residues in bushfires, and the use of fossil fuels (Mosier et al., 2006). Certain farming methods contribute to climate change and global warming by destroying biodiversity and degrading land (Foley et al., 2011). These unsustainable practices can increase greenhouse gas intensity (GHGI) and net global warming potential (NGWP) when combined. Since the worldwide agricultural sector contributes to greenhouse gas emissions, Snyder et al. (2009) suggested that they employ cutting-edge techniques and technology to help mitigate climate change and global warming. The industry can employ sustainable farming techniques such as crop residue application, diverse crop rotation, cover crops, and zero or minimal tillage (Foley et al., 2011). When combined, these sustainable farming methods may lessen soil disturbance and erosion, improve water retention, and sequester carbon in the soil in addition to lowering the consumption of fossil fuels (Mosier et al., 2006). The specific signs of weather and climate-related risks, along with negative consequences they bring along, include rising temperatures, erratic rainfall patterns, pest and disease invasions, sea level rise, shorter crop growing seasons, and increased frequency or severity of adverse weather events such as droughts, floods, hurricanes, and storms. These risks have significant effects on the agricultural sector.

Low-income nations, particularly in Sub-Saharan Africa, have already reported experiencing food insecurity issues as a result of climate change and extreme weather (Lotze-Campen et al., 2012). Weather and climate-induced hazards often negatively impact vulnerable smallholder farmers in these nations, which may lack the adaptive capacity to manage these effects (Morton, 2007). The primary reason for this is that farmers' informal adaptation tactics are unable to help them adequately deal with climate hazards and extreme weather (Molini et al., 2010). According to the majority of climate change simulation models, global temperatures will continue to rise, rainfall patterns will become unpredictable, and other climatic variables will alter (Stocker et al., 2013). The agricultural sector may become even more exposed to crop production hazards as a result of these weather and climate trends (McLeman and Smit, 2006). This requires the simultaneous use of effective techniques for both mitigating and adapting to climate change.

2.4 Impacts of climate change on food security among smallholder farmers.

Climate variability and change have already affected the production of food crops worldwide (Ray et al., 2020). Hunger and its physical effects remain a persistent issue in resource-poor economies worldwide, despite decades of efforts to improve food security (Ballard et al., 2011). Food security will be maintained when “access to food by all people at all times is adequate for an active and healthy life” (Maxwell and Wiebe, 1999; Pinstrup-Andersen, 2009). By 2060, climate change is predicted to reduce cereal production by 1–7% worldwide (Parry, 2007). Furthermore, it is anticipated that by 2050, climate change will have a negative influence on 22% of the land used for the world's major crops (Campbell et al., 2011). Accordingly, it is predicted that by 2080, climate change will put an extra 5–170 million people in danger of starvation (Schmidhuber and Tubiello, 2016). Therefore, climate change-related hazards will also have an impact on crop output and food security (Wiebe et al., 2019). Therefore, the impoverished populace in rural areas will probably also be harmed by the effects of rising temperatures (Juma and Kelonye, 2016). Many smallholder farmers will be food insecure as a result of climate change impacts on agricultural production in low-income emerging nations in Asia and Africa. It is predicted that by 2050, agricultural yields in Africa alone may drop by about 30% (Juma and Kelonye, 2016). The poor, especially the smallholder farmers, who are not able to withstand the fluctuations in global commodity prices that accompany a fall in supply, will be most affected by such a yield reduction (Cotter and Tirado, 2008).

Climate change has a greater impact in Africa, where rain-fed agriculture is practiced for day-to-day existence and adaptive capacity is minimal (Cudjoe et al., 2021). Climate variability has a wide range of intricate consequences on agriculture (Siebert and Ewert, 2014). It impacts crop yields, which in turn impact the availability of food, and has both direct and indirect consequences on the agriculture sector (Herrero et al., 2010). Saul (2015) indicates that changes in temperature and precipitation directly affect agricultural systems, potentially influencing agro-climatic conditions, growing seasons, planting and harvesting schedules, water availability, and the populations of pests, weeds, and diseases. Climate variability has detrimental consequences on food crop production, including decreased crop yields from drought and floods and decreased water availability (Levira, 2009). Food poverty is getting worse as a result of crop productivity in rain-fed agriculture being impacted by decreasing rainfall and rising temperatures (Dube and Phiri, 2013).

Crops frequently react poorly to temperatures over what is ideal for biological processes, experiencing a sharp decline in net growth and yield. Khanal (2009) states that heat stress may have an effect on a crop's overall physiological development, maturation, and yield. More frequent weather occurrences will worsen the detrimental effects on agricultural productivity. Some conditions that are influenced by climate change and variability further impact crop production are water availability, pests and diseases, and soil quality. Degradation of agricultural ecosystems may lead to desertification, which would eliminate the land's potential for production (Brussel, 2009). The number of individuals at risk of starvation and reliance on food imports is expected to rise as a result.

According to Odjugo (2010), climate change has caused a change in the crops grown in northern Nigeria. He stated that as of 1978, the farmers' preferred crops were guinea corn, groundnuts, and maize. However, in 2007, as a result of the rising temperatures and shorter rainfall periods brought on by climate change, the farmers switched to producing millet, followed by maize and beans. Additionally, the growing season has been shortened by frequent droughts and less rainfall, which has resulted in crop failure and a shortage of food.

In addition, Ubachukwu (2005) investigated the effect of climate change on agricultural productivity in the Niger Delta, whereas Efe (2009) also investigated the threat of climate change to food security and livelihoods in a few Nigerian states. They both found that agricultural yields,

food security, seed availability, and food consumption are all greatly impacted by climate change. They observed that crop yields in the Niger Delta regions decreased as a result of cooling temperatures and that the majority of farmers were not well-informed about the risks posed by climate change. To guarantee food security in northern Nigeria, Efe (2009) emphasized the consequences of climate change-induced variability on livelihoods and food security and suggested workable adaptation options for farmers and stakeholders. At the Sokoto and Kano stations, Njoku (2006) found a declining trend in the number of wet days annually. Annual agricultural yields were found to be negatively impacted by this observed fluctuation brought on by climate change. Njoku (2006) also found that in Sokoto and Kano States, the availability of food crops declined when temperatures and rainfall dropped. He advocated for the creation of long-term, successful agricultural strategies that fit within a specific set of environmental factors.

Blanc (2012) investigated how climate change affects crop yields in Sub-Saharan Africa, specifically focusing on the four most common crops: cassava, sorghum, maize, and millet. The relationship between yields and common meteorological factors, like temperature and precipitation, was examined using panel data. The findings demonstrated that the majority of Sub-Saharan African nations have seen changes in their climatic features as a result of climate change. The outcome additionally shows that the effect of precipitation on crop yields varies among Sub-Saharan African nations according to their respective national agricultural conditions. Some grain crops like millet and sorghum yields were shown to be more affected by changes in precipitation.

Since smallholder farmers rely on rain-fed farming, which is compounded by a lack of irrigation, climate change, and variability have caused production losses and exacerbated food insecurities (Akuribire et al., 2024; Maireva, 2023; Tambol et al., 2025). For example, between 1996 and 2003, rainfall decreased by 50 to 150 mm per season (March to May) affecting long-season maturing cultivars in maize and sorghum crops (IPCC, 2002). For instance, in Zimbabwe, El Niño occurrences and warm sea surface temperatures in the eastern equatorial Pacific reduced maize production by 60% (Grothmann and Patt, 2005). Therefore, climate change affects the four components of food security (food availability, food accessibility, food utilization, and food system stability) (Wheeler, and Von Braun, 2013). Moreover, the severe droughts that struck Zimbabwe in 1991–1992 and 2011–2012 caused significant food shortages, food insecurity,

water scarcity, hunger, and a major hydropower shortfall. Traditionally, farmers have been using various mitigation measures against food insecurity including the use of drought-resistant cultivars, growing of early maturing varieties, practicing conservation agriculture, selling livestock and diversifying their crop or income portfolio (Fischer et al., 2016; Mpala and Simatele, 2024; Mustafa et al., 2019). However, studies (Carter et al., 2014; Maireva, 2023; Njue et al., 2018; Nnadi et al., 2013;) have demonstrated that traditional risk reduction mechanisms are currently unable to completely cover farmers from the resulting economic shocks, which results in a poverty trap. This necessitates the concurrent application of effective mitigation and adaptation techniques for climate change such as insurance.

2.5 Empirical review on the role of crop insurance in enhancing the resilience of smallholder farmers to climate-related shocks and food security

Climate change is threatening almost every demographic on the planet, including the ecological and socioeconomic sectors. Therefore, all parties involved in the global development arena address this issue directly (Stopper, 2013), and crop insurance must be seen as one component of the answer (Mills, 2009). Agricultural insurance not only assists farmers in managing their primary risks but also plays an active role in climate change mitigation (Claassen, 2015). According to Dahlstrom et al. (2003), if appropriate political and legal frameworks are established, the agricultural insurance sector can proactively contribute to the creation of carbon sinks, carbon sequestration, and the reduction of greenhouse gas (GHG) emissions. Skees and Collier (2012) stated that governments can connect disadvantaged farmers to weather insurance and carbon markets by providing incentives and funding for climate change adaptation and mitigation.

The insurance industry plays a big part in reducing the adverse effects of climate change by having a focus on strategic direction, organizational policies regarding the disclosure of climate risk information, and general insurance issues, including home and auto insurance (Mills, 2009; Mills, 2012). There is a clear connection between climate mitigation efforts and the active participation of the insurance industry in addressing weather and climate-related risks (Mills, 2007, 2009; Mills, 2012). Key initiatives in this area may involve raising awareness about climate change, developing innovative and environmentally sustainable insurance products with favorable terms that support adaptation and mitigation strategies, and incorporating measures to

reduce climate risks. Insurance can be a systematic approach to adaptation and can significantly reduce the risks associated with climate change, according to Schwank et al. (2010). They added that insurance, particularly for highly susceptible nations, can help improve the management of climate risks like catastrophic weather events. Weather Index Insurance should not be viewed as a substitute for or a means of avoiding other methods of climate change adaptation that have been created and are being used by local communities. Instead, it ought to be present to facilitate their execution (IFAD, 2011).

Linnerooth-Bayer and Mechler (2006) assert that the development of insurance products would aid in resolving the issues surrounding food insecurity. In addition to providing farm households with post-disaster income, which would help them prevent starvation and maintain stable livelihoods, insurance will increase their creditworthiness, allowing them to participate in higher-return farming techniques.

Farmers without insurance dispose of some of their valuable assets, such as animals and equipment, which they may wish to maintain but are unable to do so due to the drought and their need to survive (Hellmuth et al., 2007). This implies that they become more reliant on aid. As a result, the money helps them get through the drought until the start of the following growing season, at which point they can start farming again (ibid). This suggests that having insurance lessens reliance on outside assistance in times of need. Additionally, insurance gives farmers the confidence and ability to take chances in order to boost their profits; these risks can include spending money on better seeds and fertilizer. Furthermore, index-based agricultural insurance contracts improve farmers' access to agricultural inputs such as loans, high-quality seeds, fertilizers, and various agrometeorological consulting and extension services (Karlan et al., 2011). Therefore, it was discovered that formal insurance as a means of risk-coping mechanism was a suitable way to transfer agricultural hazards to a third party, such as an insurance firm. This promotes investment and helps smallholder farming communities to eliminate their fear of agriculture-related risks, as insurance uses risk-pooling to disperse covariate hazards (such as droughts) over a larger geographic area, something that farmers and their pre-existing risk-sharing programs, like farmer cooperatives, are incapable of (Aidoo et al., 2014). In addition to stabilizing farmers' incomes and shielding them from the effects of devastating crop failures, agricultural insurance can also encourage farmers to embrace technologies that boost output and

lower the risk of loan default, which enables farmers to obtain better credit terms (Nyathi and Tshuma, 2024). Thus, a well-crafted agricultural insurance policy can lessen the effects of systemic risks by offering much-needed protection and facilitating prompt recovery in the event of a disaster (Mbonane, 2018; Mwangi, 2019). This could help smallholders invest for the future and, as a result, prevent extreme poverty and ensure food security.

2.6 Empirical Review on Factors Affecting the Adoption of Crop insurance by smallholder farmers

The factors influencing the uptake of crop insurance are yet to be understood especially in developing countries like Zimbabwe, among the smallholder farmers due to the absence of sufficient data and overdependence on theoretical evidence that appears to support the theoretical viability of crop insurance but the empirical evidence from pilot programs reveals conflicting outcomes regarding the effectiveness of agricultural insurance (Nyathi and Tshuma, 2024).

Several factors influence the adoption of weather-based index insurance (WII), according to empirical literature. The adoption of weather index insurance has a positive relationship with farmers' awareness (Sibiko and Qaim, 2017). According to Njue et al. (2018), farmers in Kenya who were more knowledgeable were inclined to use insurance services. Karthick and Mani (2013) also discovered that decisions to get crop insurance are influenced by an understanding of the benefits of doing so. Sibiko and Qaim (2017) claim that a lack of financial knowledge has a detrimental effect on the uptake of farm index insurance. A number of studies have investigated the influence of WII awareness on adoption rates, indicating that farmers who receive education about the program through extension services are significantly more likely to adopt it.

Literature also found that the uptake of WII is linked to the demographic factors of farmers. For example, a study in Mumbai, India's Coimbatore District, found that, among other factors, age had a considerable impact on the demand for insurance (Ngoma and Chowa, 2021). According to research by Akinola (2014), older farmers in Nigeria who have more farming experience and had prior exposure to risks in crop production are more inclined to look for crop insurance in order to protect their income. According to the findings of Njue et al. (2018) in Kenya, Karthick and Mani (2013) in India, Bharati et al. (2014) in India, and Abdulmalik et al. (2013) in Nigeria, the age and prior experience of farmers play a significant role in their willingness to accept agricultural innovations, including crop insurance.

A household's educational attainment is another element that influences uptake. Education improves one's capacity to receive, decode, and comprehend knowledge pertinent to making creative decisions and also generally influences a farmer's decision to participate (Mani and Karthick, 2013). According to research conducted in Zimbabwe by Tsikirayi et al. (2013), households that are educated are likely to participate in crop insurance programs. Furthermore, comparable findings were reached by Njue et al. (2018) conducted in Kenya. In rural China, Jin et al. (2016) concluded that low acceptance will persist due to the lack of training and adequate awareness of agriculture insurance.

In addition, uptake is also impacted by smallholders' perceptions of insurance costs. Price has an impact on WII adoption, and this has been approved by Ngoma and Chowa (2021), Tsikirayi et al. (2013), Sihem (2019), and Kishore et al. (2018). Furthermore, research has shown that a farmer's awareness and knowledge of insurance and its advantages are linked to their interaction with extension education. According to research by Karthick and Mani (2013), Masara and Dube (2017), and Wairimu et al. (2016), extension services help farmers recognize the value of insurance, hence more inclined to purchase it.

An analysis of crop insurance demand in France and Italy was conducted by Enjolras et al. (2012). According to the study, farmers' aversion to risk, as well as the inherent qualities and operational outcomes of their own agricultural businesses, all have an impact on their decision to buy crop insurance. Because state subsidies were provided in France for plans that covered catastrophic risks, the study found that premium levels were higher in Italy than in France. Insurance is typically more expensive and less profitable without that kind of involvement. Indian maize farmers' lack of knowledge about crop insurance offerings and processes led to a low demand for crop insurance, according to Shashi Kiran and Umesh (2015). One of the main causes of the low demand for crop insurance is undoubtedly farmers' incapacity to evaluate its advantages (Gamdo and Silberman, 2008).

