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The socio-economic effects of government's intervention in climate-smart agriculture technologies to smallholder farmers in Mt Darwin ward 11, Zimbabwe

Submitted by

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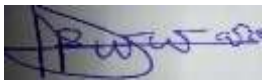
SIGNED: 

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APPROVAL FORM

The undersigned certify that they have supervised and recommended to Bindura University of Science Education for acceptance of the dissertation entitled **'The socio-economic effects of government's intervention in climate-smart agriculture technologies to smallholder farmers in Mt Darwin ward 11, Zimbabwe,'** submitted in partial fulfillment of the Bachelor of Agricultural Science Honours Degree in Agricultural Economics and Management.

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DECLARATION

I, Derera Fortune, declare that this dissertation titled "**The socio-economic effects of government's intervention in climate-smart agriculture technologies to smallholder farmers in Mt Darwin ward 11, Zimbabwe**" is my original work and has not been submitted elsewhere for any degree or qualification. I acknowledge that I have received guidance and support from my supervisor J Chimvuramahwe, and other academic staff during this research, but the intellectual content and presentation of this dissertation are entirely my own. I have followed the guidelines and regulations of the Bindura University of Science Education regarding plagiarism and academic integrity, and I have properly cited and referenced all sources of information used in this dissertation.

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DEDICATION

I dedicate this project to my parents who supported me financially during my studies. Thank you, family and friends, for your love and support

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ABSTRACT

The world's food security and income are under threat due to climate change, thus calling for government interventions in climate-smart agriculture technologies for smallholder farmers. Therefore, this study assesses the socio-economic effects of government interventions in Climate-Smart Agriculture (CSA) technologies on smallholder farmers in Ward 11, Mt Darwin District, Zimbabwe. This study aims to determine the socio-economic effects of government interventions on climate-smart agriculture technologies on smallholder farmers in Ward 11, Mt Darwin District. The study focuses on three objectives which are to determine the household demographics on beneficiaries of government CSA interventions, identifying the government interventions on climate-smart agriculture and assessing the socio-economic benefits of government intervention in climate-smart agriculture in Ward 11, Mt Darwin District. The study made use of primary and secondary data. The primary data was collected using observations, key informants, focus group discussions, and structured questionnaires administered to 120 selected beneficiaries by Agritex extension officers and farmers in the study area. The secondary data was obtained from publications and AGRITEX records. The data was analyzed using descriptive statistics, means, and the paired T-test. The response rate from questionnaires was 87.5%. Findings reveal that Pfumvudza is the most widely adopted CSA initiative, followed by horticulture and fish farming, indigenous poultry, and urea stova treatment, with lesser uptake of technologies such as drip irrigation and small ruminants. The majority of beneficiaries were women, 66.7%, and adults aged 31–40, reflecting national trends in gender empowerment and agricultural participation. Most households were large (6–9 members), had attained at least primary education, and relied heavily on farming as a primary income source. The study found that government CSA interventions have resulted to notable socio-economic improvements, including increased household incomes, improved food security and nutrition, greater drought resilience, enhanced market access, and women's empowerment. Thematic analysis from FGDs underscored the significance of comprehensive farming packages, timely input disbursement, and inclusive support strategies for smallholder farmers. From the paired T-test results, it showed that income increased after government interventions. The study concludes that while CSA interventions positively impact rural livelihoods, optimizing their effectiveness requires addressing implementation gaps and enhancing support systems.

Keywords: Climate-Smart Agriculture, government interventions, socio-economic effects, smallholder farmers

TABLE OF CONTENTS

Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ACRONYMS AND ABBREVIATIONS

AGRITEX	Agricultural Technical and Extension Service
AMA	Agricultural Marketing Authority
CLAFA	Crop, Livestock and Fisheries Assessment
CSA	Climate Smart Agriculture
FAO	Food and Agriculture Organization
FGDs	Focus Group Discussions
GMB	Grain Marketing Board
MoLAFWD	Ministry of Lands, Agriculture, Fisheries Water and Rural Resettlement
NDS	National Development Strategy
SDG	Sustainable Development Goal
SPPSS	Statistical Package for Social Sciences
WVA	World Vision Australia
ZIMSTAT	Zimbabwe National Statistics Agency
ZimVAC	Zimbabwe Vulnerability Assessment Commit

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter focuses on the socio-economic effects of government intervention on climate-smart agriculture technologies to smallholder farmers in ward 11, Mt Darwin District. The first part of this chapter highlights the introduction and the background upon which the research was conducted. it further looks on statement of the problem, research objectives, research questions, significance of the study, scope and limitations of the study as well organisation of the thesis.

1.2 Background of the study

According to the United Nations Food and Agriculture Organization (FAO), to meet current demand at present consumption levels, agriculture would need to produce 60% more food globally and 100% more in developing nations by 2050 (Sida, 2017). However, the world's food security and income are under threat due to climate change. The destruction of farms or the creation of unfavorable environmental conditions that make farming impossible are two more ways that climate change impacts agriculture. An increasing number of farming families are compelled to abandon their fields and farms each year in pursuit of employment opportunities. In 2021, harsh weather uprooted more than 23 million people globally (Chandler *et al.,* 2023). The problems that smallholder farmers in Sub-Saharan Africa currently face are expected to worsen due to climate change. The growth conditions and potential yields of many crops in Sub-Saharan Africa are predicted to be adversely affected by changes in rainfall amounts and distribution, rising temperatures, and differences in crop carbon use of the soil as a result of climate change, among other factors. The primary reason for the persistent food insecurity in Southern Africa is the changing climate, which affects the region's agricultural practices (Mutengwa *et al.,* 2023). Food shortages for underserved rural areas are being exacerbated by climate change-related limitations. The lives of Zimbabwe's smallholder farmers, who irrigate just 1% of their crops, are being strained by climate shocks. Due to their larger concentration in less hospitable climatic zones and their limited capacity to handle shocks, smallholder farmers in drought-prone areas are more vulnerable to drought (Nkonya *et al.,* 2021). Climate-smart agriculture emerged as a response to the environmental and agricultural challenges posed by climate change.

Due to the high percentage of jobs in agriculture and the concentration of food-insecure populations in rural areas, drought poses a particularly serious concern. Between 1902 and 1979, the frequency of droughts was 1 in 10 growing seasons; between 1980 and 2011, it was 1 in 4 growing seasons (Sango, 2013). Since Zimbabwe's agriculture is mostly rainfed, bad rains immediately affect a large number of people, particularly those living in rural regions who rely on farming for both their income and their food intake (World Bank Group, 2024). Following the drought brought on by El Niño, Zimbabwe proclaimed the summer agricultural season of 2023–2024 a national disaster on April 3, 2024. Poor rainfall was received across 80% of the nation. When drought brought on by the El Niño, global weather pattern caused a humanitarian crisis in Southern Africa thus Zambia and Malawi made similar announcements of droughts. In Zimbabwe, an estimated of 2.7 million people were predicted to be food insecure between April 2023 and the end of March 2024 (International Financial Cooperation, 2024).

The FAO introduced the idea of "climate-smart agriculture" in 2010 in response to the increasing demand for a well-defined and cohesive plan for managing food systems and agriculture in the face of climate change in order to meet development and food security goals (FAO, 2013). According to the 2030 Agenda, there must be transition to more sustainable methods of production and consumption, as well as increase in efficiency and sustainability of our food and agriculture systems (FAO, 2017). In order to combat poverty and injustice, World Vision Australia (WVA) works with families, communities, and children to promote sustainable development. WVA focuses further on integrating climate action into its program and aggressively connects issues of poverty alleviation and inequality with the climate catastrophe (World Vision Australia, 2022). Zimbabwe is an agro-based country where most people live in rural regions. Approximately 70% of the population makes their livelihood either directly or indirectly from agriculture, which makes it the cornerstone of the country's economic development, food security, and poverty alleviation (Government of Zimbabwe, 2015). Food imports, particularly those of maize, wheat, and rice, have surged as a result of the country's precarious socioeconomic status and the effects of climate extremes like droughts and floods that result in significant agricultural losses (Government of Zimbabwe, 2015). Rain-fed agriculture is the primary method used by smallholder farmers to raise the staple maize crop, and yields are thought to have dropped by more than 50% as a result of climate change (Mujeyi *et al.,* 2021)

1.3 Statement of the Problem

Mount Darwin District, which is divided into two agroecological farming regions (2b;3) which is prone to climate change characterized by high temperatures, pests and diseases, and insufficient rainfall, which is bad for crop and livestock productivity. (CLAFA, 2023). The livelihoods of rural populations who rely significantly on rain-fed agriculture and natural resources are at risk thus call for government intervention in climate-smart agriculture technologies. The call for government intervention in climate-smart agriculture has socio-economic effects that are not being taken into account. Preliminary observations midway along the 2020/21 season show that some farmers have sold fertilizers availed to them from the government. Due to high levels of poverty in communal areas, some farmers are selling them to meet other household needs (Mujere *et al., 2022*). Despite government interventions, poverty and household income amongst smallholder farmers in Mt Darwin remain socio-economic factors to be reviewed. The key question determines the household demographics of beneficiaries in government CSA interventions in Mt Darwin District. In addition, smallholder farmers are given inputs without considering agroecological regions. This is detrimental as agroecological regions should be considered when providing inputs to smallholder farmers. However, due to a lack of finance, farmers will adapt to the inputs provided, leading to another key question of assessing the socio-economic benefits of government intervention in climate-smart agriculture in Mt Darwin District. In particular, there is a dearth of empirical data regarding the effects of CSA practices on the Mt Darwin district's smallholder farmers' levels of poverty, household income, and agricultural output.

Furthermore, the socioeconomic effects of these programs on smallholder farmers are not well regionally documented at the ward level (ward 11 of Mt Darwin included). To fill in these knowledge gaps, this study seeks to look into the socioeconomic effects of government involvement in CSA in the Mount Darwin district.

1.4 Research Objectives

1.4.1 Main Objective

This study aims to determine the socio-economic effects of government interventions on climate-smart agriculture technologies on smallholder farmers in Ward 11, Mt Darwin District.

1.4.2 Specific Objectives

1. To determine the household demographics on beneficiaries of government CSA interventions in Ward 11, Mt Darwin District.

2. To identify the government interventions on climate-smart agriculture in Ward 11, Mt Darwin District.

3. To assess the socio-economic benefits of government intervention in climate-smart agriculture in Ward 11, Mt Darwin District.

1.5 Research Questions

1. What are the demographic characteristics of households benefiting from government interventions in climate-smart agriculture technologies in Ward 11 Mt Darwin District?

2. What are the government's intervention activities on climate-smart agriculture initiated in Ward 11 Mt Darwin District?

3. What are the socio-economic benefits of government intervention on climate-smart agriculture in Ward 11 Mt Darwin district?

1.6 Significance of the Study

The significance of this study is to explore the effects of government intervention on climate-smart agriculture in smallholder farmers. Climate change has been detrimental to agricultural productivity, especially for smallholder farmers who lack the income for irrigation and herbicides, among others. Therefore, the findings from the study will inform various stakeholders and policymakers in Zimbabwe about the effectiveness of government interventions in climate-smart agriculture activities, thus contributing to the development of evidence-based policies through research on education 5.0. In addition, the study will address a significant knowledge gap in the existing literature on Climate Smart Agriculture in Zimbabwe, particularly regarding the socio-economic impact of government interventions. To the researcher, it is a requirement of the study in the fulfilment of the degree program. The researcher can also benefit from a better understanding of the significance of the concepts under the research and gain knowledge.

1.7 Scope and limitations of the study

Lack of adequate funds since the research was self-sponsored

Biased information since some farmers did not disclose some information, which they deemed confidential

Poor roads and a lack of transport restricted the researcher from reaching the farmers who lived in remote areas.