Ghazanfar et al. (2015) looked at the variables influencing Pakistani farmers' choices to buy and take part in crop insurance. The majority of farmers expressed interest in buying crop insurance, according to their data, while a sizable portion of farmers expressed no interest at all. Their research also suggested that farmers' reluctance to acquire crop insurance may have been caused by poor literacy rates and a lack of knowledge about the anticipated advantages of the policy.

Because they were concerned about their future production, farmers with more loss experience were more inclined to buy crop insurance. They believed that to prevent losses due to upcoming climate threats, crop insurance was considerably superior.

Balmalssaka et al. (2015) investigated the interest of Ghanaian maize farmers in taking part in the crop drought index insurance market. The most important criteria influencing farmers' interest in buying crop insurance, according to the study, were education, credit availability, and prior experience with other types of insurance. Farmers were more likely to buy crop insurance when they suffered damage from drought. The amount of non-farm revenue streams and the return period from previous disaster events decreased farmers' propensity to buy crop insurance. Crop insurance must be incorporated into microfinance to increase farmers' purchases of crop insurance. According to Koume and Komenan (2012), among Ivorian cocoa farmers, a farmer's interest in buying crop insurance was significantly influenced by their age, farming experience, household size, farm revenue, and farm size.

In Zimbabwe, the study by Nyathi and Tshuma (2024) revealed that several factors were correlated with the uptake of crop insurance by smallholder tobacco farmers including, level of education, farming experience, availability of extension services, and level of income. According to Danso-Abbeam et al. (2014), farmers must be made aware of the significance of crop insurance. The demand for crop insurance can be increased and agricultural insurance can be successfully adopted by tying it into other products. Farmers benefit when agricultural insurance is linked to other financial services like credit because it gives them the money to pay insurance premiums, which lowers the amount of limited resources they need to finance risk coverage. According to Mahul and Stutley (2010), this strategy offers the advantage of reaching a wider audience because it offers a package that includes multiple products. This result strongly implies that creating more alluring crop insurance products could lead to a rise in the demand for crop insurance in the future (Goodwin et al., 2003).

2.7 Empirical review on the effectiveness of crop insurance in mitigating household food security

Research by Kambali and Panakajes, (2022) demonstrated that insurance is essential for allowing farmers to manage resources effectively in order to optimize farm profit, which raises agricultural value addition, and income, and lowers poverty levels. The nature of the risks

insured—whether they were insurable or uninsurable—was credited with the insurance program's success, whereas factors such as high premiums and administration costs (small farms), investments in uninsurable risks, incentive issues, moral hazard, political meddling, and excessively high costs brought on by overspecialization were blamed for its failure. The study by Mwangi (2017) recommended that the insurer be held financially accountable for the program's effectiveness, that coverage be limited to insurable risks, that compensation be limited to actual losses, and that a minimum 20% deductible be included to incentivize farmers to take steps to reduce losses.

Although the majority of crop insurance still heavily depends on government subsidies, Al-Maruf et al. (2021) found improvements in the schemes' financial performance. Furthermore, Subedi and Rijal (2024) connected the ability to lift impoverished households out of cycles of poverty and encourage the expansion of farm businesses with increases in income and agricultural productivity. This has to do with banks' and input suppliers' readiness to offer farmers financial and extension assistance. The two studies demonstrated that the biggest benefits of crop insurance are found in its capacity to speed up the process of obtaining finance, implementing new technology on farms, and applying better inputs— all of which contribute to an overall increase in farm income and productivity. Hess and Hazel (2010) summarized several studies and concluded that for index insurance to function well, basis risk must be reduced, reliable and effective distribution channels must be created, and all implementing entities must receive sufficient and early training. The government, on the other hand, is responsible for establishing a supportive legislative environment, teaching and raising farmers' understanding of the value of insurance, offering subsidies, and supporting impact studies to promote methodical learning and improved implementation (Fang et al., 2021; Rachman et al., 2021).

De Nicola (2010) assessed the impact of weather-based insurance on farmers' investment, consumption, and well-being in Malawi using a dynamic stochastic optimization model. The results indicated that consumption rose by about 17%, suggesting that insurance has the potential to significantly alter or improve welfare. Additionally, the study demonstrated that farmers adopted riskier but more productive and higher-quality seeds, thereby improving their welfare through higher income linked to higher productivity.

Cai (2012) assesses how an agricultural insurance program affected household borrowing, saving, and production levels in China. The results showed that the implementation of insurance reduced production diversification by 10% while simultaneously increasing the production acreage of insured crops by almost 20%. Furthermore, the study demonstrated that while the availability of insurance reduced household savings by 30%, it also boosted credit demand by 25%. The same findings were reported by Banerjee et al. (2020) in Niger, where households experienced a 9-16 % relative increase in meal diversity.

Varadan and Kumar (2012) examined the effect of insurance on rice growing and the degree of crop diversification in India using the Simpson Index of Diversification (SID) approach. The study found that crop insurance helped farmers become more specialized and successfully absorb the majority of the production risks related to rice farming. Furthermore, higher usage of higher-quality inputs, which raised farming yields, was associated with insurance adoption. According to Russo (2023), crop insurance helps reduce the suboptimal input utilization brought on by risk aversion and the uncertainty of farming results, increasing output and efficiency while lowering the demand for intermediate inputs.

In Ethiopia, Awel and Azomahou (2014) conducted research on how Weather Index-Based Insurance affected farmers' output, technology adoption, and the well-being of insured households. By changing farmers' risk-taking behavior, the study demonstrated a beneficial benefit. Furthermore, the study demonstrated a favorable impact on the adoption of technology, with insured farmers employing inorganic fertilizers at higher rates than their non-covered counterparts. The study demonstrated that insurance improved farmers' well-being by raising agricultural productivity, which in turn raised household income. These findings were also supported by Attipoe and Adams (2024); Rana et al. (2024).

2.8 Theoretical Framework

This study examines two theories that guide the study: Agricultural Household Theory and Rational Theory

2.8.1 Agricultural Household Theory

Most of the developing nations heavily depend on the agrarian system, which is a major source of income, particularly for the majority of rural households, and a source of foreign exchange

(Wheeler and Von Braun, 2013). This places the agricultural sector at the center of government policies that both influence and are influenced by the behavior of farm households. In rural regions, agriculture is frequently subsistence, with households producing primarily for their own use, selling some of their crops, and purchasing labor and fertilizer as inputs. As a result, the idea of an agricultural home encompasses a range of households, from those engaged in commercial farming to those engaged in pure subsistence. Changes to the laws governing agriculture have an impact on labor availability, production, and consumption.

In general, the interdependency between production and consumption behaviors must be taken into account in any study looking at the labor or consumption patterns of farm households. The home and the business are included in agricultural or farm household modeling since farm enterprise operations influence household consumption patterns by generating household income. In some situations, income is the only way that economic agents' activities are interdependent. However, the model is divided into components that maximize utility and those that increase and improve profit margins in order to assess family behavior based on consumption and production activities. The household maximizes utility function within a production cycle, contingent on time, production capacity, and income level (Singh et al., 1986).

According to the Agricultural Household Theory, households maximize utility by acting as both producers and consumers of goods (Mwangi, 2019). Thus, the theory is reduced to the analysis of household choices on time allocation, productivity, and consumption. Households are presumed to be price takers for all commodities, including labor, in a static model, provided that the commodities are homogeneous. Households determine the ideal degree of consumption of agricultural staples, a market-purchased product, together with free time subject to limitations, by optimizing utility.

Due to budgetary and income constraints, the household's spending on the three items cannot go over its allocated funds. Due to time constraints, more time than is available cannot be spent. The farm's output in relation to the available resources or inputs is represented by a production or technological limitation. The model does, however, assume risk-free production, a single crop, and perfect replacement of labor on and off the farm. In order to maximize efficiency and provide the most utility, the household's production makes use of the interdependency of all limitations.

2.8.2 Rational Choice Theory

The Rational Choice Theory forms the basic understanding and modeling of human behavior in a social-economic context (Adanali, 2016). According to the theory, a person has comprehensive and transitory preferences and relies on logical calculations to achieve results that align with their own goals. According to this view, rationality is the fundamental principle that directs decision-making among options, maximizing profit or pleasure by selecting the optimal course of action.

However, rational choice theorists contend that rather than describing the decision-making process, the theory only predicts the results and order of options. This model frequently makes the crucial supposition that people's preferences are self-centered, with people acting as though they are weighing costs and advantages to determine the best course of action that maximizes predicted utility (von-Neumann and Morgenstern, 1944).

According to the theory, restrictions, beliefs, and preferences influence every decision. People's preferences reflect the importance they place on the potential results of their activities. What is now known as neoclassical economics went on to develop the theory's central ideas. Three fundamental presumptions are crucial: (i) people behave autonomously based on complete information; (ii) they maximize their utility; and (iii) they have selfish preferences (Adanali, 2016). The theory has been widely used to describe and comprehend human behavior in various ways of social scientific fields, including education, management decision-making, consumer and producer choice, and financial investments in businesses (Becker and Becker, 1997).

In a decision-making approach, a decision is made by an agent that is capable of consideration instead of just being an event that happens (Pettit, 1991). This theory's main goal is to forecast and explain human behavior using the laws guiding expected utility and subsequent behaviors (Eells, 1982). According to rational choice theorists, people must forecast the results of various acts and select the course of action that has the best chance of generating the greatest amount of utility (Carling, 1992). As a result, the theory is useful for comprehending decision-making processes like choosing whether or not to adopt insurance and making decisions about production and consumption.

2.9 Conceptual Framework

The study was conducted following the below conceptual framework (Figure 2.1). The conceptual framework gives the researcher's rationale about what best describes the phenomenon under investigation.

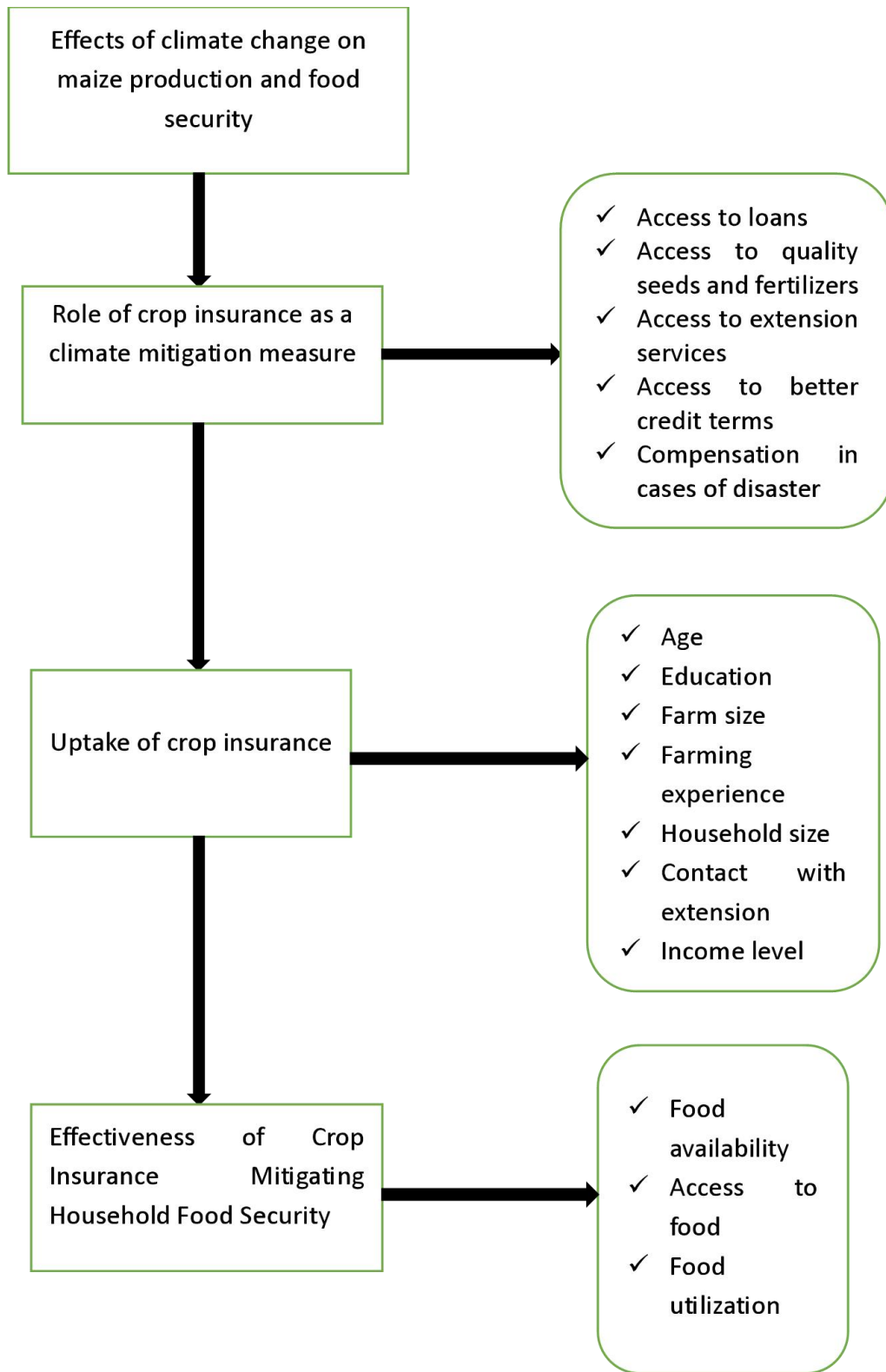


Figure 2.1: Conceptual Framework of the study

2.10 Insights from Literature

The literature review has shown that there are gaps that need to be filled in the role of crop insurance in mitigating household food insecurity among smallholder maize farmers, especially in Africa. This is evident from the 1% adoption of agricultural insurance among smallholder farmers in Africa, compared to 15.8% in Latin America and the Caribbean, and 46.2% in Asia. The literature has suggested that crop insurance can help smallholder farmers in getting access to loans, quality seeds, fertilizers, and access to extension services. However, the literature review suggested that the uptake of crop insurance is influenced by several factors, including age, educational status, farm size, household size, and income level. Moreover, the literature has suggested that crop insurance can help in securing household food security: that is availability of food, access to food, and proper utilization of food. The insights in the literature review have proved that most of the studies have been focused on the factors influencing the uptake of agriculture insurance, neglecting its role in mitigating household food insecurity among smallholder farmers. Hence, this study focuses on investigating the role of crop insurance in mitigating household food insecurity among smallholder maize farmers in this climate change era.

2.11 Conclusions

This chapter reviewed the literature on the agricultural risks faced by smallholder farmers, specifically those linked with climate change. It further discussed the types of crop insurance, which are named peril and index-based insurance. The chapter also discussed the role played by crop insurance as a climate mitigation strategy among smallholder farmers and its role in ensuring household food security. Factors that affect the adoption of crop insurance by smallholder farmers were also discussed. The two theories which guide this study were also discussed.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter presents the methodology of the study, discussing how the study was conducted. The chapter specifically presents a description of the study area, research design, population, and sampling techniques, research design, types of data used, data collection methods, data analysis, validity and reliability of the instruments, and end with ethical considerations.

3.2 Description of the study area

This study was conducted in the Goromozi District, of Mashonaland East Province in Zimbabwe. This province has a total population of 1,173,173 (National Statistics Agency Zimbabwe, 2022). The district accounts for 33% (386 199) of the provincial population and has a total household population of 101,631 (National Statistics Agency, Zimbabwe, 2022). The district map is shown in Figure 3.1.

Historically, the district was called Salisbury District made up of nine reserves namely Gwebi, Chikwaka, Seki, Nalire, Musungu, Kunzwi, Jeta, Chinamora, and Musana (Chakona, 2011). A few years later, the district was split up into various districts, including Goromonzi. There are three chieftainships in the district: Chinamhora, Rusike, and Chikwaka. The largest is Chikwaka. The vaShawasha, who migrated from Fort Victoria, is another name for the Chinamora people. The district was purposively chosen due to its productive and diversified farming activities with the main crop being maize and consisting of 3,200 hectares of arable land. The district is located in natural region II, which is known to be productive in terms of farming activities.

The average farm size in Goromonzi is approximately 3.5 acres (1.4 hectares). A significant portion of the land, accounting for 85%, is allocated to maize cultivation, while groundnuts comprise 5% and other crops also represent 5%. The major economic activity in Goromonzi District is smallholder agriculture (Makate et al., 2017). The district's land tenure includes state, communal, and freehold ownership. Four classes of land usage are distinguished: large-scale commercial farming, residential agricultural areas, small-scale commercial farming, and communal lands.

The district has fertile soils that are suitable for both intensive and extensive agricultural production. For example, in Bromley, Chikwaka, Rusike, and Chinamora, the soils are primarily pale and sandy (Goromonzi Rural District Council, n.d.). There are two main seasons in the region: winter, which lasts from April to September and is typically cold and dry, and summer, which lasts from October to March and is typically hot and rainy. The typical temperature in the region is between 15 and 20 degrees Celsius. The majority of the rainfall occurs throughout the summer, with an average of 800 to 1,000 mm. Furthermore, as the majority of Zimbabweans who live in rural areas solely depend on agriculture for household food security, they are facing food insecurity due to a shortage of healthy and nutritious food. The reasons behind this, include a shift in the pattern of rainfall and the occurrence of pests and diseases, which have contributed to the low production of maize over the past five years. However, farmers can ensure household food security if they adopt agricultural innovations such as crop insurance.



Figure 3.1: Goromonzi District, Source (Google Earth)

3.2 Research design

A descriptive research design was used in the study. Descriptive studies seek to characterize people through observation of individuals, events, or situations in their natural environments. It assisted the researcher in gathering data from the selected respondents by distributing the questionnaires and interviewing the sampled individuals (Orodho, 2017). The study used survey research because the population was somewhat vast and could be difficult to observe or manage directly. Thus, the results of the study might be used to generalize the target population of the study. The design allows the collection of both quantitative and qualitative data; thus, the study used a mixed-method approach in data collection. Combining the two methods results in a scenario that guarantees a deeper comprehension of the phenomenon being studied. Additionally, by combining the two, one can avoid their respective shortcomings and utilize their respective strengths. More complicated research topics can be addressed by the mixed-method approach than by either the quantitative or qualitative methods alone. Additionally, more reliable conclusions are drawn via mixed techniques. The findings of many approaches, such as qualitative and quantitative methods, would improve the validity of inferences more than when using just one approach (Lund, 2012).

3.3 Target population and sampling procedures

The study utilizes data from maize-growing households from Goromonzi district in Zimbabwe, consisting of participants and non-participants in a crop insurance program. The study focused on Ward 16 of Goromonzi district. The study employed multiple sampling techniques to select the study area and category of smallholder farmers. Goromonzi district was purposively selected for the study since it has a sizable number of smallholder farmers who had taken crop insurance. A multistage sampling technique was employed in Ward 16 of Goromonzi district with 6,578 households (National Statistics Agency, 2022). The study targeted smallholder maize farmers, and the households were the sampling units. Using an online sample size calculator (calculator.net), the minimum size was established to satisfy the 8.96% error margin and 95% confidence interval for individual strata. The study's initial goal was to use a 5% margin of error, however, the researcher found that the minimum sample size needed was greater than what the research budget could support. Thus, an 8.96% margin of error was applied, yielding a sample size of 113 households. The sampling unit was a household member practicing maize farming.

The simple random sampling technique was used to select a pool of target households from a sampling frame of both farmer groups and a list of group members obtained from the local insurance trainers or the extension officer. Thus, smallholder farmers who were under crop insurance were obtained through the help of extension officers and or local insurance trainers. In contrast, the random-walk technique was used to choose farmers who had never purchased crop insurance within the target farmers' neighborhood. Six households were counted at random during the random walk, and the seventh household was subsequently chosen. The next stage was to determine whether the household had ever purchased crop insurance; if not, they were eligible to serve as a control group; otherwise, the procedure was repeated until the target sample was obtained. Random sampling allows equal chances of selection to participate in the study.

Moreover, two extension officers were purposively selected as key informants as they are responsible for helping farmers to have better knowledge of farming practices and the adoption of new technologies to ensure food security.

3.4 Type of Data

Two different categories in collecting data are used in research, namely primary and secondary data (Ajay, 2017). The study used primary data; thus the researcher collected data through the questionnaires and interviews. Primary data is data that was gathered by the researcher through research instruments such as interviews, questionnaires, and observations, whereas secondary data is already existing data gathered that can be obtained from journal articles, organizational reports, books, and government websites (Johnston, 2014).

3.5 Data collection

Farmers' perception and experience play a crucial role in their decision to use crop insurance. Thus, the study used a semi-structured questionnaire and interviews to collect data, to have an in-depth understanding of the role of crop insurance as a climate change risk mitigation strategy among smallholder farmers to ensure household food security.

Questionnaire

The study used a semi-structured questionnaire to conduct personal interviews with each of the 113 household members. This questionnaire consists of both open and closed questions to enable the participants to answer the questions flexibly and conveniently. The questionnaire for

smallholder farmers consists of sections such as demographic characteristics, climate change-induced risks, coping strategies, crop insurance, food security, and other variables. The questionnaire was developed in a way that addresses all the objectives of the study. Questionnaires were administered to smallholder farmers in both English and their native language, as some were not familiar with English. Before the data collection, the participants were told the research objectives and that the data collected would be used for academic purposes only.

Key informant interviews

Interviews with two extension officers with specialised knowledge were conducted in Ward 16 of Goromonzi following personal interviews with smallholder farmers. The extension officers were purposively selected as they have the first knowledge of farmer weather-induced/climate change-related risks affecting food security, and also, they are responsible for helping farmers to have a better understanding of good farming practices and the adoption of innovations such as crop insurance. Their opinion is therefore pertinent as they might help in the uptake of crop insurance by smallholder farmers. Before the interviews, the participants were told the research objectives and that the data collected would be used for academic purposes only. Each interview took about 20 minutes.

3.6 Validity and reliability of the instruments

Mixed-method research presents unique challenges owing to the involvement of researchers, enumerators, and participants, as human interactions are naturally influenced by individual values and biases. Maximum efforts were applied to pave way for the study's findings and conclusions to be valid and reliable. They did this by strictly following the methods and procedures needed for good research. A mixed research methods approach was administered to strengthen challenges often encountered with relying on one method; qualitative and quantitative research were used, maximizing on their strengths. This approach permitted the collection of both qualitative and quantitative data, providing comprehensive results. It helped us gather and confirm information from both smallholder farmers and key informants. To gather responses effectively from smallholder farmers, targeted data collection methods were used. This involved the distribution of semi-structured questionnaires that included both open and closed questions, which allowed for flexibility and detailed answers. Interviews were conducted with key people

with specialized knowledge and skills referred to as 'key informants', giving participants the chance to share their experiences and views on the study topics without restrictions. The researcher ensured approval from the department and assigned supervisor on all the protocols needed to conduct the study. For example, research instruments were sent to the supervisor to ensure they were not posing a risk and were in line with the research objectives. Lastly, the questionnaires were sent to 3 individuals who happened to be students studying towards the Master of Science degree in food security and sustainable agricultural production/policy at Bindura University of Science Education, and this was a pilot study to rectify any errors on the questionnaire.

3.7 Data analysis

The study collected both quantitative and qualitative data. Quantitative data was analyzed using SPSS version 24. Descriptive statistics such as means, percentages, frequencies, and standard deviations were used, and results were presented in tables and figures. A multiple regression was used to determine the factors that affect the adoption of crop insurance among maize smallholder farmers.

Qualitative data was first transcribed, coded, and themes were generated; thus, thematic analysis was used. The first step involves data transcribing if it is audio. This entails going over the data and paying close attention to its meaning and trends. The second entails writing initial code. This occurs following familiarization with the data. The researcher must conduct thematic coding and compile a codebook in order to keep track of the codes. This procedure entails going over the data once more and giving it various codes. The same codes ought to be linked to topics that share a common meaning. Thirdly, entails compiling the codes along with supporting information and grouping all theme excerpts containing specific codes. This entails classifying codes according to themes. It follows sorting the original codes into a set of themes. It follows, breaking up themes into subthemes or merging various codes. Themes are combined, reviewed, and those without sufficient evidence to back them up are removed. Lastly, it involves narrating and evaluating the results.

3.8 Ethical considerations

The researcher seeks permission to conduct the study from the University Department of Agriculture Economics, Education, and Extension. This was after the research proposal was approved by the department. The researcher also got approval from the councilor of Ward 22 of Goromonzi district to conduct the study. Moreover, the instruments were sent to the supervisor for ethics before data collection. The proposal first included all research activities to obtain the clearance letter, along with information on how to ensure that the participants could participate in the study with confidence. This included informing the participants that the research would be confidential and that their privacy would be protected, as well as the research's goal and contribution to the community. Finally, the researcher informed the participants that their information would not be used for any other purposes.

CHAPTER 4: RESULTS AND DISCUSSION

4.1 Introduction

This chapter involves data analysis and analysis of the results. It is presented following the research objectives of the study. Out of the 113-sample size for the smallholder farmers, the researcher managed to collect data from 82, representing a response rate of 72.57%. The response rate was high enough for the study to draw conclusions.

4.2 Characteristics of insured and non-insured smallholder farmers

This section analyzed the socioeconomic and household characteristics of the insured and non-insured smallholder farmers in Ward 16 of Goromonzi district to establish if there were any stake differences in their characteristics, which may explain their vulnerabilities and decisions towards crop insurance. The study collected data from 48 crop-insured and 34 non-insured smallholder farmers.

4.2.1 Socioeconomic characteristics

Out of the 82 maize smallholder farmers interviewed, 48 (58.54%) were insured and 34 (41.46%) were not insured. Overall, the majority of the participants were female, with the most being not insured (64.71%), while the majority of the males were insured (47.91%) (Table 4.1). In underdeveloped nations, women are thought to be the most prevalent gender type involved in farming. According to most African customs, women should work in agriculture, while males should focus on other economic pursuits like construction, lumbering, and animal grazing (Alesina et al., 2013). However, the number of males working in agriculture has been rising over time due to population growth and higher industrialization (FAO, 2013). Research indicates that when it comes to farming, men employ more sophisticated technologies while women use local farming equipment and engage in small-scale farming (Hansda, 2017). This means gender may be one of the factors affecting the adoption of crop insurance. This may also be linked to the household decision-making process, especially when it comes to issues of guaranteeing food security.

Table 4.1 shows that the majority of the participants had better education. Of the 48 insured, 60.42% reached secondary education, and 29.16% reached tertiary education. The study further revealed that smallholder farmers who were insured were 5.88%, 50%, 38.32%, and 5.88% had

no formal, primary level, secondary level, and tertiary level, respectively. These results show that the decision to adopt crop insurance leans towards high education levels. This suggests that the farmers' degree of knowledge led to their enlightenment and subsequent awareness of the necessity of purchasing crop insurance. Therefore, more educated farmers have a more favorable opinion of insurance in general. This result is consistent with a study conducted in Kenya by Njue et al. (2018), which discovered that farmers with more educational attainment tended to purchase microinsurance.

Table 4 also shows that participants whose occupation was farming had a higher rate of adopting crop insurance at 70.83% compared to those in formal employment (20.83%) and entrepreneurship (8.33%). This may mean that farmers are only expecting farming to ensure household food security, hence the need for insurance.

Table 4.1: Socioeconomic characteristics between insured and non-insured

Variable		Insured (%)	Not insured (%)
Socioeconomic variables			
Gender	Female	52.08	64.71
	Male	47.91	35.29
Education level	No formal	2.08	5.88
	Primary	8.33	50
	Secondary	60.42	38.32
	Tertiary	29.16	5.88
Occupation	Farmer	70.83	23.52
	Entrepreneur	20.83	32.35
	Formal employment	8.33	44.11

4.2.2 Household characteristics

Table 4.2 shows household characteristics of maize smallholder farmers who were insured and not insured under crop insurance. The mean ages of both the groups, insured (52.44) and non-insured (46.5), indicate that they are in their productive ages. Njue (2018) indicated that an individual's age has an impact on their acceptance of crop insurance since they become more risk-averse as they age. Household size was higher in the non-insured farmers compared to the

insured, with a mean size of 4.94 and 4.71, respectively. This means adoption of crop insurance has nothing to do with the subscription to crop insurance. Land size was slightly higher in insured participants, with a mean of 5.18, while non-insured participants had 4.31. It is possible that people who own more acreage would rather buy crop insurance to safeguard their businesses and reduce risks so they can provide for their families. Moreover, the study shows that the mean farming experience for farmers who subscribed to crop insurance was 24.71 years and 20.7 years for non-insured farmers. According to this, farmers interested in buying crop insurance have more farming expertise, which suggests that they are better equipped to handle production risks and make wise agricultural decisions. Experience in agriculture helps farmers better grasp the causes, frequency, and severity of risk, which in turn improves their ability to manage farm risk more effectively (Akhtar et al., 2019). The results show a clear difference in household mean income between crop-insured at US\$ 705.10 compared to non-insured smallholder farmers (US\$ 436.80). These findings were not surprising given that farmers who had crop insurance also benefited from additional goods and services like farm inputs on loan and good agronomic practice trainings that were included in the insurance package, as well as frequent advising services from private extension agents. Crop insurance is increasingly being considered as a potential solution to help agriculture insurance achieve better social outcomes, make insurance more tangible, and allow schemes to scale more quickly by bundling it with other equally important services like credit and better farm inputs (Mukherjee and Pal, 2019).

Table 4.2: Household characteristics

Variable	Insured	Not insured
Age	52.44	46.5
Household size	4.71	4.94
Land size	5.18	4.31
Experience	24.71	20.7
Income	705.10	436.80

4.3 Effects of climate change on maize production and food security among smallholder farmers

Table 4.3 presents data indicating that 85.37% of participants reported experiencing fluctuations in weather and climate over the years, while 8.5% indicated experiencing the same to a certain extent. These findings are backed up by similar studies by different researchers, including the research by Gutsa (2017), Masuku (2018), and Dangwa (2024).

Table 4.3: Occurrence of Weather and Climate Change

Occurrence of Weather and Climate Change	Frequency	Percentage
Yes	70	85.37
To some extent	7	8.54
No	5	6.1
Total	82	100

4.3.1 Manifestations of climate change

Smallholder farmers identified various agricultural risks related to weather, as illustrated in Table 4.4. All of the participants indicated that they have experienced droughts, high temperatures, unreliable rains, and late starts of the rain season. About 97.56% of the participants indicated that they have experienced erratic rainfall, while 68.29% indicated shortening of the rain season. These results were also supported during an interview with the officer, who stated that,

“Climate change is real to the extent that Goromonzi, which has been viewed low-risk area, has been affected by drought every three years for the last 20 years.”

The results stated show that agricultural operations have been negatively impacted by these extreme weather occurrences, putting smallholder farmers at risk of poverty and food insecurity. The study by Gutsa (2017) claims that in the past, Goromonzi used to expect rainfall in October, and in November, residents planted their crops. Gutsa (2017) further indicated that this had changed because people are receiving rains in late November and are forced to plant in December. This has affected the good harvest they used to have due to the delayed rains and early disappearance, leading to frequent droughts. The study by Gutsa (2017) indicated that the

good harvest that used to happen in Goromonzi has been heavily impacted by the unpredictable rains.