1.8 Organisation of the thesis

This thesis comprises five chapters, with the first chapter introducing the study. Chapter 2 gives the theoretical and empirical literature from other researchers on government interventions on climate-smart agriculture technologies. Chapter 3 presents the research methodology used in the study. Chapter 4 focuses on the results and discussion of the findings. Chapter 5 gives conclusions and recommendations of the study.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter reviews theoretical and empirical literature relevant to the current study with a critical focus on the socio-economic effects of government intervention on CSA technologies to smallholder farmers in the Mt Darwin district. This chapter begins with defining the key terms and concepts of the study, Climate Change, and Zimbabwe's agriculture. It further explores smallholder farming systems, Socioeconomic implications of climate change for smallholder farmers, and the theoretical framework. The chapter will go on to review empirical literature, and it will finally conclude with insight from the literature.

2.2 Review of Key Concepts, Theories, and Issues

2.2.1 Definition of terms

2.2.1.1 Climate Smart Agriculture

The Food and Agriculture Organization (FAO) defines climate-smart agriculture as a strategy to successfully reorient and restructure agricultural systems to promote development and guarantee food security in the face of climate change. (FAO, 2019) It seeks to address three primary goals: increasing agricultural earnings and output in a sustainable manner Climate change adaptation and resilience construction. Whenever feasible, lowering and eliminating greenhouse gas emissions

2.2.1.2 Smallholder farmer

Smallholder farmer means varies widely worldwide depending on location and the intensification of farming systems. Generally, a smallholder farmer is viewed as a person involved in farming a small piece of land, cultivating food crops, sometimes with small varieties of cash crops. A smallholder farm in the developing world is a family-run business that operates on up to 10 hectares, or 24 acres (Mbillu,2015). The majority of smallholder farmers cultivate less than 2 hectares, or 5 acres, of land. Smallholder farmers are defined in various ways depending on the context, country, and even ecological zone. In this case, smallholder farmers are communal farmers in Ward 11 of the Mt Darwin district who are characterized by the features explained.

2.3 Climate Change and Zimbabwe's Agriculture

One of the biggest problems the world is now facing is climate change. Due to rising average temperatures and shifting weather patterns, the negative effects of climate change are evident in a variety of industries, including agriculture and other natural resources (Mungai *et al.*, 2021). Zimbabwe's economy has historically been considered agro-based, with agriculture serving as a key component of both forward and backward connections with other industries (International Finance Corporation, 2024). Zimbabwe used to be southern Africa's breadbasket. Climate adaptation is necessary because of Zimbabwe's high susceptibility to natural disasters and the wider effects of climate change. Annual mean surface temperatures have risen and precipitation has fallen between 1900 and 2018, according to observed climate change (International Finance Corporation, 2024). The amount of rainfall that Zimbabwe receives has gradually shifted away from the multi-decadal mean over the past 20 years. The following drought seasons were linked to decreases in crop production: 1982/83, 1986/87, 1992/93, 1995/96, 2002/03, 2004/05, 2007/08, 2011/12, 2012/13, 2015/16, 2019/20, 2021/22, and 2023/2024 (Word bank group 2025). The 2023/2024 summer cropping season was a national disaster after the El Niño-induced drought, with 80% of the country receiving poor rainfall. A humanitarian disaster in Southern Africa was brought on by drought, brought on by the El Niño global weather pattern, much like in Zambia and Malawi (International Finance Corporation, 2024). In Zimbabwe, 2.7 million people were predicted to experience food insecurity between April 2023 and the end of March 2024. Many people in Zimbabwe and around the world are now more vulnerable due to the negative effects of climate change, which have decreased agricultural productivity. For example, El Niño events in the 2023–2034 seasons caused severe droughts that left about 5.5 million people in Zimbabwe food insecure and impoverished (International Finance Corporation, 2024).

2.4 Smallholder farming system

Many African economies are driven by smallholder farmers, even though their potential is frequently underutilized. According to the Department of Agriculture, Forestry, and Fisheries (2012), smallholder farmers are also individuals who own small plots of land and cultivate one- or two-income crops in addition to subsistence crops, nearly entirely using family labour. In Southern Africa, smallholder farmers, many of whom are women, are the main producers of food, accounting for up to 90% of production in some nations (WPF, 2021). Approximately

35% of the world's food is produced on farms smaller than 5 acres, and up to 80% of the food supply in Asia and sub-Saharan Africa comes from smallholders, according to recent studies (Knight, 2022).

About 1,534,396 smallholder farming families in Zimbabwe make up 11.6% of the country's GDP (International Finance Corporation, 2024). Simple, antiquated technology, poor returns, significant seasonal labour changes, and the crucial role that women play in production are some of the key features of smallholder farmers' production systems. The biggest factor contributing to the rising rates of poverty among smallholder farmers in Africa is declining agricultural performance, and its recovery is the best chance for rural communities to rise out of poverty. A risk-averse, conservative approach toward farming and livelihood systems is brought on by food insecurity among the vulnerable, impoverished rural agricultural communities (Myeni, 2012). According to the Ministry of Agriculture in South Africa, Smallholder farmers in South Africa face various challenges that impede their growth and ability to effectively contribute to food security relative to the commercial farmers (Myeni,2012). Some of the constraints they face relate to a lack of access to land, poor physical and institutional infrastructure. Similarly in Zimbabwe the greatest challenge the agricultural sector in Zimbabwe faces is low productivity, mainly due to climate-induced risks such as recurring and severe droughts, cyclones and floods, strong winds, and pests and diseases, in addition to lack of access to finance, high input costs and excessive power cuts on irrigation agriculture (Chidavaenzi *et al.*, 2021). Droughts and other extreme weather events are becoming more frequent and severe, which puts the agricultural sector at risk and makes poor productivity worse (International Finance Corporation, 2024).

2.5 Socioeconomic implications of climate change for smallholder farmers

Zimbabwe's economy has traditionally been considered agro-based, with agriculture serving as a key component of both forward and backward connections with several industries (International Finance Corporation, 2024). The successful performance of the agricultural sector, which is expected to contribute more than 20% of GDP by 2025 and enhance the standard of living for around 1,534,396 smallholder farming families in Zimbabwe, thus foundation of NDS1's inclusive economic growth (International Finance Corporation, 2024). Due to their inability to handle shocks and their increased focus on less hospitable climates, smallholder farmers in drought-prone areas are increasingly vulnerable to drought (Nkonya *et al.*, 2023). According to Professor Jiri, smallholder farmers in Southern Africa are still the ones

most impacted by the difficulties posed by climate change and unpredictability. A range of agronomic techniques and crop selections is necessary due to climatic unpredictability (Jiri *et al.,* 2017). For smallholder farmers in rural areas, the decline in agricultural productivity has resulted in several social and economic issues. Farmers are no longer able to produce enough food crops for their use, so they stopped bringing extra products to the market (Mugambiwa *et al,*.2024). Farmers' livelihoods are directly impacted by climate change; when crops and cattle are destroyed, revenue also declines. Farmers in the most susceptible areas of the world are already frequently on the verge of destitution, and as climate change picks up speed, the risk increases. Crop yields are predicted to continue to fall, pushing 43 million people into poverty in Africa alone by 2030 (Chandler *et al.,* 2023). Since climate change has made things so unpredictable, many families have been stuck in poverty cycles because they are unable to plan forward as a result, every bad season reduces their chances of recovering and thriving even more (Mugambiwa *et al.,* 2024). According to predictions, if farmers are unable to adjust to the consequences of climate change, worldwide food output might drop by as much as 30% by 2050. Climate change impacts the whole agriculture sector, resulting in lower food supply and increased food costs globally, therefore, these disruptions are not limited to farmers (Chandler *et al.,* 2023).

2.6 Conceptual Framework for this Study

2.6.1 **Zimbabwe** Climate Smart Agriculture Results Framework

The conceptual framework of this study in Figure 2.2,shows illustrates the relationship between government CSA interventions, household demographics, and socio-economic outcomes for smallholder farmers. At the core of the framework is the government intervention in CSA technologies, such as increasing access to sustainable use of VSA technologies and input tools, increasing CSA farm practice and strengthening knowledge, mainstreaming CSA policy and capacity to farmers. Expected results are Household welfare outcomes are the specifically income levels, food security, and resilience to climate change, improved access to sustainable farming, Improved farmer support services extension and climate information services, Inclusive and viable partnership for value addition, post-harvest handling and marketing of products However, the effects of these interventions may vary based on household demographic factors such as age, gender, education level, household size, and landholding.

Key components of the conceptual framework include:

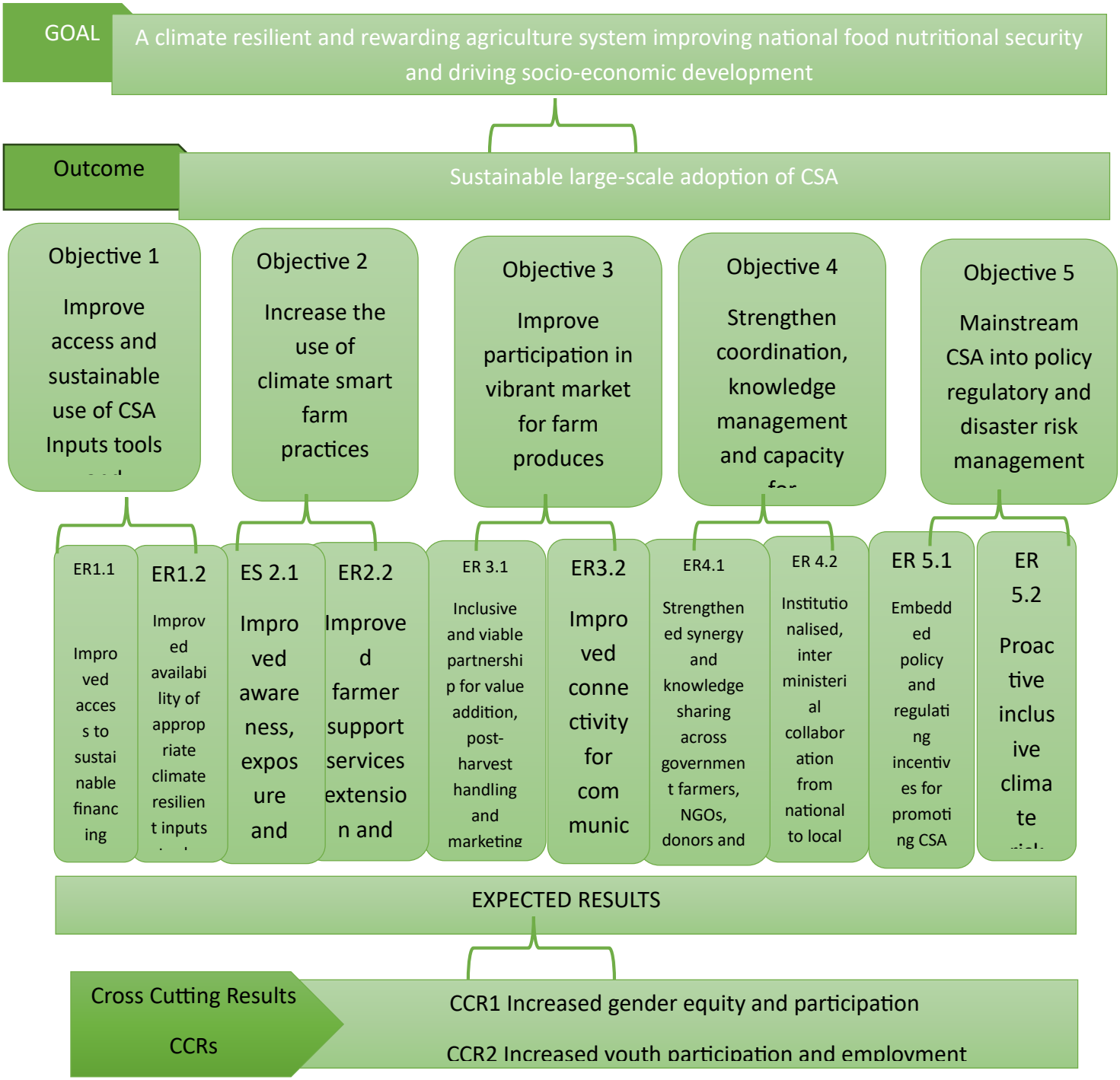


Fig 2 Zimbabwe Climate Smart Agriculture Results Framework

2.7 Review of Empirical Literature

To determine the household demographics of beneficiaries in government CSA interventions, the researcher reviewed other interventions done by other governments for smallholder farmers. Geographical location affects the beneficiary's household demographics. Nonetheless, the farming methods and susceptibility to climate change of smallholder farmers worldwide are comparable. The age, gender, level of education, and size of the household are socio-demographic traits of farmers (Al-Shadiadeh, 2012). The lives of millions of small and marginal farmers in this region are still in danger due to a lack of other economic possibilities and pervasive poverty. Ajayi *et al.,* (2019) discovered that smallholder farming households, particularly women and young people, are no longer able to secure their livelihoods due to their reliance on rain-fed agriculture, unpredictable weather, and climatic trends. In Zambia, the districts chosen for Zambia's CSA project were mainly chosen due to their somewhat higher poverty rates than the national average, their poor rainfall patterns and greater vulnerability to climate change, and their potential to promote the production of both crops and animals (Ajayi, *et al.,* 2019). 80,000 smallholder farmers in Zambia benefited from the initiative, which aimed to promote gender mainstreaming by having at least 40% of the beneficiaries be women. According Mujeyi *et al*. (2021) the household head's level of education, education, and the total number of livestock units all had a positive effect on food security for smallholder farmers in CSA adopters in Mudzi. Preliminary observations midway along the 2020/21 season show that some farmers have sold fertilizers availed to them from the government. Due to high levels of poverty in communal areas, some farmers are selling them to meet other household needs (Mujere *et al.,* 2022). Farmers in the Zaka district valued CSA practices because they had protected them from crop failure risks over the years. However, Mpala's findings showed that two key factors limited financial infrastructure, and affordability significantly hampered the effectiveness of CSA strategies in increasing crop productivity (Mpala *et al.,* 2024). Overall, the authors' examination of the research makes it abundantly evident that smallholder farmers are at risk from climate change because of their low income, high rate of illiteracy, and poverty. According to a study by Shikuku *et al.,* (2017), younger farmers with higher literacy levels are more likely to adopt climate-smart agriculture technologies, while women often face predicaments in accessing and adopting despite playing a major role in agriculture. On the balance Moyo *et al., (*2020) found that households with limited education and larger family sizes were more likely to benefit from simplified, low-input CSA models like Pfumvudza. On the balance, access to government extension services was discovered to be uneven, favoring

male-headed households (Moyo *et al.*, 2020). Thus, government intervention in some marginal areas of CSA has after-effects on smallholders, which have to be reviewed in this study.

To combat climate change effects through implementation of the SDG 13 of taking urgent action to combat climate change and its impact, to eradicate poverty in all its forms everywhere, SDG 1 and SDG 2 End hunger, achieve food security and improved nutrition, and promote sustainable agriculture. The government of Zimbabwe intervened in climate-smart agriculture technologies for smallholder farmers as below. Several empirical studies have examined the nature and impact of government interventions in climate-smart agriculture (CSA), particularly in sub-Saharan Africa. CSA involves practices that increase agricultural productivity, enhance resilience to climate change, and reduce greenhouse gas emissions (FAO, 2013). In Zambia, CSA projects were initiated at the national level due to their poor rainfall patterns and greater vulnerability to climate change. Smallholder farmers in Zambia benefited from the initiative, which aimed to promote gender mainstreaming by having at least 40% of the beneficiaries be women (Ajayi *et al.*, 2019). In Zimbabwe, the government has partnered with international donors and NGOs to implement CSA interventions such as conservation agriculture (Pfumvudza/Intwasa), input support programs, and training via extension services (MoLAWFRD,2021). As suggested in the 2019 ZimVAC Rural Livelihoods Assessment Report, the government of Zimbabwe implemented the Pfumvudza/Intwasa cropping program, which is run by the Ministry of Lands, Agriculture, Water, and Rural Resettlement, in the 2020–2021 and 2021–2022 cropping seasons. The goal of the Pfumvudza/Intwasa cropping initiative was to increase household food security, which will lead to increases in nutrition security and overall livelihoods (ZIMVAC, 2022). Furthermore, according to Nyati *et al.*, 2021), collective livestock raising on a modest scale is crucial to maintaining livelihoods in underdeveloped nations. Livestock is a source of organic fertilizer and is essential to balanced nutrition and food security. Small-scale animal production provides the majority of smallholder farmers with a living. One strategy for climate-smart agriculture is small-scale animal production. Nyati suggested that the Anglican Diocese organization (Matabeleland) supply goats to smallholder farmers in Ntabazinduna. Despite other advantages, the main goal was to protect farmers in the case of a bad crop, thus diversification (Nyathi *et al.*, 2021).

In addition, the government has advanced the growing drought-tolerant small grain crops like rapoko, sorghum, and millet are typically done to address climate change-related problems with inconsistent and low rainfall. (CLAFA, 2023). As the ward 17 Nyanga district lacks the enabling circumstances for the crop to have a strong yield due to its dry climate, Mushore

(2021) determined that the weather is making it hard to produce maize, which is the main cereal for Zimbabwe and the inhabitants living there. Small grain crops are therefore appropriate as they can endure dry circumstances. This is beneficial as it will mostly guarantee food supply even during periods of drought Mushore *et al.,* 2021. According to the Zimbabwe Irrigation Investment Prospectus, smallholder farmers who can access dam water can use technologies such as drip irrigation to combat the effects of climate change, as it has been successfully utilised in Manicaland Cashel valley, where canals are used for flood irrigation. (Chidavaenzi, *et al.,* 2021)

To assess the socio-economic benefits of government intervention in climate-smart agriculture in Ward 11, Mt Darwin District, the researcher reviewed the significant literature. The financial and social advantages of government support for climate-smart agriculture are to boost production, promote household food security, and prevent poverty by allowing farmers to sell their produce for more revenue (Khumalo, 2024). For instance, a study by Arslan *et al*., (2015) in Malawi propounded that CSA adopters significantly gain higher productivity and reduced vulnerability to drought. Additionally, one climate-smart agriculture strategy that helped smallholder farmers in Ntabazinduna, Matabeleland, is small livestock farming. The Anglican Diocese organization partnered with the government to provide small ruminant goats to smallholder farmers as a buffer against poor harvests, diversification, and healthy goat protein consumption (Nyathi *et al.,* 2021). This helps smallholder farmers achieve financial and food security, supporting the SDGs of ending poverty and eradicating hunger. Furthermore, Mushore stated that the development of tiny grains is crucial since it will guarantee food supply even during drought seasons. Since the ward 17 Nyanga district lacks the enabling circumstances for the crop to have a strong yield due to its dry climate, the weather is making it hard to produce maize, which is the main cereal for Zimbabwe and the residents there (Mushore *et al.,* 2021). The Pfumvudza program's cultivation of drought-tolerant small grain crops like millet, sorghum, and rapoko is often done to address the low and inconsistent rainfall that is a result of climate change. (CLAFA, 2023). The researcher has to examine the advantages and difficulties of these treatments since smallholder farmers face difficulties. On the other hand, other studies caution that CSA benefits are not realized and depend on the quality of implementation, access to resources, and household capacity to adapt to such innovations (Thierfelder *et al.,* 2017). Without long-term government support, initial benefits may be unsustainable.

2.8 Major Insights from the Literature Review

The researcher identified that the studies on the socio-economic effects of climate-smart agriculture (CSA) technologies on smallholders have been done in Zimbabwe. The researcher noted that little is known about the socio-economic effects of government intervention in CSA to smallholder farmers in Ward 11, Mt Darwin District. Therefore, there was a need to assess the socio-economic effects of government interventions in CSA technologies on smallholder farmers, particularly communal farmers, to contribute to designing appropriate policy and extension support programs.

2.9 Conclusion

This chapter reviewed literature on the government interventions on climate-smart agriculture technologies for smallholder farmers in theoretical and empirical literature. Literature showed that CSA interventions are effective but vary in accessibility and outcomes. It was clear from the reviewed literature that Household demographics significantly shape adoption and benefits. However, sustained impact requires inclusive and well-supported programming to achieve the socio-economic benefits of these government interventions in CSA technologies to smallholder farmers in Ward 11. Thus, this study is trying to fit into Ward 11, Mt Darwin, to assess the socio-economic effects of CSA technologies on smallholder farmers.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter shall provide knowledge of the study area and the criteria for data collection. The sampling procedure and data analysis methods will also be discussed in this chapter.

3.2 Study Area and Population

3.2.1 Description of study area

The research will be undertaken in the ward 11 of Mt Darwin district, Mashonaland Central, in Zimbabwe. Mount Darwin is in the northeastern part of Zimbabwe and is about 156 km north of Harare. It shares borders with Rushinga district to the east and Shamva to the south, Muzarabani to the west, and to the north it borders with Mozambique. The area of study is shown in Figure 2

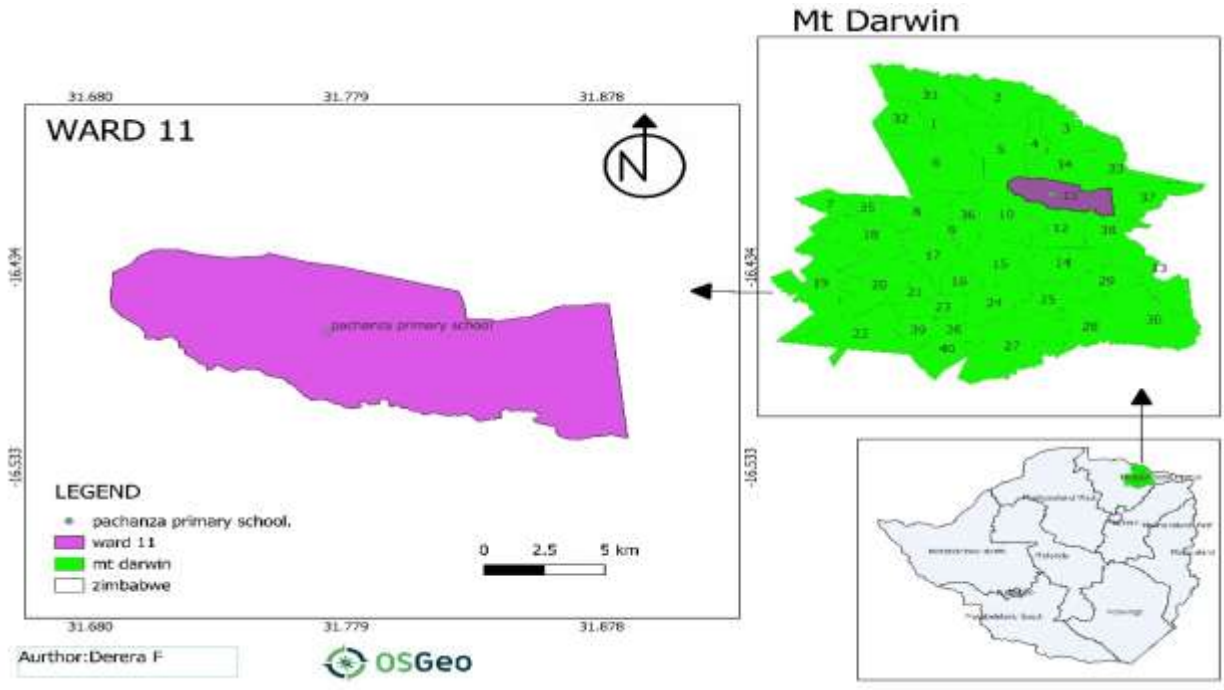


Figure 2: Map of the study area

Source Author, Jan 2025

The latitude of the study area is 16.7737, while the longitude is 31.576. It has a total area of 459,219.09 ha with a potential arable area of 367 375.27Ha, which is about 80% of the total area. The district is the largest in Mashonaland Central and is divided into 40 wards with six farming sectors, which are large-scale commercial farms, Scale Commercial Farms, Resentment Farms, A1, A2, and Communal farming. Communal areas constitute about 80% of the total area of the district (MoLAFWR, 2021). The greater part of the district is communal settlements. The district is further divided into two parts: the upper Mt Darwin with natural regions 2A, 2B, 3, and the lower Mt Darwin, which is known as the Zambezi Valley basin and is in natural region 4, which is prone to erratic rainfall patterns and drought. The average rainfall of about 650-800mm per year per year makes the ward generally suitable for livestock rearing and for major crop types (Mavhura, *etal*,. 2015)**.** Ward 11 consists of 15 communal villages, which are Pachanza A, Pachanza B, Kamanura, Murambiza, Chimhepo, Kanyera, Chimundege, Chohore, Magunye, Chipamurandu, Nyamuchira, Muwayura, Marongedza, and Murota.