Table 4.4: Manifestations of climate change

Change	Frequency	Percentage
Erratic rainfall	80	97.56
Increase in floods	24	29.26
Unreliable rainfall patterns	82	100
Shortening of the rain season	56	68.29
Late start of rains	82	100
Poor rain distribution	54	65.85
Droughts	82	100
High temperatures	82	100
Strong winds	25	30.49

4.3.2 Impacts of weather/climate change on smallholder farming and food security

The Goromonzi district has experienced significant negative impacts due to climate change, as illustrated in Figure 4.1. When requested to rank these impacts, 21% of farmers indicated that they had experienced crop losses, while 15% specified that climate change presented difficulties, with some unable to pay off loans and provide adequate food for their families. Moreover, 13% indicated that they were facing difficulties in sending children to school, while 11% and 9% indicated loss of livestock and water scarcity.

Zimbabwe's economy is heavily dependent on rain-fed agriculture, but output is being jeopardized by hydro meteorological extremes. For example, choosing crop kinds to grow and determining planting dates have grown more challenging due to the growing uncertainty surrounding the seasons' onset and finish (Mushore et al., 2017). Gutsa (2017) indicated that Goromonzi has seen major changes, such as the rains coming several weeks late and the typical mid-season dry spell lengthening from two or three weeks to roughly six weeks per season. For example, Gutsa (2017) pointed out that elderly women in the village noted that there are more and more instances where the rains were not received on time, and there were indications that the mid-season dry spell had changed for several years and seemed to have lasted longer than the typical two weeks. For instance, in 2015, the hamlet experienced a nearly four-week-long mid-season dry spell in March, during which the majority of the maize experienced extreme moisture

stress that was past its recovery point (Gutsa, 2017). The absence of a good harvest for the smallholder farmers further affected their ability to feed the household, pay loans, and send children to school, as the majority heavily rely on crop farming. According to ZVAC-OCHA (2015), the El Niño weather phenomenon during the 2015–16 agricultural season caused long-term drought-related damage in Zimbabwe, resulting in approximately 40,000 livestock deaths and an estimated 2 million people experiencing food insecurity. Farmers continue to lose local breeds because of the drought, even though their smaller size allows them to adapt to the nutritional limitations commonly faced in Zimbabwe. Due to severe crop failure brought on by the inadequate rainfall performance, household food availability and output are very low. Lack of pasture and water consequently had an incalculable impact on livestock output.

Climate change has also resulted in water scarcity for domestic use. It has grown more challenging for people and animals to obtain water in the areas of Goromonzi as a result of the early drying up of several water sources (Gutsa, 2017). The impacts of climate change are causing wells in the villages, both communal and at people's homesteads, to dry up earlier and more quickly. This has to do with both insufficient rainfall and the delayed onset of precipitation.

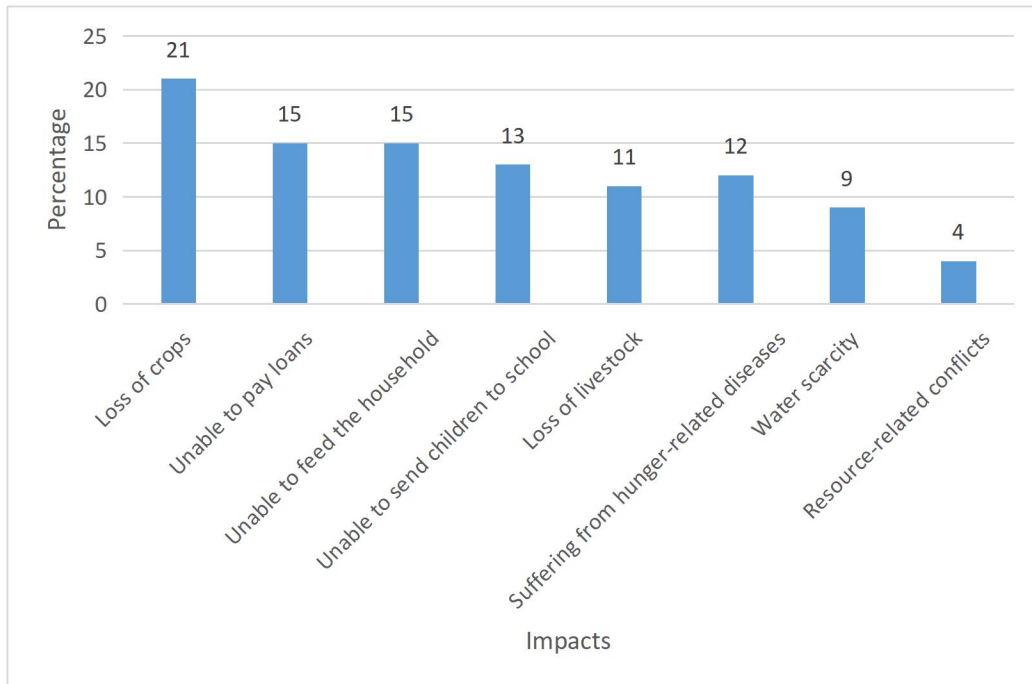


Figure 4.1: Impacts of Climate change on household livelihood

4.3.3 Coping strategies of smallholder farmers to climate change

Over the years, smallholder farmers have developed coping strategies to climate change as shown in Table 4.5. The majority (91.46%) of the participants indicated that they rely on farm and crop diversification. Farmers are using several strategies to cope with drought. The top methods include planting drought-resistant and improved crop and livestock varieties (85.36%), using grains stored from previous harvests (78.04%), taking on off-farm jobs (63.41%), and buying agricultural insurance (58.54%). and remittance from relatives and friends (51.21%).

Crop diversification involves the cultivation of a variety of crops to establish a safety net. If certain crops fail due to adverse weather conditions, the remaining crops can provide essential support. They therefore intercrop crops like beans, maize, and pumpkins. Since legumes fix nitrogen, this aids in increasing soil fertility. Once again, they provide soil cover, which aids in preserving and retaining soil moisture. Families are guaranteed to have some harvestable yields even if other crops fail. A study conducted by Mushore (2021) in Nyanga smallholder farmers indicated that farmers often grow a variety of crops, particularly drought-tolerant groundnuts, round nuts, cow peas, sugar beans, maize, sorghum, rapoko, and millet. Moreover, the government of Zimbabwe, through its extension division, has been spearheading the growing of drought-resistant crops as a climate mitigation strategy. Many seed houses have developed maize seed varieties that can withstand low rainfall; however, with the adverse and increasing temperatures and unpredictable rainfall patterns, it would be wise for farmers to grow all kinds of crops, especially small grains, which are drought-resistant. Nonetheless, even in marginal areas, the majority of Zimbabwe's subsistence farmers prefer to produce maize crops, which leads to ongoing food shortages. Even if some households have switched from maize to sorghum, AGRITEX still needs to educate people about the value of planting drought-resistant crops, especially during drought seasons. The use of drought-resistant cultivars, growing of early maturing varieties, practicing conservation agriculture, selling livestock, and diversifying their crop or income portfolio have been classified as traditional mitigation measures against food insecurity, including (Fischer et al., 2016; Mustafa et al., 2019). However, studies (Nnadi et al., 2013; Carter et al., 2014; Njue et al., 2018; Maireva, 2023) have demonstrated that these traditional mitigation measures are currently unable to completely cover farmers from the resulting economic shocks, which results in a poverty trap. Therefore, it was observed that

formal insurance as a risk-coping mechanism was a suitable way to transfer agricultural hazards to a third party, such as an insurance firm.

A sizeable number of smallholder farmers indicated that they have adopted agricultural insurance as a coping strategy. However, all the insured farmers indicated that they only use conventional insurance, referred to as named-peril crop insurance. They further indicated that the insurance only covers drought without a proper assessment. On the other hand, the extension officer during the interview stated,

"Agricultural insurance for smallholder farmers has come at such an appropriate time. Farmers can restart field activities in the event of crop failure as they receive compensation."

Multi-peril crop insurance encompasses all risks affecting crop output, excluding those not specified in the insurance policy (Ellis, 2016). According to Tsikirayi et al. (2013), the amount insured is often determined by either the anticipated crop revenue or the production expenses. However, there are issues with moral hazard, adverse selection, high administration expenses, and transaction costs related to indemnity-based insurance (Binswanger-Mkhize, 2012). Multi-peril crop insurance protects crops from lower yields and losses brought on by disease, fire, flooding, hail, frost, drought, and insect damage. Literature suggests that indemnity-based insurance has failed in the majority of both developed and developing nations (Kwadzo et al., 2013). This might be a concern to the smallholder farmers, as they indicated that insurance companies only cover losses as a result of drought, and without proper assessment, making farmers doubt the importance of crop insurance. The majority of agricultural insurance experts, policymakers, and practitioners in low-income nations are increasingly advocating for weather-based index insurance schemes, nearly to the exclusion of traditional or all-risk policies (Carter et al., 2014). The arguments put forth by proponents and advocates of utilizing weather index insurance to assist smallholder farmers in low-income countries are indeed compelling. However, the researcher aligns with the perspectives of Goel (2013), Elabed and Carter et al. (2015), and Greatrex (2015) in asserting the necessity of developing a more integrated index. Such an index should extend beyond the confines of weather index insurance to provide comprehensive protection for smallholder farmers against a broader spectrum of primary agricultural risks, encompassing both weather-related and non-weather-induced threats. This approach would enable farmers to manage the residual risks more effectively (Pacheco et al., 2016). Their

informal and indigenous methods of managing agricultural risks could help them do this (Mobarak and Rosenzweig, 2013).

The researcher argues that governments in low-income countries should assist agricultural insurance programs by covering technical, infrastructural, and administrative costs, in addition to subsidizing premiums for insured farmers. The approach resonates with practices of advanced agricultural insurance programs in developed countries like the US, Canada, and Spain. The advanced methods provide much-needed support for effective essential for effective management of the agricultural risks faced by subsistence farmers. This should be done differently, nevertheless, taking into account the unique conditions and limited financial resources of low-income nations with conflicting resource demands (Fang et al., 2021).

Table 4.5: Coping strategies of smallholder farmers to climate change

Coping strategy	Frequency	Percentage
Use of grains stored from the previous year/s harvest	64	78.04
Sale of livestock/poultry birds	35	42.68
Engaging in off-farm jobs	52	63.41
Migration to other regions with favorable weather/climate	5	6.09
Reliance on food aid and disaster relief supplies	27	32.92
Reliance on fruits, vegetables etc. from the wild	38	46.34
Borrowing from neighbors	24	29.26
Reliance on support from neighbors and social networks	8	9.75
Remittance from relatives and friends	42	51.21
Agricultural insurance	48	58.54
Farm and crop diversification	75	91.46
Use of drought-resistant and improved crop and livestock varieties	70	85.36

This study looked at how smallholder farmers adapt to crop risks in the Goromonzi district. It also evaluated how effective agricultural insurance could be as a way to help manage these risks (see Figure 4.2). Many farmers think their coping strategies are effective. On the other hand a number of farmers contend that their current strategies lack effectiveness. Specifically, 57% of

farmers indicated that their coping strategies were effective to some degree, with 26% categorizing them as effective and 5% asserting that they were ineffective. Feedback from participants indicated that each farming household utilized a variety of coping strategies. This suggests that while a particular strategy may not yield positive results for one household, it could prove effective for another. To effectively tackle the agricultural challenges faced by smallholder farmers, it is beneficial to implement several adaptation measures at the same time. Research shows that these adaptation strategies frequently achieve varying degrees of success, which is well-documented in scholarly literature concerning the impacts of climate

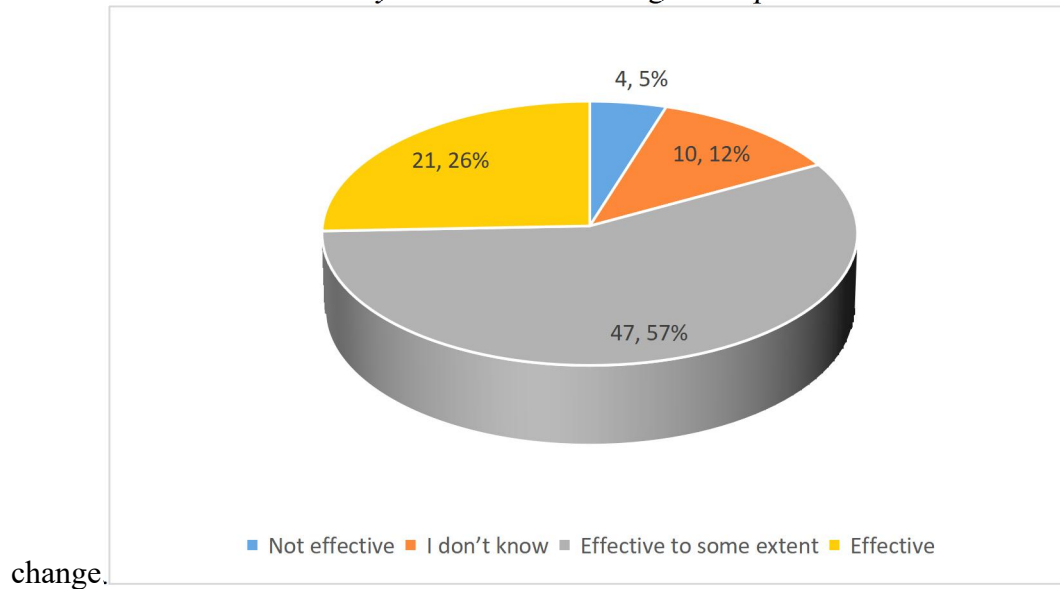


Figure 4.2: Effectiveness of smallholder coping strategies to climate change

4.4 The role played by crop insurance in enhancing the resilience of smallholder farmers to climate-related shocks and food security

4.4.1 Awareness of crop insurance

The participants were asked if they had heard of crop insurance or not, as shown in Figure 4.3. The results showed that 49% have heard of crop insurance, while 51% had not. These results are somewhat contrary to the expectation, since 58.54% of the participants were insured. According to field findings, even though farmers had insurance, they knew very little about crop insurance, and some of them were not that educated, therefore, they were illiterate. However, it became evident that farmers participating in the crop insurance scheme were covered by insurance when they disclosed their contractual terms. These findings are partly consistent with those of Tsikirayi et al. (2013), who found that farmers need to be educated about agricultural insurance through more focused awareness and sensitization campaigns. Nyathi and Tshuma (2024) indicated that

the adoption of crop insurance among smallholder farmers in Zimbabwe is very low and that a larger proportion are unaware of the insurance schemes offered by insurance companies. Machangu-Motcho (2023) asserts that farmers' adoption of crop insurance is aided by their understanding of the value of insurance and how it affects their revenue. This lack of awareness and comprehension of agricultural insurance is in line with research conducted in Ghana by Bozzola and Finger (2021) and Rejesus et al. (2018) in the Philippines, who found limited information on agricultural insurance among farmers. Therefore, training is essential since it fosters knowledge and a favorable attitude regarding farm insurance.