3.2.2 Socio-Economic Background of Study Area

Residents in Ward 11 in the Mt Darwin District keep mainly cattle and goats, and grow some crops for subsistence use mainly. Non-arable land is used for grazing under communal tenure. Mt Darwin has an approximate population of 212,190 people with an average household size of five people per household, whilst Ward 11 has an estimated population of 7427 people. A population density of about 33 persons per km 2 with a population growth rate of 1.3% (Zimstat, 2022). The district has 92 primary schools and 46 secondary schools. The inhabitants of this communal area are predominantly smallholder farmers who depend on rain-fed cropping and livestock rearing, generally for subsistence. Livelihood is dependent mainly on farming and other off-farm activities to supplement income.

3.3 Sampling technique

A purposive sampling was done by the researcher to target the exact beneficiaries of government interventions in CSA technologies. The Ministry of Lands, Agriculture, Fisheries, Water, and Rural Resettlement (MLAFWR) through the department of AGRITEX provided a list of each of the 14 villages of the targeted population. Due to financial constraints, the

researcher trained 4 Agritex officers to distribute questionnaires to beneficiaries, each targeting 20 beneficiaries.

3.4 Research approach

This study used a hybrid methodology that drew heavily from the literature on the philosophy of social sciences and combined quantitative and qualitative methods. Procedures for gathering, evaluating, and combining quantitative and qualitative data in a single research or a multiphase series of experiments are known as mixed methods designs (Creswell *et al.*, 2023). A mixed methods approach's central claim is that combining both types of data yields a more comprehensive grasp of a study subject than either quantitative or qualitative data alone. Because this study employed a mixed-methods approach, it is triangulated.

3.5 Data collection methods

The study used two data collection instruments which are primary and secondary: A questionnaire, focus group discussions, observations, records and interviews. The table below shows the data collection methods used by the researcher.

Table 1

Specific Research Objective	**Data concepts and variables/indicators**	**Data collection methods/tools**	**Respondents' subjects**
To determine the household demographics of beneficiaries in government CSA interventions in Ward 11, Mt Darwin District.	Age, gender, education level, household size, landholding size, source of income	Structured questionnaires, Agritex records	Smallholder farmers benefiting from CSA programs
To identify the government interventions on climate-smart agriculture in Ward 11, Mt Darwin District.	conservation agriculture, drip irrigation, urea stova treatment	interviews Observations	Government officials, Villagers
To assess the socio-economic benefits of government	Increased yield, income levels, food security, input	(Interviews, Focus group	Beneficiary smallholder

intervention in climate-smart agriculture in Ward 11, Mt Darwin District	access, resilience to climate change	discussions, questionnaires)	farmers, community leaders

OBJECTIVE 1:To determine the household demographics of beneficiaries in government CSA interventions in Mt Darwin District.

3.5.1 Survey Questionnaire

An interview guide is suitable for a researcher who intends to conduct an interview. An interview guide lists the topics and questions that a researcher plans to cover (Jamshed, 2014). A questionnaire consisting of both open and closed-ended questions was prepared by the researcher and administered to the sampled farmers in Ward 11, Mt Darwin. Due to financial constraints, the researcher trained 4 extension officers before they administered a questionnaire to the sampled farmers. The questionnaires were hand-delivered, and time was given to the farmers to fill in the questionnaires. According to Creswell (2014), structured questions may have limited depth and misunderstanding of questions by low-literacy respondents, as the research is conducted in marginalised areas where there are people with high illiteracy levels. However, the questionnaire will provide quantifiable data for statistical analysis (Creswell, J.W. (2014). Moreover, the researcher used secondary data from Agritex records on household demographics of beneficiaries in government CSA interventions in the Mt Darwin District. The survey questionnaire is in Appendix 1

OBJECTIVE 2: To identify the government interventions on climate-smart agriculture in the Mt Darwin District.

3.5.2 Interview and Observations

Key informants are the subjects of the Depth interviews. These participants are Agritex officers, officers from the department of irrigation, social welfare, women's affairs, the ministry of youth development, and non-government organizations, but they may also be the decision makers in the research study. However, most in-depth interviews in qualitative research are semi-structured; they contain a series of questions that need to be addressed, but that have no specific format regarding what the answers should look like. Consequently, the set-up of the questions and the structure of the answers need to be similar (Roberts, 2020). Depth interviews

are unique in that they allow for probing on a one-to-one basis, fostering interaction between the interviewer and interviewee. Depth interviews also work well when those being interviewed have very little time and when they do not want the information to be shared with the other study participants. To validate the interview, the researcher used an observation method when identifying some CSA activities in Ward 11. Appendices 2 and 4 show the key informant questionnaire and pictures taken by the researcher during observations.

OBJECTIVE 3: To assess the socio-economic benefits of government intervention in climate-smart agriculture in Ward 11, Mt Darwin District

3.5.3 Focus Group Discussions

Focus Groups Focus groups are interviews conducted among several respondents at the same time and led by a moderator (Nyumba *et al.,* 2018) who leads and structures the interview and often plays a central role in transcribing the interview later. The researcher employed traditional focus group discussion with the help of the local extension officer, and permission was given by the village head. The open discussion, which was done using vernacular language, include 7 women, 4 men, 5 youths, and 2 people living with disability who are in agriculture and benefited from the CSA government programs. The researcher managed to conduct 3 focus group discussion sessions**.** The main advantages of such too are that it encourages community engagement, reveals group dynamics shared experience. any can be managed cost effectively ((Mannering, *et al.,* 2023). Moreover, team members can also vet potential moderators by considering their own experience with candidates leading group discussions within their teams and with peers. However, (Krueger *et al.,* 2014) argued that information gathered cannot be statistically generalized and sensitive topics are avoided. Thus, the researcher prepared questions that are apolitical and not sensitive. A focus group Guide used by the researcher is in Appendix 5

3.6 Data Analysis Methods

Using SPSS software (Statistical Package for Social Sciences for Windows, version 20; BI Survey Tips, Spreadsheet), questionnaire data were coded and analysed. The researcher used different data analytical tools, as shown below in Table 2

Table 2

Specific Research Objective	Data concepts	Data Variables/Indicators	Data analysis tools
Determining the household demographics of beneficiaries in government CSA interventions in Ward 11 Mt Darwin District.	Household structure and socio-demographic characteristics	Age Gender Education level Household size Source of income	- Descriptive statistics (frequencies, means, - Charts (bar, pie, histograms)
To identify the government interventions on climate-smart agriculture in ward 11 Mt Darwin District.	Types of CSA interventions, implementing bodies, delivery mechanisms, implementation scale	- Types of intervention conservation agriculture - Source (Govt, NGO, PPP)	Frequency distribution (quantitative)
To assess the socio-economic benefits of government intervention in climate smart agriculture in ward 11 Mt Darwin District	Economic improvement, food security, climate resilience, livelihood outcomes	- Crop yield changes (before and after CSA) - Household income changes - Food security status - Asset ownership	- Paired t-test - Thematic analysis

OBJECTIVE 1: To determine the household demographics of beneficiaries in government CSA interventions in ward 11 Mt Darwin District.

3.6.1 Descriptive statistics

The researcher used Descriptive statistics because its ideal for summarizing large datasets into understandable measures such as mean age, gender distribution, and education levels. It is of

paramount importance when describing the sample and drawing patterns (Kothari, 2004). Bar and pie charts visually represent categorical data like gender and education. Histograms are useful for displaying frequency distributions of continuous variables like age or household size.

OBJECTIVE 2: To identify the government interventions on climate-smart agriculture in Ward 11, Mt Darwin District

3.6.2 Frequency distributions

Frequency distributions allow for counting and tabulating how often certain government interventions in CSA technologies occur. For example, how many farmers practice conservation agriculture, and how many interventions come from NGOs and the government? This helps identify the most common interventions and delivery models. (Babbie *et al.,* 2010).

OBJECTIVE 3: To assess the socio-economic benefits of government intervention in climate-smart agriculture in Ward 11, Mt Darwin District

3.6.3 Paired t-test

Paired t-test is used for comparing means before and after an intervention when data is normally distributed, that is, income before and after government interventions (Gaad, 2022). The paired t-test will help to analyse if there are changes in income before and after government interventions. Thematic analysis helps interpret qualitative responses from beneficiaries on perceived changes in livelihoods, resilience, and well-being. It is ideal for open-ended survey or interview data. (Yanto, 2023).

3.7 Reliability analysis

The capacity of research to provide consistent and trustworthy results or data over several trials is known as reliability (Andersson *et al*,. 2024). With a Cronbach's alpha coefficient of 0.782, this study showed a high degree of consistency. This implies that there was enough foundation for data analysis; therefore, the study's conclusions may be applied broadly by the government.

3.8 Ethical Considerations

The questionnaires were completed by the participants themselves, and each one included clear and concise explanations of the study's goals, confidentiality level, and ethical standards.

3.9 Chapter Summary

This chapter presented the methods that were used in this study. It contained subsections of research design, area of study, population, sample and sampling techniques, data collection methods, data collection instruments and data analysis methods.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents research findings of the study. The first section explains the demographic and economic characteristics of the sampled households. This chapter presents results of identified government interventions in ward 11 Mt Darwin District. Furthermore, there is thematic analysis of results obtained from FGDs on socioeconomic effects of government interventions in climate smart agriculture technologies to smallholder farmers in Ward 11, Mt Darwin district. These results are presented in form of tables and graphs. This chapter further presented the benefits and constraints faced by smallholder farmers in the study area as well as the paired T test for income. Lastly, this chapter ended with a chapter summary.

4.2 Table Response rate

Table below shows the response rates of the respondents from the distributed questionnaires.

Table 3

Questionnaires distributed	Questionnaire returned	Response rate (%)
120	105	87.5%

Source: Study 2025

From the 120 questionnaires distributed, only 105 questionnaires were returned, resulting in a response rate of 87.5%. Eleven of the questionnaires were not fully completed while four of the respondents were reluctant to participate in the study. Response rate has an effect of a research proceeds, this is supported by the work by Holtom et al., (2022), who recorded that a wide variation in response rates between 75% - 95% is suitable for a study.

4.3Socio-economic characteristics of respondents

The findings presented show the respondents' socio-economic characteristics. These demographic variables include gender, age, education level, source of income and marital status. Demographic characteristic of households is vital when analysing socio-economic data as they represent the households' economic behaviour (Randela, 2005).

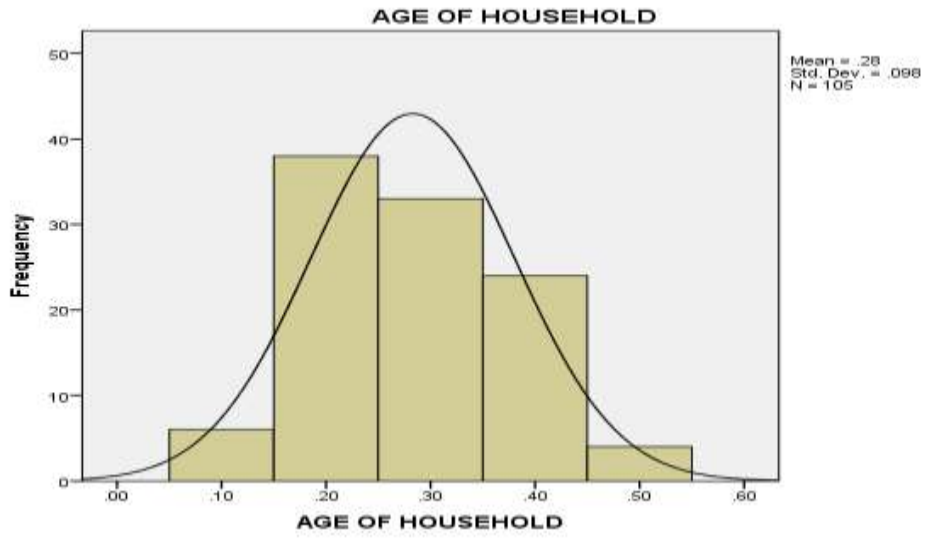
4.3.1 Distribution of respondents by gender

Table 4

Sex	**Frequency**
Male	35
Female	70
Total	105

The findings presented in Table 4 show that 66.7% proportion of the respondents were females, while males were only 33.3% of the total proportion of respondents in the study area. This reflected national efforts to empower women in agriculture, recognizing their central role in food production. This is supported by Zimbabwe's Gender Policy in Agriculture (FAO, 2017) which also emphasizes women's inclusion in all agricultural programs thus government of Zimbabwe is gender inclusive when it comes to agriculture.