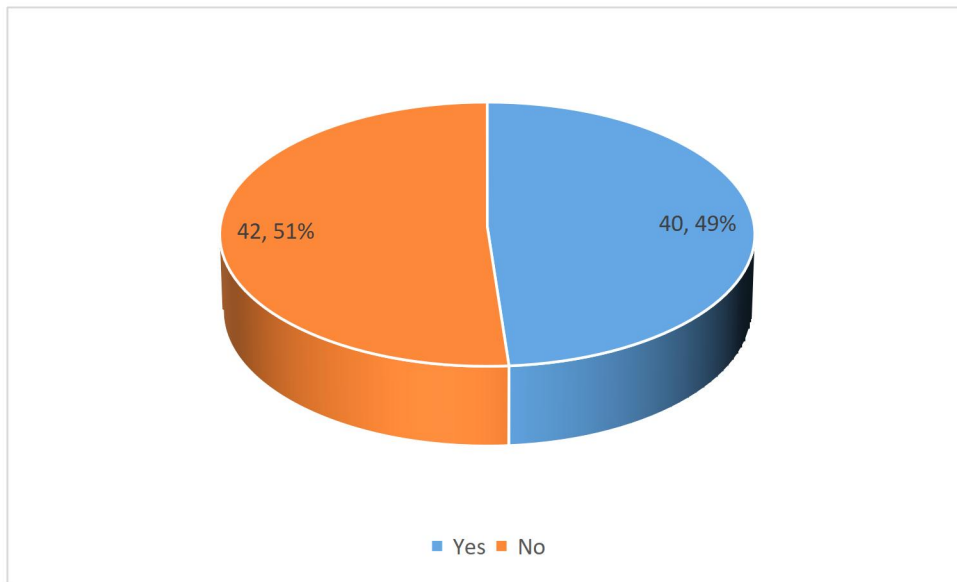


Figure 4.3: Awareness of crop insurance

4.4.2 Reasons for not adopting insurance

Out of the 34 participants who were not insured, about 47% attributed to their non-participation to in the crop insurance program to lack of understanding how insurance works, another 23% indicated that crop insurance was not readily available in their area whereas 12% alluded that crop insurance was expensive for them (Figure 4.4). However, 18% of the participants indicated that they did not need crop insurance. This result calls for awareness campaigns by the private and government institutions, particularly the AGRITEX, for promoting the adoption of crop insurance amongst smallholder farmers. The same results were also obtained by Njue et al. (2018) in Kenya amongst maize smallholder farmers.

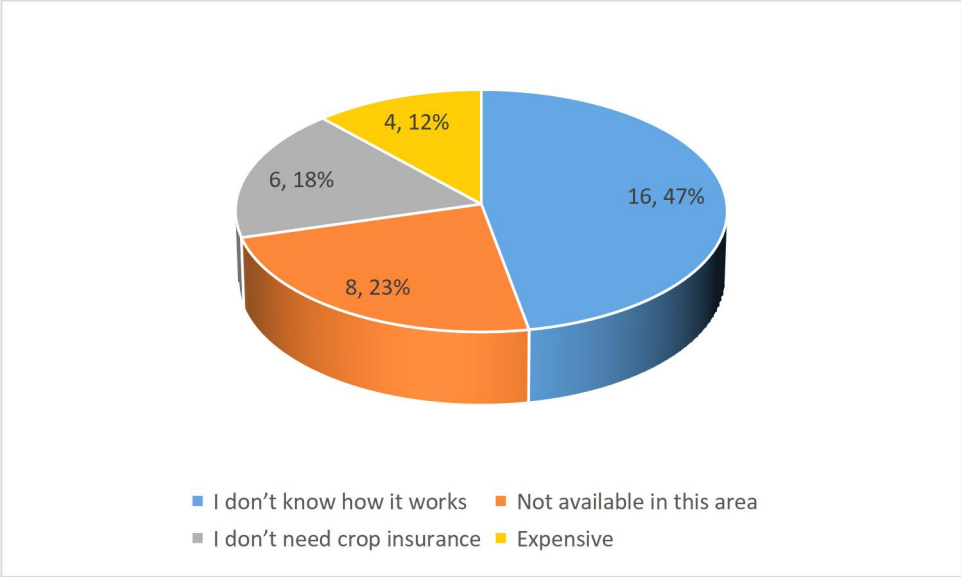


Figure 4.4: Reasons for non-adoption of crop insurance

4.4.3 The role of crop insurance in crop risk management among smallholder farmers

The study requested participants to rank the role of crop insurance in managing crop risks, as illustrated in Figure 4.5. The majority (13.7%) of the participants ranked improving access to financial services number, followed by increase on crop production (13.6%), improve in household food security (12.5%), peace of mind (10.9%), value change linkage benefits (10.9%) and crop price protection (8.5%).

The study noted different roles of crop insurance among smallholder farmers; however, those insured indicated that the current scheme is not convincing as the insurers only provide multi-peril insurance, which covers drought only, and without a proper assessment. However, some policymakers and researchers have indicated that appropriate crop insurance schemes have many benefits in crop risk management. For instance, research has shown that payments made to insured farmers in response to trigger events have been encouraging and boosting the confidence of certain farmers in low-income nations to increase their agricultural output (Nnadi, 2013; Birthal et al., 2021); safeguarding farmers' financial investments (Birthal et al., 2022); offering stability and sustainability in agricultural endeavors (Panda, 2013); and guaranteeing household food security during difficult years (Márza et al., 2015; Wang et al., 2022). Other studies found that crop insurance helps in obtaining agricultural loans, agro-inputs (like fertilizers and

improved seeds), and agro-based value chain links (Makaudze & Miranda, 2009; Haruna et al., 2017), and agro-meteorological, agricultural extension, and agronomic information (Goel, 2013; Nyathi & Tshuma, 2024). Crop insurance promotes investment and helps smallholder farmers eliminate their fear of agriculture-related risks. Additionally, it uses risk-pooling to disperse covariate hazards over a larger geographic area, something that individual farmers and their pre-existing risk-sharing programs, like farmer cooperatives, are incapable of (Aidoo et al., 2014). In addition to stabilizing farmers' incomes and shielding them from the effects of devastating crop failures, agricultural insurance also encourages farmers to embrace technologies that boost output and lower the risk of loan default, which enables farmers to obtain better credit terms (Nyathi and Tshuma, 2024). Thus, a well-crafted agricultural insurance policy can lessen the effects of systemic risks by offering much-needed protection and facilitating prompt recovery in the event of a disaster (Mbonane, 2018; Mwangi, 2019). This could help smallholders invest for the future and, as a result, prevent extreme poverty.

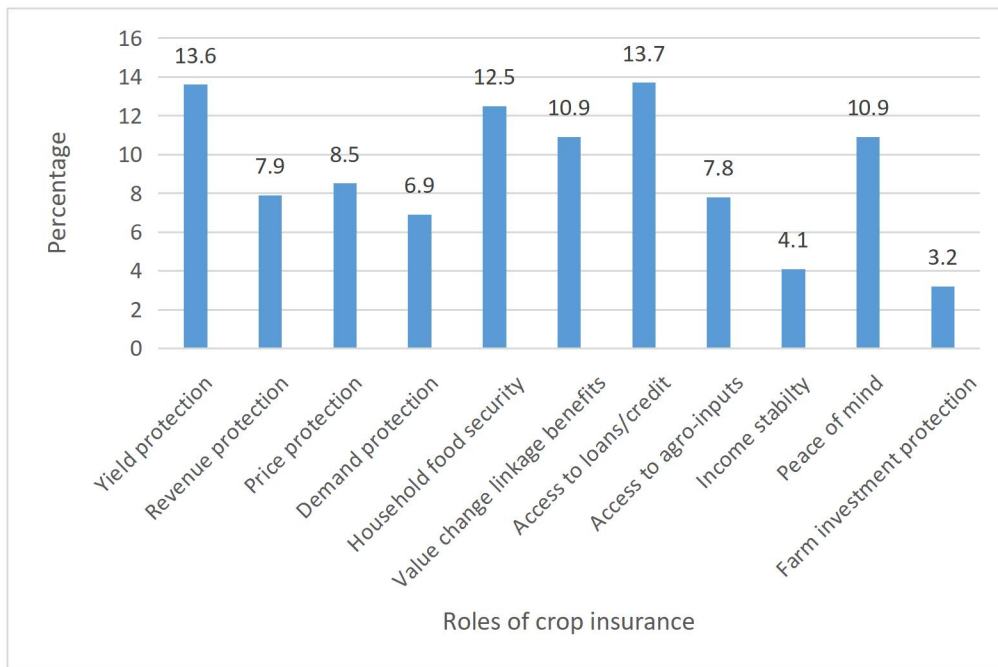


Figure 4.5: Benefits of crop insurance in crop risk management

4.5 Factors affecting the adoption of crop insurance among smallholder maize farmers

This section focuses on the factors that have influenced smallholder farmers' participation in the crop insurance scheme. Farmers were asked to indicate the extent of adoption of crop insurance in Ward 16 of Goromonzi district (Figure 4.6). The majority (51%) of the respondents were not

aware of the adoption rate of crop insurance, 21% alluded that the adoption rate was poor, 17% pointed out that the adoption rate was very poor, with only 10% and 1% alluded that the adoption rate of crop insurance was good and very good. These results were not surprising, as the majority of the respondents were not aware of the crop insurance schemes and were complaining that the compensation is done without a proper assessment. However, during the interview, the extension officer stated that,

“Crop insurance uptake in Goromonzi was higher than in other districts in the province, maybe due to the experience as a pilot district.”

These results show that by giving proper information about the roles of crop insurance in mitigating climate change risks, the uptake of crop insurance amongst the smallholder farmers might rise.

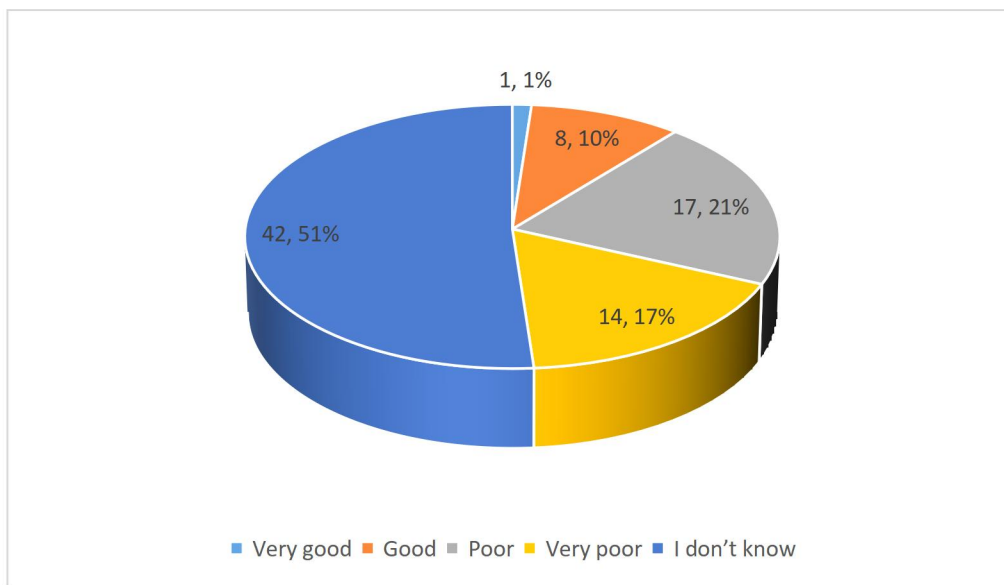


Figure 4.6: Rate of adoption of crop insurance in Ward 16 of Goromonzi district

Table 4.6 shows the factors influencing the uptake of crop insurance amongst the smallholder farmers. A regression analysis was performed to see which variables were associated with the uptake of crop insurance. The age of the participants positively influenced the adoption of crop insurance at a 5% significance level. This means that an increase in the age of the farmers significantly increases the uptake of crop insurance. These results also align with the findings of Sargazi et al. (2013) and Nyathi and Tshuma (2024). It has been argued that farmers are more likely to obtain insurance as they get older. However, these results were contrary to the study of

Swain and Hembram (2020), which found that farmers' age was negatively correlated with their acceptance of agricultural insurance because younger farmers are more likely to understand the advantages of crop insurance. However, more empirical research is still needed to confirm the two schools of thought about the impact of age on the acceptance of crop insurance. Notably, the importance of age in influencing the adoption of agricultural insurance points to the necessity of mainstreaming gender in initiatives that encourage this uptake. Focusing on the youth is crucial when developing an insurance support program since the youth hold the key to the development of agriculture, given that Zimbabwe's working population demographics, where 57% of the working population is young with an overall median age of 17 years (National Statistics Agency, Zimbabwe, 2022). This conclusion has important implications for how insurance support programs are designed, including strategies to encourage young people to get agricultural insurance.

This indicates that older farmers tend to have more farming experience, as greater years of farming experience positively influence the participation of smallholder farmers in crop insurance schemes at a 5% significance level. This is accurate given that seasoned farmers are more likely to be aware of the dangers associated with farming and be open to purchasing crop insurance to safeguard their operations. This is so that information gathered over years of farming experience may be channeled into farming decision-making. Experience in farming also improves human capital. It is anticipated that seasoned farmers will be more aware of the advantages of insurance and, as a result, be more inclined to choose crop insurance. The findings are consistent with studies conducted by Islam et al. (2021) and Machangu-Motcho (2023), which found that farming experience influences the adoption of crop insurance.

The results show that the education of the farmers positively influenced the adoption of crop insurance at a 5% significance level, contributing 15.97% to the model. This shows that educated farmers are very likely to adopt crop insurance. Using the primary level as a benchmark, households are more likely to adopt crop insurance as their educational attainment increases. This is in line with research conducted in Ghana by Ankrah et al. (2021), which found that education speeds up the adoption process and reduces the delay period in decision-making. Studies by Aditya et al. (2018) and Cariappa et al. (2020) further support the importance of education in the adoption of agricultural insurance by pointing out that knowledge of crop

insurance products necessitates a particular level of education. The same results were obtained by Mwangi (2019) in Kenya and Nyathi and Tshuma (2024) in Zimbabwe. This suggests that when education levels rise, households become more aware of the advantages and opportunities offered by insurance products, leading them to embrace insurance as a way to protect themselves against production hazards. Farmers with formal education in Zimbabwe are more likely to comprehend the terms of insurance contracts, allowing their participation in insurance to be unhindered by ignorance.

The land size of the farmers also positively influenced the adoption of crop insurance at a 5% significance level, contributing 8.72% to the model. Similar findings indicating a direct correlation between the amount of land used for crop cultivation and insurance uptake were reported by Fahad et al. (2018). This means that farmers can easily increase the amount of land used to grow a specific crop when it is significant to them (Wodaju et al., 2023). This suggests that a household of this type would be wise to go above and above to obtain insurance against the possibility of insurable hazards. The amount of marketable securities rises along with the size of the holdings, increasing the likelihood that farmers will seek out official credit sources, which are packaged with the insurance product. As the size of the land increases, so as the chances of losing crops and farm revenue. Therefore, the farmer will be shielded from future losses by securing it with crop insurance.

The study revealed that household income positively influenced the adoption of crop insurance at a 5% significance level, contributing 29.59% to the model. This confirms the results of Hill et al. (2013), who discovered that wealthier farmers in Ethiopia adopted crop insurance at a higher rate than households in lower income brackets. Farmers with higher incomes require insurance because they risk suffering greater losses if they do not. The findings were in line with research conducted in Nigeria by Falola et al. (2013), which discovered that low agricultural insurance uptake is caused by the fact that one's ability to insure against risk increases with income.

Table 4.6: Factors associated with the adoption of crop insurance in smallholder farmers

Variable	Coeff	SE	T-Value	P-value	R-sq
Age	5.94	2.21	2.69	0.009	7.16
Education (1= no formal, 2=Primary,	0.64	0.16	4.05	0	15.97

3=Secondary,4=Tertiary)

Household size	-0.23	0.37	-0.63	0.533	0
Land size	0.87	0.29	2.96	0.004	8.72
Experience	3.91	1.89	2.07	0.042	3.88
Income	268.4	46.4	5.78	0	28.59

4.6 Effectiveness of crop insurance in mitigating household food security among smallholder farmers

This section focuses on the effectiveness of crop insurance in mitigating household food security among smallholder farmers. The study specifically focused on farmers who participated in crop insurance to give their experiences. All the insured participants indicated that they have experienced drought during the 2023/24 growing season, hence they were expecting compensation. However, the farmers pointed out that the compensation by the insurers was not done appropriately due to a lack of proper assessment. Of the 48 insured participants, 56% indicated that they were insured late in the season, with 25% indicating that payments were done immediately after the event, and 17% were not paid (Figure 4.7). Of the 48 insured farmers, about 53.52% were not satisfied, with payment time showing that most of the farmers were not satisfied with the payout time, with 35.12% partially satisfied, and only 11.36% were satisfied. Moreover, about 71.44% of the insured farmers were not satisfied with the payout amount, with 18.56% partially satisfied and 8% satisfied. These experiences by farmers are likely to discourage farmers from adopting such good technologies.