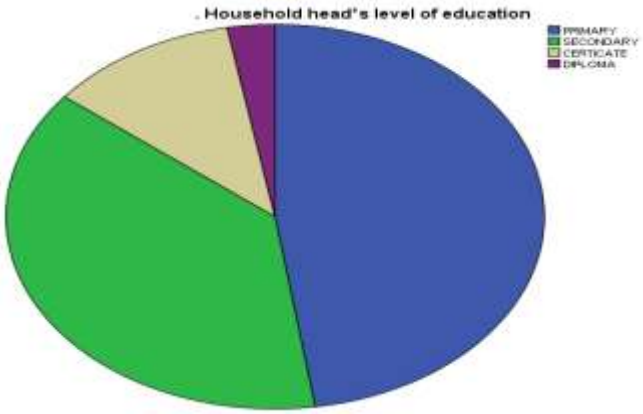
4.3.2 Distribution of respondents by age



According to the findings in above, the highest proportion (36.52%) of the respondents interviewed was aged between 31-40 years old, whereas the youth aged 18-30 years were the least, with a proportion of 5.7%. From the findings it shows that elderly people practice government CSA technologies than youths in the study area. Very few beneficiaries are under 30 (5.7%), suggesting low youth participation, which could be a concern for sustainability and

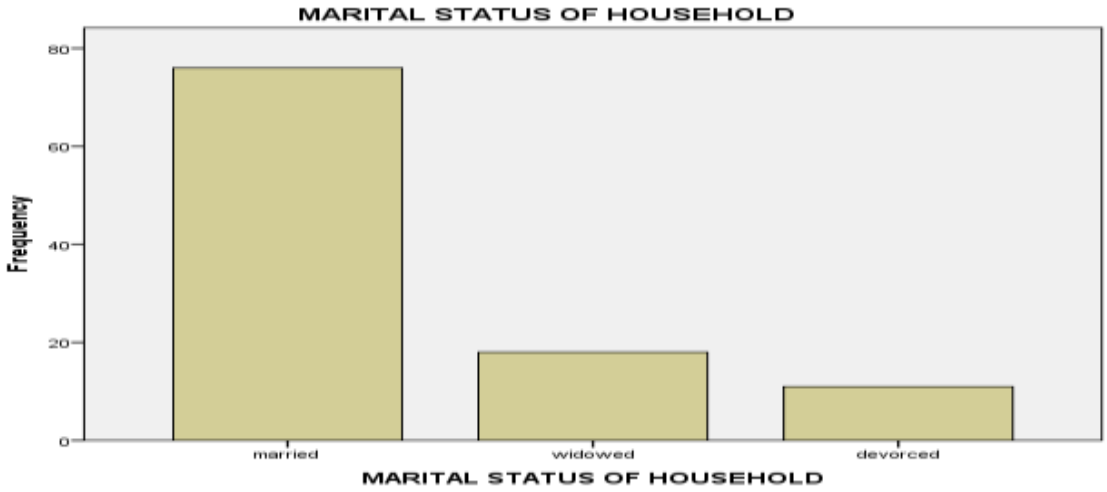
innovation in agriculture. Low participation of youth has been founded by Chisango *et al.*, (2022) that youth disengagement from agriculture in Zimbabwe is partly due to limited access to land and inputs.

4.3.3 Distribution of respondents by level of education



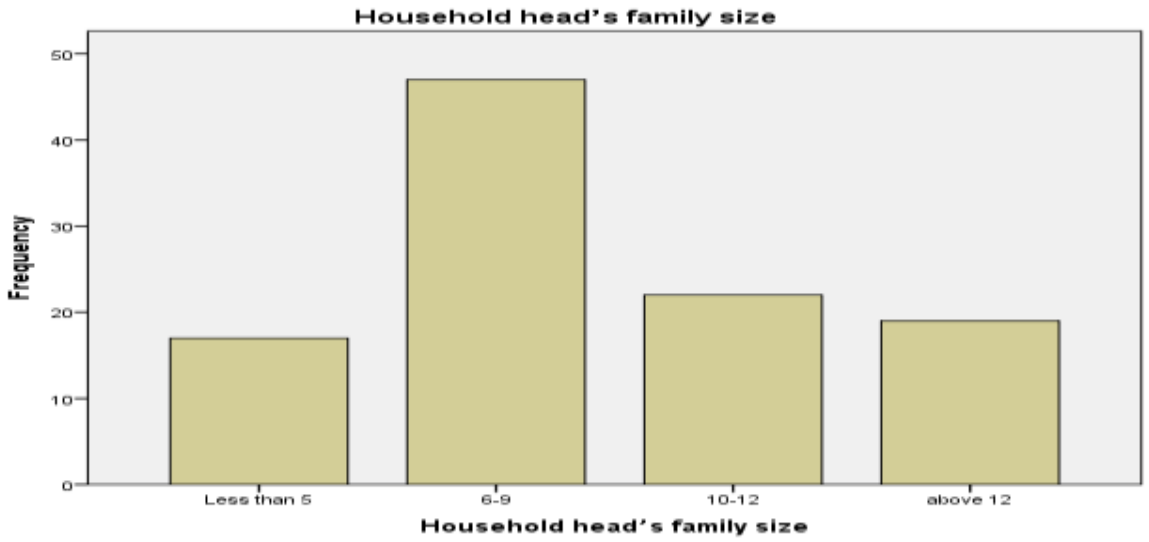
The findings presented in above show that the majority (47.6%) of the respondents in the study area have attained a primary level of education, while the least (11.4%) attend formal education to tertiary with certificates. The respondents who attained secondary education were 31.8% and only 2.9% are holders of diplomas who attained tertiary education. Thus, 87% of the interviewed households have the basic tools to be considered literate. FAO (2013) also notes that training and extension services are essential when education levels are low for adoption of CSA technologies. Moreso Katema et al (2017) postulated that high literacy levels have a positive outcome on improving the production capacity.

4.3.4 Distribution of respondents by marital status



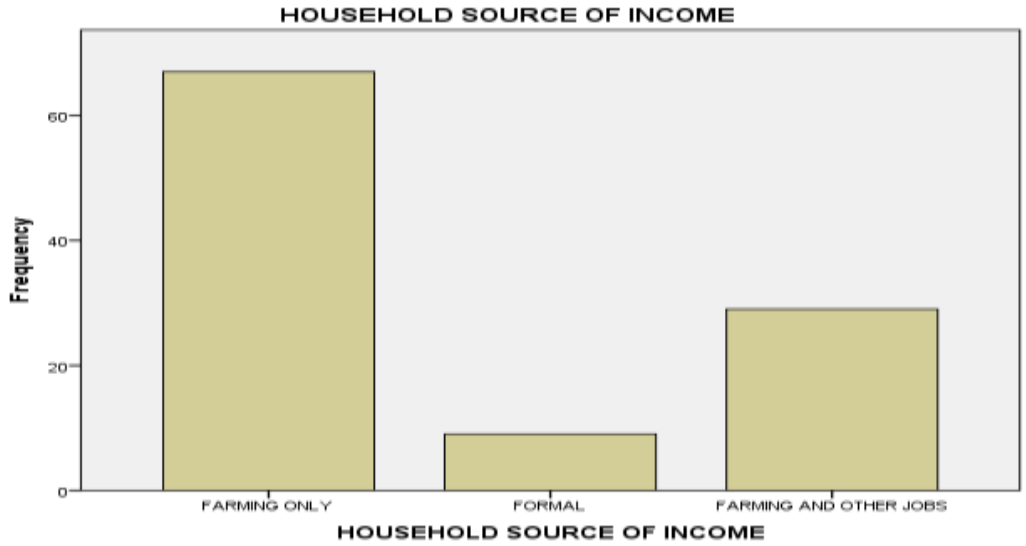
The findings above show that the majority (60%) of the respondents are married, followed by the divorced 17.5%, and 7.5% being widowed. This implies that government intervention in CSA technologies is more attractive to married couples who are engaged in various social and economic commitments. Such commitments include ensuring better housing, education for children, clothing the acquisition of better health services and food availability for family members. Katema *et al.*, (2017) founded that married people make better production management decisions due to balanced decision-making, leading to improved unity and success. The widowed and divorced women are engaged in government CSA activities in order to provide for their children.

4.3.5 Distribution of respondents by household size



The findings show that a large proportion (44.8%) of the households have between 6-10 members, while 21% of households have been between 10-12 members. Masunga (2014) in her findings concluded that higher family size contributes to the availability of labour. The amount of labour capable of executing farm labour specifically depends on the age. Large households, however, face higher food demand, making CSA interventions important for achieving food security. Large-sized households are forced to venture into more sources of income like horticulture and fish farming and Pfumvudza.

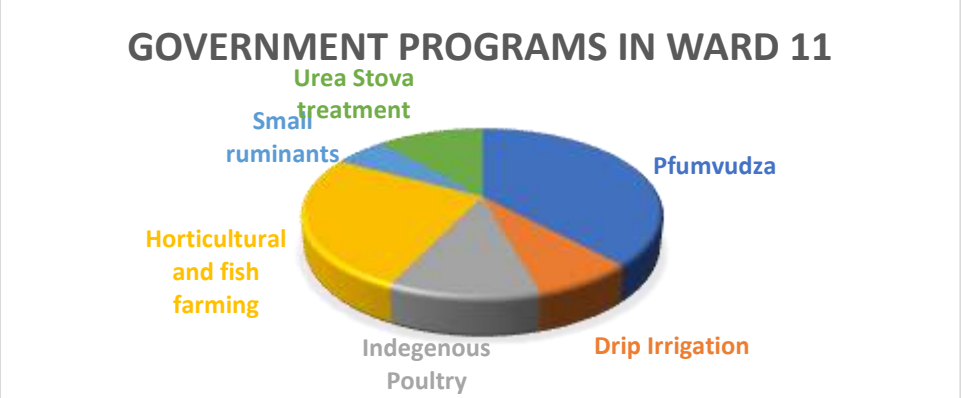
4.3.6 Distribution of respondents by source of income



Farming of crops was recorded as the main source of income with 63.8%, followed by farming and other jobs with 27.6%, and formal employment with 8.6.%. The farmers were involved in the cultivation of crops like maize, groundnuts, and sorghum. This indicates that CSA outcomes such as yields, food security, income will directly affect household welfare, especially among those with no other income sources. Other farmers who depend on farming and other jobs are engaged in activities like mining in Mukaradzi as a source of income. Some of the interviewed respondents are formally employed and engaged in their business within Mt Darwin town to complement their incomes. From past studies it was reviewed that diversification is a key resilience strategy, but households relying only on farming are more vulnerable to climate shocks justifying CSA support (IFAD, 2022).

4.4 The government interventions on climate-smart agriculture in Ward 11, Mt Darwin District

This pie shows the identified technologies in Ward 11



This pie shows the identified technologies in ward 11. Pfumvudza, Horticulture and Fish farming, and Indigenous poultry were the most widely accessed interventions, while drip irrigation, urea stova treatment and small ruminants had lower uptake.

From the pie chart above it shows that Pfumvudza, with 38% of respondents benefiting, is the most dominant government CSA initiative in Ward 11. Majority of smallholder farmers in the ward were beneficiaries of Pfumvudza especially on maize and sorghum Pfumvudza. Pfumvudza promotes conservation agriculture, minimum tillage, mulching, and crop rotation all designed to boost productivity and climate resilience. According to FAO (2021), Pfumvudza significantly improved yields and household food security in drought-prone regions of Zimbabwe by increasing maize yields by up to 300%.

More so, drip Irrigation with only 7.6% of farmers accessing this water-efficient technology. Drip irrigation is key to water conservation and off-season production. Tsoka, (2018) found that access to small-scale irrigation in rural Zimbabwe increases income and crop diversification, but uptake is limited due to infrastructure and cost barriers. Low adoption may reflect poor infrastructure, cost, or lack of government distribution. Drip irrigation was practiced by farmers who drilled boreholes in their homestead.

Furthermore, Indigenous Poultry has 11.4% uptake shows moderate attention to livestock diversification. Indigenous poultry are climate-resilient, require low inputs, and provide a steady protein source and income. Chiduwa *et al.* (2018) argued that poultry, especially indigenous breeds, offer a safety net for rural women under climate stress, with high adaptability to disease and heat. There's high potential for expansion as part of CSA livelihood strategies, especially for women-headed households.

Horticulture and Fish Farming with 25.7% uptake indicates that there is a significant intervention. Through Village Business Units, horticulture and fish-farming promotes income diversification, efficient land use, and nutritional security. Dube *et al.,* (2021) report that integrating horticulture and aquaculture enhances resilience by spreading risk across multiple income streams. This is a key CSA strategy that appears to be well adopted locally. Expansion could benefit nutrition and household income.

Small Ruminants is the least technology in Ward 11 with 5.7% uptake. Goats and sheep are drought-tolerant, less resource-intensive, and suitable for marginal lands. The government goat scheme project resulted in a small ruminant project with few beneficiaries. Mupawaenda *et al.* (2009) found that small livestock is essential for female farmers, offering income and manure for farming. Low uptake suggests a need for targeted promotion, especially among vulnerable households.

Respondents of Urea Stover Treatment highlighted 11.4% participation. The urea stove treatment enhances the nutritional value of crop residues for livestock, reducing feed costs and improving livestock productivity during dry seasons. This is intertwined with the studies from Snapp *et al.,* (2010) that showed improved feed treatment techniques help maintain livestock body condition during lean periods in Malawi and Zambia. This is a cost-effective intervention but may require more training for wider adoption.

4.5 Thematic analysis of Results obtained form FGDs

Thematic analysis method was used by the researcher to analyses data from Focus Group discussions and depth interviews. Thematic analysis is a method for analysing interview and focus group transcripts, qualitative survey responses, and other qualitative data (Yanto, 2023). Table 5 provides an overview of the major themes and sub-themes that emanated from the study.

Discussions on the socio-economic effects of climate-smart agriculture to smallholder farmers

Table 5

GROUPS	**RESPONSE**	
	Themes	**Sub themes**
Pachanza	Benefits experienced due to government CSA technologies intervention	Increased markets access Better resilience to drought Women inclusion
Marongedza	Socio-Economic effects of Government CSA Interventions	Increased household incomes Food security and nutrition

Murota	specific recommendations you would like to make regarding government interventions or support for CSA practices	Comprehensive farming package Early disbursement of farming inputs Faming inclusion

4.5.1 Benefits experienced due to government CSA programs from FGDs in Pachanza

4.5.1.1 Increased market access

There is increased market access in local to beneficiaries under small ruminant, drip irrigation, poultry and Pfumvudza. One of the beneficiaries on March 2025 said:

> *"I want to thank the Agricultural Marketing Authority (AMA) for helping us to get local markets and now we are supplying to supermarkets like TM and Pachedu supermarket"*

This result is literally supported by Ntshangase *et al.* (2018), who postulated that that farmers with higher incomes are more likely to adopt technologies than those with low incomes thus government intervention assisted smallholder farmers. Through AMA farmers can sell their goats to Rushinga, maize to Mt Darwin GMB deport and produces from horticulture are sold in local supermarkets. Low productivity and lack of market access led to low income. Most farmers are highly dependent on agricultural income. However, to improve access to markets there is need for infrastructure development for perishable products to avoid post-harvest losses.

4.5.1.2 Better resilience to drought

Resilience is the capacity of individuals, households, communities, organisations, or systems to anticipate, prevent (where possible), prepare for, withstand, survive, revitalise, learn, and transform when faced with acute shocks or chronic stresses such as those resulting from climate change (Zimbabwe CSA, 2018). There is reduced panic from climate shocks such as drought as smallholder farmers engage in diversified CSA technologies brought by the government, such as drip irrigation, urea stova treatment, pfumvudza, and others. One of the beneficiaries of the urea stover treatment for small ruminants and livestock testified how this technology helped him for the sustainability of his livestock during the 2023-24 El Niño drought, he said as below:

"I am happy that I didn't lose any of my cattle during the drought, as I gave my cattle stored feed from urea stova treatment that I did with help from Agritex officers in 2022."

Resilience to drought shocks is evident from the studies of (Asfaw at al, 2016.) where there produce livestock feed from fodders of maize and fertilizer to make it nutritious for livestock feed. They use crop residues to produce feed for livestock All in all government intervention through Agritex in training and supply inputs such as Urea fertilizer has significantly resulted in sustainability in crop and livestock in smallholder farmers.

4.5.2. The socio-economic effects of the Government in CSA interventions from FGDs in Marongedza

4.5.2.1 Increased household incomes

There is an increase in household income due to government interventions in CSA technologies in Ward 11. The farmers claimed that they utilise a portion of the revenue from selling their excess chickens, grains, and produce to pay for their children's education, infrastructure development, and the acquisition of household goods. When asked how much government CSA interventions are increasing household income, one farmer responded respectively below: Horticultural and fish farming beneficiary at Village Business Units (VBUs)

> *"We worked for two days a week for two hours. For each shift per day, we are paid $5 plus per day our monthly dividend of 25 dollars. that means in total we are each getting minimum of 65 monthly. This money is a lot considering that this project just last year and the income will grow as we expand. This is improving our lives in this community."*

The existence of CSA among smallholder farmers in Zimbabwe has been confirmed by a study by Mujeyi *et al. (*2021) which states that CSA increased household income for smallholder farmers. It was reviewed that smallholder have boosted their household income as they manage to pay school fees, buy farming equipment, and build modern houses, which are roofed by iron sheets rather than houses built with dagga and grass thatch. This is clear evidence that government interventions in CSA technologies such as horticulture and fish farming, Pfumvudza, Poultry and small ruminant are increasing household income to smallholder farmers who are vulnerable to climate change and rely on rain-fed agriculture.

4.5.2.2 Food Security and Nutrition

Pfumvudza, poultry, and small ruminant were reviewed by the researcher in the Focus Group Discussion as technologies brought by the government. Under Pfumvudza, Maize for personal consumption is grown on one plot, while the other is used to produce grain for sale to the Grain Marketing Board (GMB). The farmers described how increasing food production via pfumvudza/intwasa farming is converting food-insecure households in the district into food-secure ones. One farmer said:

> *"Though it requires more labour, pfumvudza/intwasa farming is best for this community that frequently experiences drought. To help with home food needs and other expenses, we used to sell to go to Mukaradzi for mining and selling of livestock. However, with pfumvudza/intwasa, we generate enough grain for household consumption."*

These results concurred with studies from the research from Jakachira *et al., (2022),* which states that with Pfumvudza, there significant rise in food output, giving farmers a larger surplus to sell and boosting their financial capital. The money made from selling extra grain enables the farmer to have more financial resources and is better able to weather shocks brought on by climate change, like Elnino which happened in the 2023-25 season in Zimbabwe. According to a Malawian study, Nyasimi *et al.* (2014), conservation agriculture led to maize harvests that were between 11% and 70% higher than those from conventional farming.

4.5.3 Specific recommendations regarding government interventions in CSA practices, FDGS in Murota

4.4.3 .1 Early disbursement of inputs

A focus group discussion conducted in Murota raised a point of that early disbursement of inputs as- major recommendation for government interventions in climate smart agriculture technologies in ward 11**.** The interviews revealed that the government's sometimes-late distribution of farming inputs harmed the viability of Pfumvudza/intwasa farming.

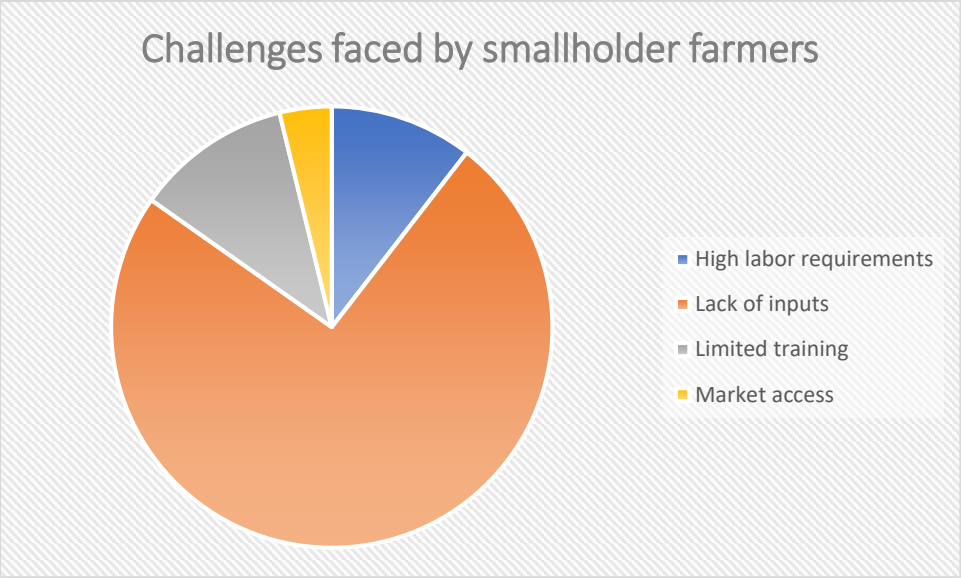
A farmer succinctly described this issue when she said:

> *"Agritex officers always ensure that we prepare our fields on time and to the required standards and provide us with adequate instruction on Pfumvudza/intwasa farming. Our biggest challenge is that there are delays on deliveries for inputs like seed and fertilizers, leading to harvest of low yields".*

The results are supported from literature that farmers who take part in the Pfumvudza/intwasa farming programme receive a package of farming inputs lately due to government delays (Jakachira *et al.*, 2022). This is detrimental as this results to low yields being realised hence affect food security negatively. Thus, from the study, the researcher reviewed that early disbursement of inputs is crucial for these government interventions.

4.6 Challenges faced by smallholder farmers in attaining government interventions in CSA technologies,

The farmers in ward 11 area indicated challenges faced during the government interventions in CSA technologies. A chart below presents information on challenges faced by smallholder farmers in the study area. These predicaments are discussed accordingly.



4.6.1 Lack of inputs

About 57.5% of the respondents highlighted inadequate inputs, such as fertilizer and seed, as their first constraint. Arimi *et al.*,2016) suggested that the use of fertilizer is the least sustainable technology under crop production due to the high cost of purchase. Similarly, (Garba *et al.*,*2017*) revealed that a lack of fertilizer was responsible for the reduction in most agricultural production through reduced hectares. From focus group discussions conducted by the researcher, it was revealed that the lack of inputs is due to nepotism, the government's short

supplies, and theft. Lack of inputs is detrimental to production as it results in low yields leading to reduced income and food insecurity.

4.6.2 High Labour Requirement

From the results obtained high labour requirement was discovered as the predicament facing smallholder farmers in attaining the government brought CSA technologies. Smallholder farmers face high labour requirements when adopting Pfumvudza because there use traditional tools for digging such as hoes and the whole process up to harvest. Similarly, it was found by the MoLAFWRD, 2018 that there is growing evidence that the labour demand of different CSA practises. However, innovative ways of improving access to affordable and appropriate mechanisation, such as equipment pooling and service provider models, have been shown to enhance adoption.