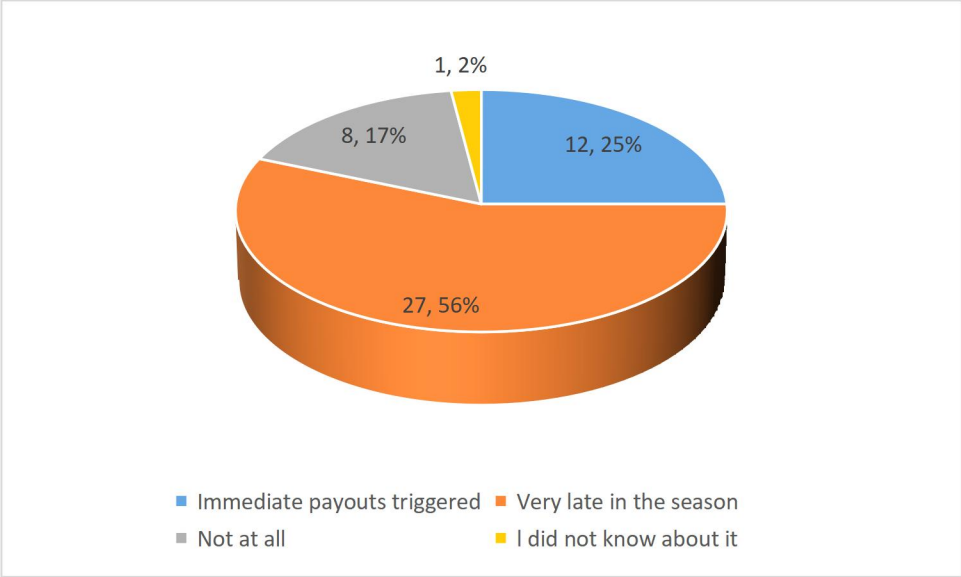


Figure 4.7: Experiences of Farmers on Payments

Farmers were asked to rate the effectiveness of crop insurance in mitigating household food security (Table 4.7). About 70.83% of the farmers agreed that crop insurance transfers weather-induced risks from farmers to insurers, providing financial protection against crop failures or losses, with 18.75% strongly agreed, while 8.33% disagreed, and 2.08% strongly disagreed. This shows that crop insurance has a lot of potential in climate risk management; however, insurers should move from multi-peril insurance to weather index insurance. The effects of moral hazards, fraud, and adverse selection may prevent the insured farmer from receiving compensation under multi-peril crop insurance contracts. This could have an impact on the expected compensation that will be applied to agricultural planning. Agricultural insurance may improve planning, sustainability, and stability in the agricultural industry, albeit this benefit cannot be guaranteed. There is no doubt that, in the instance of an index insurance contract, compensation is expected to be paid if the trigger event takes place. Index-based weather insurance (IBWI) has been developed to provide risk-hedging products for smallholder producers, but very little has been documented about the quality of indexed products (Njue et al., 2018; Azahra et al., 2024), and most IBWI products for both livestock and crop insurance are still in the piloting phase. Maireva (2023); Nyathi and Tshuma (2024) asserted that an indemnity-based crop insurance is insufficient to cover smallholders, especially when dealing with a population of smallholders that is overly distributed due to the accompanying moral hazard and adverse selection flaws, as well

as the confusing expenses of insurance administration. Therefore, there is a need to continue research about the suitability of Index-based weather insurance to smallholder farmers.

Farmers also strongly agreed (43.75%) that crop insurance helps smallholder farmers build resilience against climate-related shocks, ensuring food security and stability by providing a safety net, while 47.97% agreed and 4.17% disagreed. This means that, a well-crafted agricultural insurance policy can lessen the effects of systemic risks by offering much-needed protection and facilitating prompt recovery in the event of a disaster (Mbonane, 2018; Mwangi, 2019). This could help smallholders invest for the future and, as a result, prevent extreme poverty and ensure food security. Moreover, participants agreed (75%) that farmers are more likely to invest more in production, knowing they have a safety net in case of crop failures or losses. Crop insurance gives farmers the confidence and ability to take chances to boost their profits; these risks can include spending money on better seeds and fertilizer. In addition weather index-based agricultural insurance contracts make it possible for farmers to access agricultural resources like loans, improved seed varieties, fertilisers, and other services related to extensions, weather, and climate information for them to make informed decisions (Karlan et al., 2011). This promotes investment and helps smallholder farmers eliminate their fear of agriculture-related risks (Aidoo et al., 2014). The majority (66.67%) of the participants also agreed that crop insurance can improve food security by protecting crop yields and reducing the vulnerability of smallholder farmers to climate-related risks, while 18.75% strongly agreed, with 8.3% disagreeing (Table 4.7). Varadan and Kumar (2012) examined the effect of insurance on rice growing and the degree of crop diversification in India using the Simpson Index of Diversification (SID) approach. The study found that crop insurance helped farmers become more specialized and successfully absorb the majority of the production risks related to rice farming. Furthermore, higher usage of higher-quality inputs, which raised farming yields, was associated with insurance adoption. According to Russo (2023), crop insurance helps reduce the suboptimal input utilization brought on by risk aversion and the uncertainty of farming results, increasing output and efficiency while lowering the demand for intermediate inputs.

Table 4.7: Effectiveness of crop insurance in mitigating household food security

Statement	SD	D	NA	A	SA
	(%)	(%)	(%)	(%)	(%)

Crop insurance transfers weather-induced risks from farmers to insurers, providing financial protection against crop failures or losses	2.08	8.33	0	70.83	18.75
Crop insurance helps smallholder farmers build resilience against climate-related shocks, ensuring food security and stability by providing a safety net.	0	4.17	4.17	47.97	43.75
Crop insurance can improve food security by protecting crop yields and reducing the vulnerability of smallholder farmers to climate-related risks	0	8.33	6.25	66.67	18.75
Farmers are more likely to invest more in production, knowing they have a safety net in case of crop failures or losses	0	2.08	12.5	75	10.42

SD- strongly disagree; D- disagree; NA- neither agree; A- agree; SA- strongly agree

Insured farmers were asked to rate the effectiveness of the current crop insurance as shown in Figure 4.8. Of the 48 insured farmers, 54% indicated that crop insurance is not effective in mitigating household food security among smallholder farmers, while 25% said it is effective, and 17% said partially effective, with only 4% saying it is very effective. However, this contradicts the view of the extension officer who said that;

“On a scale of 1 to 10, I would rate crop insurance at 6. Farmers should not only receive compensation for inputs used only but should also receive enough to cover losses of food.”

The late payments, inadequate payments to cover losses, and poor assessments may have led to the lower effectiveness of crop insurance in the case of smallholder farmers. Moreover, the crop insurance scheme is still in pilot phases, which might lead to lower effectiveness. The study showed that experiences with insurance firms were perceived negatively, particularly when the insurance business broke the contract and no compensation was obtained. The same was reported during the interview with the extension officer, who indicated that farmers were only compensated for the inputs while neglecting the major role of crop insurance in compensating for

yield losses. Nyathi and Tshuma (2024) asserted that an indemnity-based crop insurance is insufficient to cover smallholders, especially when dealing with a population of smallholders that is overly distributed due to the accompanying moral hazard and adverse selection flaws, as well as the confusing expenses of insurance administration. Thus, a well-crafted agricultural insurance policy can lessen the effects of systemic risks by offering much-needed protection and facilitating prompt recovery in the event of a disaster (Mbonane, 2018; Mwangi, 2019). This could help smallholders invest for the future and, as a result, prevent extreme poverty.

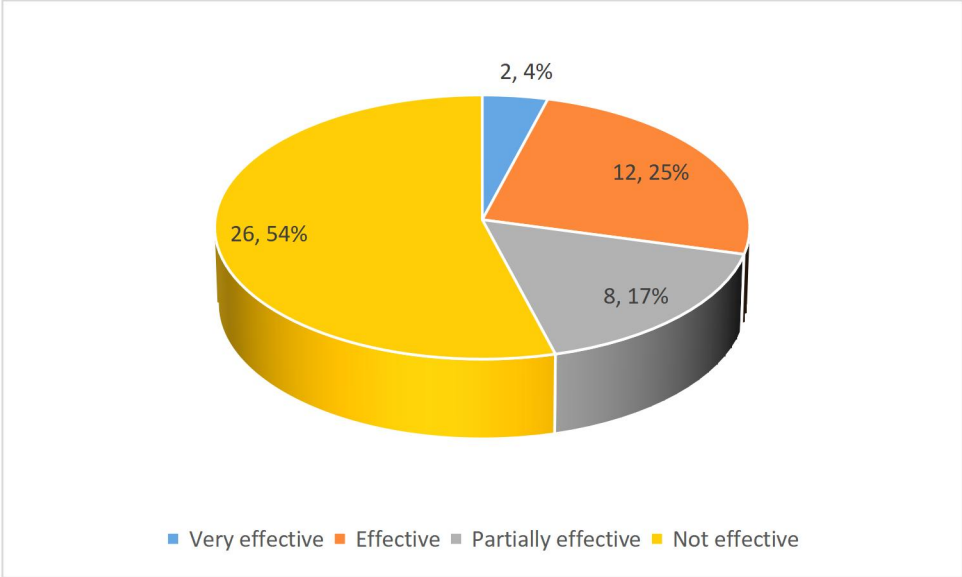


Figure 4.8: Rate the effectiveness of crop insurance in mitigating household food security

Table 4.8 shows the challenges that were encountered by smallholder farmers with crop insurance.

Table 4.8: Challenges you have faced with crop insurance

Challenge	SD (%)	D (%)	NA (%)	A (%)	SA (%)
High costs	0	2.08	8.33	72.92	16.67
Poor information	0	8.33	4.17	50	37.5
Poor payouts	2.08	2.08	0	10.42	85.42
Poor or no monitoring at all by insurance companies	0	0	0	47.92	52.08

SD- strongly disagree; D- disagree; NA- neither agree; A- agree; SA- strongly agree

Of the 48 participants, 72.92% agreed that high cost is a challenge to crop insurance adoption by smallholder farmers, while 16.67% strongly agree, and only 2.08% disagree. This was also agreed with the extension officer, who stated that,

“Goromonzi was used as a pilot district for smallholder farmer agricultural insurance, so the marketing of the program acted as a positive driver for the uptake of crop insurance, however, it is very expensive for the mere farmer in the rural area who solely depends on subsistence farming. Moreover, farmers are widely scattered, and it is too expensive to reach them. Financial institutions are working to reduce expenses and boost revenues in the face of these limitations, which raise the costs of marketing agricultural insurance. It's really difficult”.

This is because traditional multi-peril crop insurance is very costly to administer, and it necessitates rate-setting, monitoring, and loss correction at the farm level. According to Makaudze and Miranda (2009), the biggest barrier to the growth of agricultural insurance markets has not been a lack of demand or administrative knowledge among farmers, but rather the high cost of traditional crop insurance. Thus, insurers should develop crop insurance schemes that are affordable for smallholder farmers.

The farmers also strongly agreed (50%) that there is no information about crop insurance, which affects the adoption of crop insurance, while 37.5% strongly and 8.33% disagreed. This is not surprising, as the majority of the participants were not aware of the crop insurance schemes in the Goromonzi district. Moreover, agricultural insurance is still unpopular in Zimbabwe because insurance products do not satisfactorily meet the expectations of the smallholder subsistence farmers, who make up the bulk of the country's population after the land redistribution process. The same was stated by the extension officer,

“The truth is, many farmers are unfamiliar with the idea of crop insurance. Many believe it's only for the wealthy”.

Extension officers or agents are notably responsible for the delivery of agricultural support programs at the district and sub-county levels nationwide. They are already working to promote climate change adaptation through climate-smart agriculture initiatives. They already have solid networks with farmers and connections to the main agricultural extension system, which makes it easier to promote technology adoption among stallholder farmers. According to Bahimati (2022), raising farmers' knowledge through several official training initiatives can result in a 5% rise in insurance purchases. Similarly, Mohammad et al. (2022) found that in northern Bangladesh, farmers' willingness to pay for flood insurance as a climate change adaptation strategy was positively impacted by their access to knowledge through extension services.

Moreover, the majority of farmers strongly agreed that poor payouts (85.42%) and poor or no monitoring at all by insurance companies (52.08%) were some of the challenges faced by farmers (Table 4.8). This was also not surprising, as farmers previously indicated that they received poor payouts without a proper assessment. This kills trust between farmers and insurers. Agricultural insurance adoption is hampered by several variables, including a general lack of trust in insurance services. This opinion is consistent with a 2018 IPEC survey that found farmers had lost trust in insurance companies that exploit unsuspecting communal farmers by failing to fully disclose the fine print. In keeping with this, the Insurance Council of Zimbabwe has emphasized the necessity for insurance providers to develop agricultural insurance products that meet the demands of the newly established indigenous farmers (ICZ, 2020).

The interview with the extension officer indicated that these challenges can be addressed through government support, especially in subsidies, dissemination of information, development of suitable policies for insurers to operate and promote premium subsidies, awareness campaigns to educate farmers about the benefits of crop insurance, early registration of the farmers, as well as payment of compensation in the event of crop losses, and implementation of correct monitoring systems. These recommendations were also supported by Mwangi (2019) in Kenya and Nyathi and Tshuma (2024) in Zimbabwe.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

Chapter 5 presents the conclusions and recommendations of the study. The chapter lastly provides suggestions for future studies based on the limitations and results of the study, to advance knowledge on the role of crop insurance in mitigating household food insecurity among smallholder farmers.

5.2 Conclusion

Crop insurance is important for smallholder farmers in mitigating the risks of food insecurity, especially caused by climate change. It is impossible to overstate the importance of crop insurance in farm-level risk management given the increasing unpredictability of weather patterns and the wide range of agricultural risks. Smallholder farmers require crop insurance more than ever before to reduce and manage climate-related risks and increase their ability to withstand revenue shocks brought on by crop losses. This research investigated the role of crop insurance in mitigating household food insecurity among smallholder maize farmers in Goromonzi District. The study used a mixed-methods methodology, collecting data using a semi-structured questionnaire from smallholder farmers and an in-depth interview with extension officers. Data was collected from 82 (48 insured and 34 non-insured) smallholder maize farmers and one extension officer. The study specifically answered the following objectives (1) investigates the effects of climate change on maize production and food security among smallholder farmers (2) identify the insurance schemes available for the smallholder maize farmers, (3) examine the role played by crop insurance in enhancing the resilience of smallholder farmers to climate-related shocks and food security and (4) identify factors affecting the adoption of crop insurance among smallholder maize farmers. The findings indicated that crop insurance has a bigger role in mitigating food insecurity risks amongst smallholder farmers.

The study proved the existence of weather or climate change-related risks among smallholder farmers in Ward 16 of Goromonzi district, as evidenced by 85.37% of the participants indicating that the weather and climate have been variable and have changed over the years. The manifestations of weather or climate change, including erratic rainfall, persistent droughts, high temperatures, shortening of the rain season, and early start of rains, have affected smallholder maize farming by increasing yield losses, causing smallholder farmers to be food insecure.