4.6.3 Market access

Lack of a reliable market was also the problem identified facing smallholder farmers. Smallholder farmers in Ward 11 face market challenges because of poor roads and infrastructure. This challenge was also founded by Ton, G. (2008) that agricultural markets are facilitated by institutional arrangements that effectively resolve the inherent tensions within groups as well as between farmers and other economic agents operating in urban areas where there is low transactional cost.

4.6.4 Limited training

Smallholder farmers revealed that the extension services they receive are not adequate to meet their needs. Farmers are still experiencing inadequate knowledge of fish farming techniques and urea stover treatment. It indicated that farmers are being trained mostly in Pfumvudza and Poultry and neglecting other technologies such as Urea stova treatment amongst others. These needs are important to farmers to apply and increase their output levels. About 35% of farmers in the study area were not accessing extension services, causing this challenge to negatively affect their production levels. Similarly, the findings concurred with Agholor *et al*. (2013) in their research concluded that extension services offered in developing countries have been deficient regarding accuracy, relevance, and applicability to farmers' problems.

4.7 Paired T-test on Analysis of CSA Intervention on Household Income

This analysis evaluates whether government intervention on Climate-Smart Agriculture (CSA) technologies significantly impacted household income. A paired samples t-test was used to compare the incomes of the same group of households before and after the CSA intervention. The annual income earned by the household was used for the paired T test from which income from yields sold, livestock sold and all produce sold by the farmers.

Hypotheses

Null Hypothesis (H_0): There is no difference in household income before and after adopting CSA technologies.

Alternative Hypothesis (H_1): Household income increased after adopting CSA technologies.

Significance Level (α): 0.05

Descriptive Statistics

Table 5

Metric	**Income Before CSA**	**Income After CSA**
Mean	565.19	1004.57
Standard Deviation	341.243	364.888
N (Sample Size)	105	105

The average household income increased by **439.38** units after CSA implementation. This suggests that there is a practical and economic significant change in income.

Paired Samples Correlation

Table 6

Correlation	**Value**
R	0.918
p-value	0.001

Incomes before and after CSA have a substantial positive association (r = 0.918), suggesting that while income patterns within families were relatively stable, they greatly improved after the intervention. The fact that the post-CSA income is greater than the pre-CSA income is confirmed by the negative mean difference. At 0.001, the p-value is significantly below the significance level of 0.05. This shows that the outcome is statistically significant, and the alternative hypothesis is accepted while the null hypothesis is rejected.

The analysis reveals that the government-supported CSA interventions, like Drip irrigation, Pfumvudza, and other interventions in the study, significantly raised household income. Statistically, a large mean difference (-439.38) and a very significant p-value (0.001) show strong evidence of impact; the nearly 78% increase in mean income (from 565.19 to 1004.57) indicates that CSA adoption is not only statistically significant but also economically transformative thus increasing access to CSA technologies should be prioritized in farming regions that are vulnerable to climate change and smallholder farmers who are vulnerable. The findings validated that government CSA interventions in Ward 11 of the Mt Darwin district are a tool for poverty reduction and climate resilience. On the balance, these results were similarly found by Arslan *et al.* (2015), who reviewed that a set of potentially climate-smart agricultural practices, including reduced tillage, crop rotation, and legume intercropping, combined with the use of improved seeds and inorganic fertilizer, increases income to farmers in Zambia.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary of the Key Findings

The study investigated the socio-economic effects of government interventions in CSA technologies on smallholder farmers in Ward 11, Mt District. The conclusion and recommendations are based on key issues that have arisen from the findings of the study. The whole study is built on three specific objectives that are identifying the government interventions on climate-smart agriculture, determining the household demographics of beneficiaries in government CSA interventions, and assessing the socio-economic benefits of government intervention in climate-smart agriculture in Ward 11, Mt Darwin District.

5.2. Conclusions

The study established that the majority of the respondents who are beneficiaries of government CSA technologies are female, whilst males constituted a small fraction. The majority of the farmers engaged in CSA activities are between the ages of 31-40 years. Most of the farmers have reached the primary level of education, and the average household size in the study area was 6-9 members. The majority of the smallholder farmers relied on farming as a source of income.

From the results obtained by the researcher, Pfumvudza is the most dominant government CSA technology adopted by the majority of people in the Mt Darwin district. Horticulture and fish farming are the second CSA technology, which is mostly practiced by women and youths in VBUs. Urea stover treatment is also a technology that is growing since is shows that it started in 2023, but has already been adopted by many farmers. However, small ruminants are the least with the government not directly involved, thus Non-Government Organisations are taking part in such technologies.

The results from thematic analysis indicated that increased market access, better resilience to drought, and women's inclusion are the benefits experienced by smallholder farmers through government intervention in CSA technologies. Moreover, from the FGDs conducted, it was reviewed that increased household incomes, food security, and nutrition are the most socio-

economic effects of government CSA interventions to beneficiaries in Ward 11. On the other hand, farmers gave specific recommendations regarding government interventions or support for CSA practices, such as a comprehensive farming package, early disbursement of farming inputs, and farming inclusion.

The findings from the study further revealed that apart from socio-economic benefits attained by smallholder farmers, there are challenges faced by beneficiaries during intervention and after. These predicaments include high labour requirements, market access, limited training, and lack of inputs.

Lastly, results from the paired T-test showed that there is a significantly raised household income. The annual income obtained before intervention and income after intervention showed a significant improvement in incomes since the government intervention in CSA technologies to smallholder farmers in Ward 11 of Mt Darwin District.

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5.3. Recommendations

Strengthen and Expand Government Interventions in CSA

Given the significance of climate-smart agriculture in enhancing resilience and productivity, the government should continue and expand its interventions in CSA technologies support programs in Ward 11. Interventions such as the provision of small grains, training, and subsidized inputs should be scaled up to reach more smallholder farmers.

Inclusion Interventions to Demographic Profiles

Findings from the study on household demographics suggest the need for age, gender, and education-sensitive CSA initiatives. For instance, government CSA programs should consider youth involvement strategies and farmer field schools for farmers with lower educational attainment to ensure inclusivity and effectiveness.

Enhance Farmer Training and Extension Services

To maximize the socio-economic benefits of CSA technologies, continuous farmer education is critical. The government of Zimbabwe should incentivise Agritex officers with sufficient

resources for effective extension services. Strengthening extension services, providing regular training workshops, and facilitating farmer-to-farmer knowledge sharing will help ensure effective adoption and utilization of CSA practices.

Facilitate Access to Markets and Finance

To sustain the socio-economic gains observed, interventions should be linked to broader rural development efforts. Farmers adopting CSA technologies should be supported with improved access to markets, credit facilities, and value chain development to enhance their income and long-term sustainability.

Monitoring and Evaluation of CSA Programs Regularly

There should be regular monitoring and evaluation of CSA initiatives to assess their effectiveness, capture lessons learned, and make evidence-based policies. Monitoring should be done in all areas, including marginalised areas as Ward 11. The participatory approaches involving local farmers in feedback mechanisms can improve the relevance and impact of interventions.

Promote Multi-Stakeholder Collaboration

The government should collaborate with non-governmental organizations, private sector actors, and research institutions to leverage resources, knowledge, and innovative solutions. Such partnerships can enhance the reach and quality of CSA programs in Ward 11 and beyond.

5.4. Study Limitations and Suggestions for Future Research

Study Limitations

Geographical Scope

The study was conducted in Ward 11 of Mt Darwin District; this may limit generalizability to other findings in other wards or districts with different ecological zones, socio-economic, and policy environments.

Time Constraints

Due to limited time for data collection and analysis, the researcher may not fully capture the long-term effects of government CSA interventions, especially those whose benefits manifest gradually over multiple farming seasons, like small ruminants.

Focus on Government Interventions Only

The study exclusively focused on government-driven CSA initiatives; hence need to overlook the influence of non-governmental actors, private input suppliers, or informal knowledge systems that also play a role in farmers' adoption of CSA practices.

5.5 Suggestions for Future Research

Future research should expand beyond Ward 11 to include comparative studies across multiple wards or districts within Mt Darwin or other regions in Zimbabwe. Thus, ideal in determining whether the socio-economic effects of government CSA interventions are consistent or vary across different geographic locations.

While this study focused on government interventions, further research could investigate the contributions and impacts of NGOs, community-based organizations, and private sector partners in promoting CSA in rural communities.

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APPENDICES

INTERVEIW GUIDE ON THE EFFECTS OF GOVERNMENTS INTERVENTION ON CLIMATE SMART AGRICULTURE TECHNOLOGIES IN MT DARWIN DISTRICT

My name is Derera Fortune; I am a student pursuing a BSc Honours Degree in Agricultural Economics and Management at Bindura University of Science Education. I am undertaking a study analysing the effects of governments intervention in climate smart agriculture technologies in Mt Darwin district Mashonaland central Zimbabwe.

NOTE

- The information collected by use of this questionnaire is strictly for academic purposes and should be accorded high confidentiality.
- The respondent should be the one who makes major decisions on the plot that is household head, spouse or fellow of the household.

Date……

SECTION A

1. **SECTION A: HOUSEHOLD DEMOGRAPHIC INFORMATION/ CHARACTERISTICS**

1.Sex of household head			1. Male 1☐	Female 2 ☐	
2. Age of household head	18-30yrs 1☐	31-40yrs 2☐	41-50yrs 3☐	51-60yrs 4☐	60+yrs 5☐
3. Marital status of household head	Single 1☐	married 2☐	Widowed 3☐	Divorced/ separation 4☐	

4. Household head's level of education						
Primary 1☐	Secondary 2☐	Certificate 3☐	Diploma 4☐	Degree 5☐	Other (specify)……	

5What is your household size?			
Less than 5 1☐	6-9 2☐	10-12 3☐	above 12 4☐
Main occupation of household head	**1** ☐ farming only	**2** ☐ farming and other jobs	**3** ☐ formal job

6. Source of income of the household head	1 ☐ Livestock sales	2☐ farming	3☐ off-farm employment	4☐ other specify

SECTION B

Section B: Government Interventions in Climate-Smart Agriculture (CSA)

7. Are you aware of any government-supported CSA technologies in your ward?

   (1)Yes ☐(2)No☐

8. Which of the following CSA technologies have you received through government support? (Select all that apply)

(1)☐ Pfumvudza 2)☐ Poulty3 ☐ Small ruminant 4☐ Urea stova treatment 5☐Drip Irrigation
6☐ Horticulture and fish farming _____

9. How did you access these government interventions?

(1)☐ Direct government support 2)☐ NGO partnerships 3 ☐ Farmer groups
4☐ Other (specify): _____

10. How long have you been using the CSA technologies introduced through government support?

(1)☐ Less than 1 year 2)☐ 1–2 years 3)☐ 3–5 years 4)☐ More than 5 years

Section C: Effects of CSA Technologies on Household Welfare

11. Has your household income changed since adopting CSA technologies?

(1)☐ Increased (2)☐ Remained the same (3)☐ Decreased

12. If income increased, estimate the percentage of increase:

(1)☐ Less than 10% (2)☐ 10%–30% (3)☐ 31%–50% (4)☐ More than 50%

13. How has your household food security changed due to CSA practices?

(1)☐ Greatly improved (2)☐ Slightly improved (3)☐ No change (4)☐ Worsened

14. Which seasons do you now have food available due to CSA adoption? (Tick all that apply)

(1)☐ Rainy season (2)☐ Dry season (3)☐ All year round

Section D: Socio-Economic Benefits of Government CSA Interventions

15. What benefits have you experienced due to government CSA programs? (Tick all that apply)

(1)☐ Increased yields (2)☐ Reduced production costs (3)☐ Improved knowledge and skills (4)☐ Better resilience to drought (5)☐ Increased market access (6) ☐infrastructure development (7)☐ food security and nutrition

16. Do you feel more economically stable as a result of participating in CSA programs?

(1)☐ Yes (2)☐ No

17. Have CSA interventions improved your participation in community development initiatives?

(1)☐ Yes (2)☐ No

18. What challenges do you face in adopting CSA technologies?

(1)☐ Lack of inputs (2)☐ Limited training (3)☐ High labor requirements (4)☐ Market access (5)☐ Other: _____