However, the coping strategies of the smallholder farmers were found to be effective to some extent. For example, 57% indicated that the coping strategies were effective to some extent, with 26% and 5% indicating 100% effective and not effective, respectively. This implies that about 62% of the farmers indicated that smallholder farmers' agricultural risk management was ineffective to varying degrees. Hence, the gap in presumed agricultural methods to lessen impact, which was calculated from the ineffectiveness of smallholder farmers' current adaptation measures, was used to examine the potential role of agricultural-related insurance in reducing the effects of household food insecurity among subsistence maize farmers in Goromonzi District.

Crop insurance used as a supplemental planned or ex ante crop risk mitigation strategy can assist immensely in managing major agricultural risks of smallholder farmers in Goromonzi district, as outlined by the assumed low effectiveness of current adaptation strategies.

Findings from the contribution of crop insurance in augmenting smallholder farmers' resilience, 13.7% of the participants ranked improving access to financial services number, followed by increase on crop yield (13.6%), improve in household food security (12.5%), peace of mind (10.9%), value change linkage benefits (10.9%) and crop price protection (8.5%). However, the participants indicated that the insurers are providing only multi-peril crop insurance, for drought and compensation was done without a proper assessment. Moreover, farmers mentioned their concerns about the current multi-peril crop insurance that may result in low adoption of the crop insurance among smallholder farmers, including late compensation payments, no yield loss compensation, and poor or no monitoring at all by insurance companies. This led to the insured farmers' rating effectiveness of crop insurance, where 54% indicated that crop insurance is not effective in mitigating household food security among smallholder farmers, while 25% said it is effective, and 17% said partially effective, with only 4% saying it is very effective. These results were also supported by the extension officer, who rated the effectiveness of crop insurance at 6 on a scale of 1 to 10. However, since it is a pilot project, the insurance companies have a lot to do in providing different insurance products, such as index-based products, to improve effectiveness.

Although extension officers and agents can spearhead the adoption of crop insurance, the adoption of crop insurance primarily depends on characteristics of the farmers, age, farming experience, education, land size, and income. In particular, the degree of risk aversion varies

with age and is partially a gender issue. Access to trainings and information on agricultural insurance is also linked to gender. Farmers who are older and male are more likely to attend trainings, which increases their likelihood of learning about and adopting crop insurance. The results also demonstrate that education and the level of income of the farmers play a critical role in the adoption of agricultural innovations like crop insurance. Insurance is a helpful instrument for income stabilization and as a backup recovery plan in the event of crop failure. It will consequently require a paradigm shift away from traditional risk management techniques, which have not been able to keep up with the frequent fluctuations in weather. However, the majority (51%) of the participants indicated that they had not heard of crop insurance. These results are somewhat contrary to the expectation, since 58.54% of the participants were insured. This is also supported as the majority (47%) of the farmers who were not insured were due to a lack of understanding of how insurance works. Thus, the majority of the farmers had limited understanding of the concept of crop insurance due to the generally complicated nature of insurance and the lack of awareness by insurance providers to inform smallholder farmers about the significance and advantages of crop insurance. This suggests that to encourage crop insurance adoption and instill the insurance culture in farming operations, there is a need for intense awareness and demanding training.

5.3 Recommendations

Based on the research findings and conclusions, it can be recommended that;

- The major public and private sector players in the crop insurance should increase their investment in farmer education and an intensive awareness campaign to encourage farmers to view agricultural insurance favorably. Farmers will be able to see the value of crop insurance and eliminate a variety of unfavorable opinions about it with the right training. Efforts need to be made for initiatives to sensitize and raise awareness on the existence of products, and the advantages of crop insurance will be extended to various stakeholders, including agricultural insurance players and smallholder farmers. Endeavors to address the problems of low awareness and penetration rates will be made around the complicated topic of crop insurance, particularly index-based and contracts. All major public and private sector players must coordinate their efforts to scale up investments in programs, especially training and innovations that can expedite the adoption of crop insurance. The option of drafting grant

proposals to request money from development organizations that have shown a commitment to aiding climate change adaptation can be investigated as part of a resource mobilization strategy. Strong leadership and dedication are needed to develop the resource mobilization plan. It is evident that the execution of the National Climate Change Policy mainly relies on donor funds, as well as most of the climate change adaptation initiatives. Building local government capacity to oversee climate change adaptation projects and integrating agriculture into the local government agricultural extension system requires massive funding. Huge investments are required to address data quality-related problems and provide higher-quality insurance products. Additionally, funding is needed to encourage investment in innovations that can effectively collect farm data and communicate information to farmers.

- When designing crop insurance services, crop insurance providers must involve all relevant parties, especially smallholder farmers. To accomplish this, it is advised that crop insurance companies create channels for smallholder farmers and climate specialists to provide feedback to create effective risk mitigation plans and crop insurance policies that are sensitive to climate variability and change. In order to increase the acceptance of insurance and hasten its uptake, such an approach aids in creating insurance services that best meet the requirements of smallholder farmers, given their socioeconomic circumstances. Therefore, crop insurance should be pushed hard in addition to other risk-coping methods and measures like conservation agriculture and diversified cropping.
- Investigating ways to create farmer- and gender-sensitive contracts and programs that address the strategic and specific requirements and concerns of female farmers, in addition to meeting farmer expectations.
- Bundling of crop insurance policies with the provision of offering agricultural inputs, marketing, and agricultural value chains, agricultural-related meteorological, extension, and agronomic information.
- Government-supported crop insurance services should be subsidized with favorable policies put in place, which stimulate the desire to acquire crop insurance contracts. All efforts should focus on ensuring access to available, affordable, and easy-to-reach agricultural insurance services. As a result, insurance companies and programs may become more viable, profitable, and sustainable. Climate change mitigation and the promotion of sustainable farming methods can also be included in crop insurance programs and contracts.

- Employ the use of a variety of adaptation measures to diversify their approaches to managing agricultural risks. Because all adaptation mechanisms cannot fail simultaneously, if one fails, the others might not; this points to this being an effective and sustainable way for smallholder farmers to manage their agricultural risks. This structure may guarantee risk stacking and complementary agricultural risk management between the many risk management techniques and crop insurance contracts.

5.4 Suggestions for Future studies

The same study should be replicated with an increased sample size, this is because the study could not cover a larger sample due to time and resource constraints, including more wards in Goromonzi or other districts in Zimbabwe. The studies should include more females, for in-depth interviews, as they are more vulnerable to climate change.

Examine how to create and carry out crop insurance plans that offer complete coverage for both upstream and downstream risks at reasonable premiums: The findings of the study on stakeholder viewpoints make it clear that participating farmers are not fully protected against agricultural risks by present crop insurance contracts, which are multi-peril based. Future research should focus on deliberate efforts to package comprehensive programmes with favorable terms for smallholder farmers, creating crop insurance programs that offer comprehensive cushioning against agricultural risks at reasonable premiums to marginal and vulnerable smallholder farmers in low-income nations. This will guarantee that crop insurance schemes and contracts effectively protect participating farmers. For example, the current multi-peril crop insurance policies should be recalculated to preserve their all-risks characteristics at lower premiums. The penetration rates among smallholder farmers might rise as a result of this.

Examining how sociocultural and religious factors affect the uptake of farm insurance policies and contracts based on: The adoption rates of farm insurance contracts may be impacted by these informal adoption measures. Future research studies can focus on the impact of sociocultural and religious elements on the uptake of crop insurances. These and several more problems need answers, and future studies could concentrate on addressing them.

The analysis did not calculate willingness to pay in terms of the price farmers are willing to pay for the insurance because this was outside the purview of this study, even though the decision to

accept agricultural insurance reflects farmers' willingness to pay for the insurance. This is a crucial area that the report suggests requires further investigation. In light of this, additional studies can also calculate the amount of crop cover or insurance premiums that farmers are willing to purchase. Government planning would be greatly influenced by this to guarantee the distribution of enough insurance subsidies to cover farmers who choose to purchase agricultural insurance.

REFERENCES

- Adanalı, Y.K., 2016. *Rational choice theory: Its merits and limits in explaining and predicting cultural behavior* (Doctoral dissertation, Middle East Technical University (Turkey)).
- Aditya, K.S., Khan, T. and Kishore, A., 2018. Adoption of crop insurance and impact: insights from India. *Agricultural Economics Research Review*, 31(2), pp.163-174.
- Aidoo, R., Mensah, J.O., Wie, P. and Awunyo-Vitor, D., 2014. Prospects of crop insurance as a risk management tool among arable crop farmers in Ghana. *Asian Economic and Financial Review*, 4(3), p.341.
- Ajayi, V.O., 2017. Primary sources of data and secondary sources of data. *Benue State University*, 1(1), pp.1-6.
- Akhtar, S., Nazir, A., Razzaq, A., Ullah, R., Faisal, M., Naseer, M.A.U.R. and Raza, M.H., 2019. Maize production under risk: The simultaneous adoption of off-farm income diversification and agricultural credit to manage risk. *Journal of integrative agriculture*, 18(2), pp.460-470.
- Alesina, A., Giuliano, P. and Nunn, N., 2013. On the origins of gender roles: Women and the plough. *The quarterly journal of economics*, 128(2), pp.469-530.
- Al-Maruf, A., Mira, S.A., Rida, T.N., Rahman, M.S., Sarker, P.K. and Jenkins, J.C., 2021. Piloting a weather-index-based crop insurance system in Bangladesh: Understanding the challenges of financial instruments for tackling climate risks. *Sustainability*, 13(15), p.8616.
- Ankrah, D.A., Kwapong, N.A., Eghan, D., Adarkwah, F. and Boateng-Gyambiby, D., 2021. Agricultural insurance access and acceptability: examining the case of smallholder farmers in Ghana. *Agriculture & Food Security*, 10(1), pp.1-14.
- Attipoe, S.G. and Adams, A., 2024. Influential factors shaping cocoa farmers' crop insurance participation and coverage amount in Ghana. *Cogent Food & Agriculture*, 10(1), p.2417830.
- Azahra, A.S., Johansyah, M.D. and Sukono, 2024. Agricultural Insurance Premium Determination Model for Risk Mitigation Based on Rainfall Index: Systematic Literature Review. *Risks*, 12(12), p.205.

- Akuribire, D.A., Shin, H.J. and Lee, S., 2024. Factors Influencing Climate-Smart Agriculture Adoption among Smallholder Farmers in East Gonja, Northern Ghana, *30(4)*, pp.441-451.
- Berhanu, A.A., Ayele, Z.B., Dagneu, D.C., Fenta, A.B. and Kassie, K.E., 2024. Smallholder farmers' coping strategies to climate change and variability: Evidence from Ethiopia. *Climate Services*, *35*, p.100509.
- Bhatti, U.A., Bhatti, M.A., Tang, H., Syam, M.S., Awwad, E.M., Sharaf, M. and Ghadi, Y.Y., 2024. Global production patterns: Understanding the relationship between greenhouse gas emissions, agriculture greening and climate variability. *Environmental Research*, *245*, p.118049.
- Binswanger-Mkhize, H.P., 2012. Is there too much hype about index-based agricultural insurance?. *Journal of Development studies*, *48(2)*, pp.187-200.
- Birthal, P.S., Hazrana, J. and Negi, D.S., 2021. Effectiveness of farmers' risk management strategies in smallholder agriculture: Evidence from India. *Climatic Change*, *169(3)*, p.30.
- Birthal, P.S., Hazrana, J., Negi, D.S. and Mishra, A.K., 2022. Assessing benefits of crop insurance vis-a-vis irrigation in Indian agriculture. *Food Policy*, *112*, p.102348.
- Bozzola, M. and Finger, R., 2021. Stability of risk attitude, agricultural policies and production shocks: evidence from Italy. *European Review of Agricultural Economics*, *48(3)*, pp.477-501.
- Campbell, B., Mann, W., Meléndez-Ortiz, R., and Streck, C. T.T., 2011. *Agriculture and climate change: a scoping report*. Washington Dc.
- Cariappa, A.A., Mahida, D.P., Lal, P. and Chandel, B.S., 2021. Correlates and impact of crop insurance in India: evidence from a nationally representative survey. *Agricultural Finance Review*, *81(2)*, pp.204-221.
- Carter, M.R., De Janvry, A., Sadoulet, E. and Sarris, A., 2014. Index-based weather insurance for developing countries: A review of evidence and a set of propositions for up-scaling. FERDI Working Paper, No. P111, Fondation pour les études et recherches sur le développement international (FERDI), Clermont-Ferrand.
- Carter, M.R., Elabed, G. and Serfilippi, E., 2015. Behavioral economic insights on index insurance design. *Agricultural Finance Review*, *75(1)*, pp.8-18.

Chakona, L., 2011. *Fast track land reform programme and women in Goromonzi district, Zimbabwe* (Doctoral dissertation, Rhodes University).

Cotter, J., and Tirado, R., 2008. *Food security and climate change: the answer is biodiversity*. Amsterdam: Greenpeace Int.

Dangwa, L., 2024. *An assessment of conservation agriculture adaption by smallholder farmers. A case of Goromonzi, Zimbabwe* (Doctoral dissertation, Stellenbosch University).

Devereux, S., 2009. Why does famine persist in Africa?. *Food security*, 1, pp.25-35.

Ellis, E., 2016. *Farmers willingness to pay for crop insurance: Evidence from Eastern Ghana*. McGill University (Canada).

Fahad, S., Wang, J., Hu, G., Wang, H., Yang, X., Shah, A.A., Huong, N.T.L. and Bilal, A., 2018. Empirical analysis of factors influencing farmers crop insurance decisions in Pakistan: Evidence from Khyber Pakhtunkhwa province. *Land use policy*, 75, pp.459-467.

Falola, A., Ayinde, O.E. and Agboola, B.O., 2013. Willingness to take agricultural insurance by cocoa farmers in Nigeria. *International Journal of Food and Agricultural Economics (IJFAEC)*, 1(1), pp.97-107.

Fang, L., Hu, R., Mao, H. and Chen, S., 2021. How crop insurance influences agricultural green total factor productivity: Evidence from Chinese farmers. *Journal of Cleaner Production*, 321, p.128977.

FAO, 2016, *Towards the future we want: End hunger and make the transition to sustainable agricultural and food systems*, FAO at Rio +20, Food and Agricultural Organization of the United Nations, FAO, Rome.

Fischer, H.W., Reddy, N.N. and Rao, M.S., 2016. Can more drought resistant crops promote more climate secure agriculture? Prospects and challenges of millet cultivation in Ananthapur, Andhra Pradesh. *World Development Perspectives*, 2, pp.5-10.

Ghimire, R. and Chapagain, R., 2023. Farmers' Satisfaction towards the Agriculture Insurance: A Case of Chitwan and Kaski Districts of Nepal. *The International Research Journal of Management Science*, 8(1), pp.123-139.

- Goel, K., 2013. A complete agro-financial service framework for emerging economies. *The Journal of Risk Finance*, 14(5), pp.490-497.
- Greatrex, H., Hansen, J., Garvin, S., Diro, R., Le Guen, M., Blakeley, S., Rao, K. and Osgood, D., 2015. Scaling up index insurance for smallholder farmers: Recent evidence and insights. © 2015 CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).
- Grothmann, T. and Patt, A., 2005. Adaptive capacity and human cognition: the process of individual adaptation to climate change. *Global environmental change*, 15(3), pp.199-213.
- Gutsa, I., 2017. *Climate change and the livelihoods of elderly female headed households in Gutsa village, Goromonzi District, Zimbabwe* (Doctoral dissertation, University of the Witwatersrand, Faculty of Humanities, School of Social Sciences).
- Hansda, R., 2017. Small-scale farming and gender-friendly agricultural technologies: the interplay between gender, labour, caste, policy and practice. *Gender, Technology and Development*, 21(3), pp.189-205.
- Haruna, B., Sohngen, B., Yahaya, I. and Wiredu, A.N., 2017. Effects of weather-index insurance: the case of smallholder maize farmers in Northern Ghana. *International Journal of Food and Agricultural Economics (IJFAEC)*, 5(3), pp.75-85.
- Heenkenda, S., 2012. *The Role of micro insurance in agricultural risk mitigation: with special reference to the paddy sector in Sri Lanka*. Germany: Lambert Academic Publishing.
- Hou, P., Liu, Y., Liu, W., Yang, H., Xie, R., Wang, K., Ming, B., Liu, G., Xue, J., Wang, Y. and Zhao, R., 2021. Quantifying maize grain yield losses caused by climate change based on extensive field data across China. *Resources, Conservation and Recycling*, 174, p.105811.
- IPCC, 2002. Climate change and biodiversity IPCC Technical Paper V. Rome.
- Islam, D.I., Rahman, A., Sarker, M.S.R., Luo, J. and Liang, H., 2021. Factors affecting farmers' willingness to adopt crop insurance to manage disaster risk: evidence from Bangladesh. *International Food and Agribusiness Management Review*, 24(3), pp.463-480.

- Juma, S.G. and Kelonye, F., 2016. Projected rainfall and temperature changes over Bungoma County in western Kenya by the year 2050 based precis modeling system. *Ethiopian Journal of Environmental Studies and Management*, 9(5), pp.625-640.
- Johnston, M.P., 2014. Secondary data analysis: A method of which the time has come. *Qualitative and quantitative methods in libraries*, 3(3), pp.619-626.
- Karlan, D., Kutsoati, E., McMillan, M. and Udry, C., 2011. Crop price indemnified loans for farmers: A pilot experiment in rural Ghana. *Journal of Risk and Insurance*, 78(1), pp.37-55.
- Kambali, U. and Panakaje, N., 2022. A Review on Access to Agriculture Finance by Farmers and its Impact on their Income. *International Journal of Case Studies in Business, IT, and Education*, 6(1), 302-327.
- Kaunda, S. and Chowa, T., 2022. An Analysis of Factors Influencing Uptake of Agriculture Index Insurance among Smallholder Farmers—A Case of Kasama District in Zambia. *Open Journal of Business and Management*, 11(1), pp.184-209.
- Kwadzo, G.T., Kuwornu, J.K. and Amadu, I.S., 2013. Food crop farmers' willingness to participate in market-based crop insurance scheme: Evidence from Ghana. *Research in Applied Economics*, 5(1), p.1.
- Lawi, M.B., Yakusak, E. and Oshadumo, D., 2024. ASSESSMENT OF POULTRY FARMERS'WILLINGNESS TO PAY FOR AGRICULTURAL INSURANCE IN OSUN STATE, NIGERIA. *Journal of Agribusiness and Rural Development*. 3(73), 312–326.
- Lioubimtseva, E. and Henebry, G.M., 2009. Climate and environmental change in arid Central Asia: Impacts, vulnerability, and adaptations. *Journal of Arid Environments*, 73(11), pp.963-977.
- Lund, T., 2012. Combining qualitative and quantitative approaches: Some arguments for mixed methods research. *Scandinavian journal of educational research*, 56(2), pp.155-165.
- Machangu-Motcho, J., 2023. Factors for Crop Insurance Uptake among Smallholder Maize Farmers: A Case Study of Njombe Region in Tanzania. REPOA, Dar es Salaam.
- Madaki, M.Y., Kaechele, H. and Bavorova, M., 2023. Agricultural insurance as a climate risk adaptation strategy in developing countries: a case of Nigeria. *Climate Policy*, 23(6), pp.747-762.

- Mahmood, S., Sajjad, A. and Rahman, A.U., 2021. Cause and damage analysis of 2010 flood disaster in district Muzaffar Garh, Pakistan. *Natural hazards*, 107(2), pp.1681-1692.
- Maireva, C., 2023. THE PERCEPTION OF SMALLHOLDER FARMERS TOWARD MICRO-INSURANCE AS A RISK COPING STRATEGY IN ZIMBABWE. *Agricultural Socio-Economics Journal*, 23(1), pp.77-87.
- Makate, C., Wang, R., Makate, M. and Mango, N., 2017. Impact of drought tolerant maize adoption on maize productivity, sales and consumption in rural Zimbabwe. *Agrekon*, 56(1), pp.67-81.
- Makaudze, E., M. and Miranda, M., J., 2009. Catastrophic Drought Insurance Based on the Remotely Sensed Normalized Difference Vegetation Index for Smallholder Farmers in Zimbabwe. Contributed Paper Presented at the Joint 3rd African Association of Agricultural Economists (AAAE) and 48th Agricultural Economists Association of South Africa (AEASA) Conference, Cape Town, South Africa, September 19-23, 2010.
- Malhi, G.S., Kaur, M. and Kaushik, P., 2021. Impact of climate change on agriculture and its mitigation strategies: A review. *Sustainability*, 13(3), p.1318.
- Manatsa, D., Mushore, T. and Lenouo, A., 2017. Improved predictability of droughts over southern Africa using the standardized precipitation evapotranspiration index and ENSO. *Theoretical and applied climatology*, 127, pp.259-274.
- Mârza, B., Angelescu, C. and Tindeche, C., 2015. Agricultural insurances and food security. The new climate change challenges. *Procedia Economics and Finance*, 27, pp.594-599.
- Masara, C. and Dube, L., 2017. Socio-economic factors influencing uptake of agriculture insurance by smallholder maize farmers in Goromonzi district of Zimbabwe. *Journal of Agricultural Economics and Rural Development*, 3(1), pp.160-166.
- Masuku, M.P., 2018. Migration as a climate change adaptation strategy in rural Zimbabwe: an analysis of the experiences of female climate migrants in Goromonzi district.
- Maxwell, D. and Wiebe, K., 1999. Land tenure and food security: Exploring dynamic linkages. *Development and Change*, 30(4), pp.825-849.

- Mbonane, N.D., 2018. *An analysis of farmers' preferences for crop insurance: a case of maize farmers in Swaziland*. Master's Thesis in Agricultural Economics, University of Pretoria (South Africa).
- Mobarak, A.M. and Rosenzweig, M.R., 2013. Informal risk sharing, index insurance, and risk taking in developing countries. *American Economic Review*, 103(3), pp.375-380.
- Mpala, T.A. and Simatele, M.D., 2024. Climate-smart agricultural practices among rural farmers in Masvingo district of Zimbabwe: perspectives on the mitigation strategies to drought and water scarcity for improved crop production. *Frontiers in Sustainable Food Systems*, 7, p.1298908.
- Mukherjee, S. and Pal, P., 2019. On improving awareness about crop insurance in India. *Review of Agrarian Studies*, 9(1).
- MUNYAVHI, A. and RUKASHA, T., 2023. Smallholder Maize Production, Input Investment, Productivity and Profitability in Ward 1, Chikomba District, Zimbabwe. *The Review of Rural Resilience Praxis*, pp.14-32.
- Mushore, T.D., Odindi, J., Dube, T. and Mutangas, O., 2017. Prediction of future urban surface temperatures using medium resolution satellite data in Harare metropolitan city, Zimbabwe. *Building and Environment*, 122, pp.397-410.
- Mushore, T.D., Mhizha, T., Manjowe, M., Mashawi, L., Matandirotya, E., Mashonjowa, E., Mutasa, C., Gwenzi, J. and Mushambi, G.T., 2021. Climate change adaptation and mitigation strategies for small holder farmers: a case of Nyanga District in Zimbabwe. *Frontiers in Climate*, 3, p.676495.
- Mustafa, M.A., Mayes, S. and Massawe, F., 2019. Crop diversification through a wider use of underutilized crops: A strategy to ensure food and nutrition security in the face of climate change. *Sustainable solutions for food security: combating climate change by adaptation*, pp.125-149.
- Muzerengi, F., Gandidzanwa, C.P. and Chirubvu, L., 2023. Impacts of climate change on household food security in Matande communal lands, Mwenezi district in Zimbabwe. *Jàmbá: Journal of Disaster Risk Studies*, 15(1), pp.1-11.

Mwangi, P.M., 2019. *Effects of Area-Yield Index Crop Insurance (AYII) On Food Security* (Doctoral dissertation, University of Nairobi).

National Statistics Agency, Zimbabwe. 2022. Zimbabwe population census 2022 [Online]. Available: <https://zimbabwe.opendataforafrica.org/arfkbif/zimbabwe-population-census-2022> [2023, July 29].

Njue, E., Kirimi, L. and Mathenge, M., 2018. Uptake of crop insurance among smallholder farmers: Insights from maize producers in Kenya. *Research in Agricultural and Applied Economics*.

Nnadi, F.N., Chikaire, J., Echetama, J.A., Ihenacho, R.A., Umannakwe, P.C. and Utazi, C.O., 2013. Agricultural insurance: a strategic tool for climate change adaptation in the agricultural sector. *Net Journal of Agricultural Science*, 1(March), 1–9.

Nshakira-Rukundo, E., Kamau, J.W. and Baumüller, H., 2021. Determinants of uptake and strategies to improve agricultural insurance in Africa: a review. *Environment and Development Economics*, 26(5-6), pp.605-631.

Okpukpara, B.C., Adebayo, O. and Ukwuaba, I.C., 2021. Smallholder Farmers ‘Access to Agricultural Insurance Schemes: An Analysis of the Inhibitors in Kogi State, Nigeria. *Turkish Journal of Agriculture-Food Science and Technology*, 9(12), pp.2159-2165.

Omotoso, A.B. and Omotayo, A.O., 2024. The interplay between agriculture, greenhouse gases, and climate change in Sub-Saharan Africa. *Regional Environmental Change*, 24(1), p.1.

Orodho, J.A., 2017. Techniques of writing research proposals and reports in education and social sciences: An Illustrative Guide to Scholarly Excellence. *Nairobi: Kanezja Publishers*.

Pacheco, J.M., Santos, F.C. and Levin, S.A., 2016. Evolutionary dynamics of collective index insurance. *Journal of mathematical biology*, 72(4), pp.997-1010.

Parry, M., 2007. The implications of climate change for crop yields, global food supply and risk of hunger. *SAT eJournal*, 4:1–44

Pinstrup-Andersen, P., 2009. Food security: definition and measurement. *Food security*, 1, pp.5-7.

- Rachman, M.I., Nuryartono, N., Arifin, B. and Bakhtiar, T., 2021. Effect of the government intervention program to the crop insurance participation level. *Jurnal Manajemen & Agribisnis*, 18(1), pp.1-1.
- Rana, R.H., Adeyinka, A.A., Mushtaq, S., Barratt, J. and Alam, K., 2024. The impact of agricultural insurance on farmers' mental health: what we can learn from the literature. *Environment, Development and Sustainability*, pp.1-18.
- Rejesus, R., Zheng, X. and Yorobe Jr, J., 2018. Advantageous selection in crop insurance: theory and evidence. *Journal of Agricultural Economics*, 69(3), pp.646-668.
- Roser, M. and Ritchie, H., 2013. Hunger, and Undernourishment. Oxford: University of Oxford; Available from: <https://ourworldindata.org/hunger-and-undernourishment>.
- Russo, S., 2023. The Effect of Insurance on Farmers' Production, Technical Efficiency and Input Use: An Endogenous Stochastic Frontier Model to Analyse the Italian Case (Ph.D). Department of Agriculture, Food, Natural Resources, and Engineering at the University of Foggia.
- Sargazi, A., Mashalla, S. and Mehd, I.M., 2013. Effective factors on the demand of insurance of agricultural crops in sistana area of Iran. *Journal of Agricultural Economics and Development*, 2(3), pp.90-94.
- Schmidhuber, J. and Tubiello, F.N., 2016. Food security under climate change. *Nat Clim Chang*, 6(1), pp.10-3.
- Subedi, S.D. and Rijal, P., 2024. An Overview of Overall Agriculture Insurance Sector of Nepal with analysis of Crop and Livestock Insurance Subsectors. *Journal of Insurance Studies in South Asia (JISSA)*, 1, p.40.
- Swain, M. and Hembram, B.R., 2020. Determinants of adoption of crop insurance: Evidence from Bolangir District in Odisha. *Journal of Land and Rural Studies*, 8(2), pp.121-137.
- Tambol, T., Derbile, E.K. and Soulé, M., 2025. Use of climate-smart agriculture technologies in West Africa peri-urban Sahel in Niger. *Scientific Reports*, 15(1), p.2771.

Toromade, A.S., Soyombo, D.A., Kupa, E. and Ijomah, T.I., 2024. Reviewing the impact of climate change on global food security: Challenges and solutions. *International Journal of Applied Research in Social Sciences*, 6(7), pp.1403-1416.

Touch, V., Tan, D.K., Cook, B.R., Li Liu, D., Cross, R., Tran, T.A., Utomo, A., Yous, S., Grunbuhel, C. and Cowie, A., 2024. Smallholder farmers' challenges and opportunities: Implications for agricultural production, environment and food security. *Journal of Environmental Management*, 370, p.122536.

Tsikirayi, C.M.R., Makoni, E. and Matiza, J., 2013. Analysis of the uptake of agricultural insurance services by the agricultural sector in Zimbabwe. *Journal of International Business and Cultural Studies*, 7, p.1.

UNCTAD (1994). *Agricultural Insurance in Developing Countries*. United Nations Conference report on Trade and Development (UNCTAD), New York.

United States Department of Agriculture. 2023. Food Insecurity in the U.S (2023). [Cited July 10, 2023]. Available from: <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-u-s/>.

Varadan, R.J. and Kumar, P., 2012. Impact of crop insurance on rice farming in Tamil Nadu. *Agricultural Economics Research Review*, 25(2), pp.291-298.

Wang, H., Liu, H. and Wang, D., 2022. Agricultural insurance, climate change, and food security: evidence from Chinese farmers. *Sustainability*, 14(15), p.9493.

Wheeler, T. and Von Braun, J., 2013. Climate change impacts on global food security. *Science*, 341(6145), pp.508-513.

Wiebe, K., Robinson, S, and Cattaneo, A., 2019 Climate change, agriculture and food security. *Sustain Food Agric*.. <https://doi.org/10.1016/B978-0-12-812134-4.00004-2>.

Wodaju, A., Nigussie, Z., Yitayew, A., Tegegne, B., Wubalem, A. and Abele, S., 2023. Factors influencing farmers' willingness to pay for weather-indexed crop insurance policies in rural Ethiopia. *Environment, Development and Sustainability*, pp.1-26.

Word Count. 2020. How many people die from hunger each year. Denmark: The World Counts; Available from: <https://www.theworldcounts.com/challenges/people-and-poverty/hunger-and-obesity/how-many-people-die-from-hunger-each-year/story>.

Yanagi, M., 2024. Climate change impacts on wheat production: Reviewing challenges and adaptation strategies. *Advances in Resources Research*, 4(1), pp.89-107.

Zaveri, E. and B. Lobell, D., 2019. The role of irrigation in changing wheat yields and heat sensitivity in India. *Nature communications*, 10(1), p.4144.

Appendix 2: Interview guide

Assessing the Role of Crop Insurance in Mitigating Household Food Insecurity among Smallholders Maize Farmers in Goromonzi District, Zimbabwe

Interview guide for Extension workers

1 Greetings

2. What is your view on the threat of climate risks to smallholder maize farming in Goromonzi district

3. Among the climate change adaptation strategies, agricultural insurance is gaining prominence as a risk-sharing or transfer strategy. What is your view on the significance of crop insurance in enhancing the resilience of smallholder farmers to climate-related shocks and food security in Goromonzi district?

4. How would you rate the effectiveness of crop insurance in mitigating household food security?

5. Kindly share with us your view on the status of uptake of crop insurance in Goromonzi district?

6. What would you consider the most critical barriers or drivers for the uptake of crop insurance among smallholder farmers in Goromonzi district?

7. How best can the uptake of crop insurance be promoted by the Government and private sector players in Goromonzi district?

Thank you