Fig 4a

Fig 4b

Fig 4c

Fig 4d

Fig 4e

Variable	Category	Frequency	Percentage	Valid percentage	Cumulative percentage
Sex	Male	35	33.3	33.3	33.3
	Female	70	66.7	66.7	100
	Total	**105**	**100**	**100**	
Age	18-30yrs	6	5.7	5.7	5.7
	31-40yrs	38	36.2	36.2	41.9
	41-50yrs	33	31.4	31.4	73.3
	51-60yrs	24	22.9	22.9	96.2
	60+yrs	4	3.8	3.8	100
	Total	**105**	**100**	**100**	
Education	Primary	50	47.6	47.6	47.6
	Secondary	40	38.1	38.1	85.7
	Certificate	12	11.4	11.4	97.1
	Diploma	3	2.9	2.9	100
	Total	**105**	**100**	**100**	

Size	Less than 5	17	16.2	16.2	16.2
	6_9	47	44.8	44.8	61
	10_12	22	21	21	81.9
	above 12	19	18.1	18.1	100
	Total	**105**	**100**	**100**	
Source of income	Farming only	67	63.8	63.8	63.8
	Formal	9	8.6	8.6	72.4
	Farming and other jobs	29	27.6	27.6	100
	Total	**105**	**100**	**100**	

Source: Surveys results (2025)

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	INCOME BEFORE CSA	565.19	105	341.243	33.302
	INCOME AFTER CSA	1004.57	105	364.888	35.609

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	INCOME BEFORE CSA & INCOME AFTER CSA	105	.918	.001

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	50% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	INCOME BEFORE CSA - INCOME AFTER CSA	-439.381	145.155	14.166	-448.969	-429.793	-31.017	104	.001

Thank you for your time

Focus Group Discussion (FGD) Guide

Study Title: *The Socio-Economic Effects of Government Intervention in Climate Smart Agriculture among Smallholder Farmers in Ward 11, Mt Darwin District, Zimbabwe*

Facilitator: Fortune Derera

Date: _____

Venue: _____

Participants: 6–10 smallholder farmers (mixed by gender, age, CSA participation status)

Duration: 1.5 to 2 hours

Introduction (To be read aloud by facilitator)

Note that:

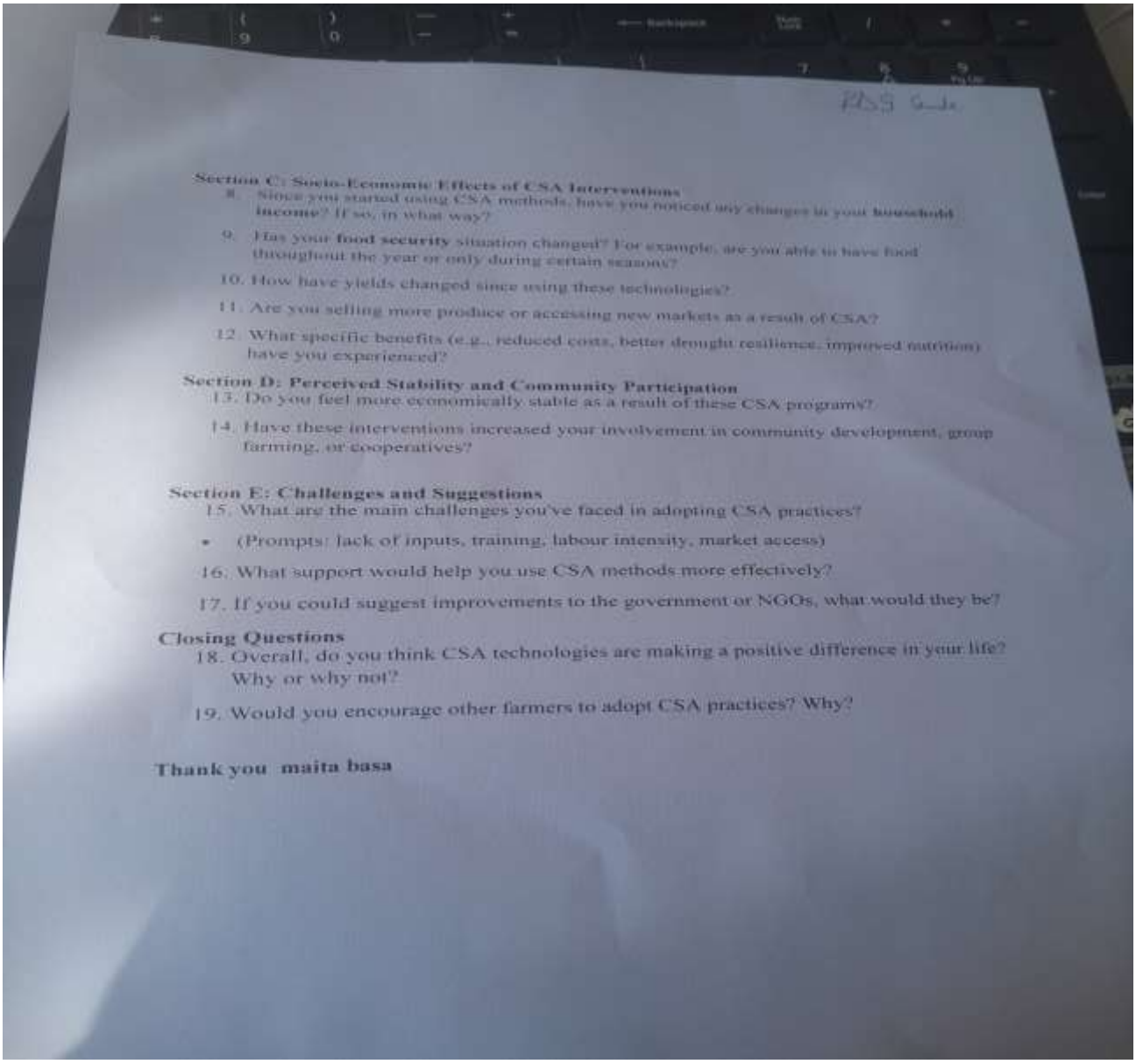
1. This discussion is confidential and will be used only for academic purposes.
2. Please feel free to share your experiences, thoughts, and suggestions.
3. There are no right or wrong answers. Your input is very valuable.

Section A: Opening and Demographic Questions (Warm-up)

1. Can each of you briefly introduce yourself—your name, age range, household size, and how long you've been involved in farming?
2. What is your main source of income (e.g., farming, livestock sales, off-farm employment)?

Section B: Government CSA Intervention Activities

3. Are you aware of any climate-smart agriculture technologies promoted by the government in this area?
4. Which CSA practices have you received or heard about (e.g., Pfumvudza, drip irrigation, small livestock, Urea treatment, etc.)?
5. How were you introduced to these practices? Through government extension officers, NGOs, farmer groups, or another source?
6. For how long have you been practicing these CSA methods?
7. Do you feel the government and its partners are doing enough to promote these practices? What more should they be doing?



Section C: Socio-Economic Effects of CSA Interventions

8. Since you started using CSA methods, have you noticed any changes in your **household income**? If so, in what way?
9. Has your **food security** situation changed? For example, are you able to have food throughout the year or only during certain seasons?
10. How have yields changed since using these technologies?
11. Are you selling more produce or accessing new markets as a result of CSA?
12. What specific benefits (e.g., reduced costs, better drought resilience, improved nutrition) have you experienced?

Section D: Perceived Stability and Community Participation

13. Do you feel more economically stable as a result of these CSA programs?
14. Have these interventions increased your involvement in community development, group farming, or cooperatives?

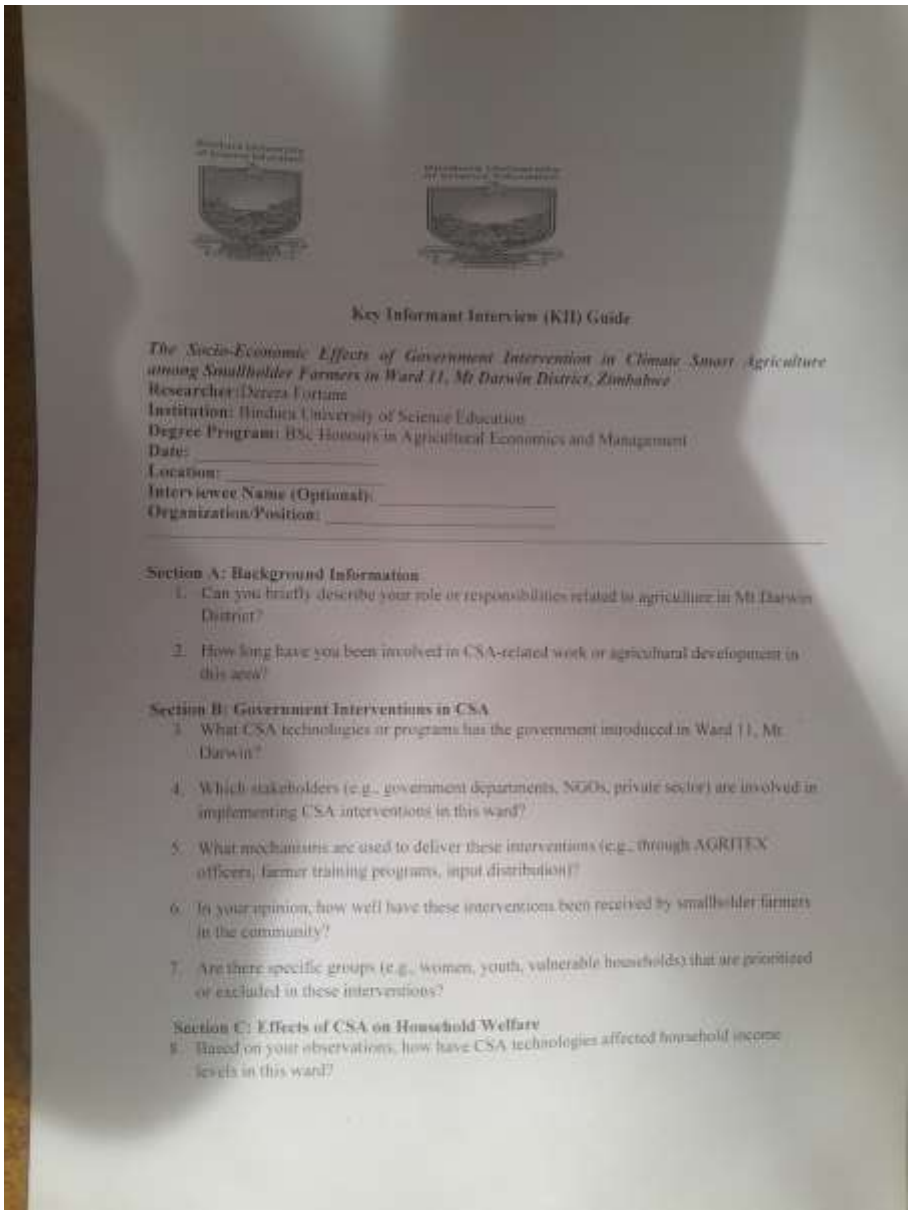
Section E: Challenges and Suggestions

15. What are the main challenges you've faced in adopting CSA practices?
    - (Prompts: lack of inputs, training, labour intensity, market access)
16. What support would help you use CSA methods more effectively?
17. If you could suggest improvements to the government or NGOs, what would they be?

Closing Questions

18. Overall, do you think CSA technologies are making a positive difference in your life? Why or why not?
19. Would you encourage other farmers to adopt CSA practices? Why?

Thank you maita basa



Key Informant Interview (KII) Guide

The Socio-Economic Effects of Government Intervention in Climate Smart Agriculture among Smallholder Farmers in Ward 11, Mt Darwin District, Zimbabwe

Researcher: Dzeza Fortune
Institution: Hinduru University of Science Education
Degree Program: BSc Honours in Agricultural Economics and Management
Date: _____
Location: _____
Interviewee Name (Optional): _____
Organization/Position: _____

Section A: Background Information

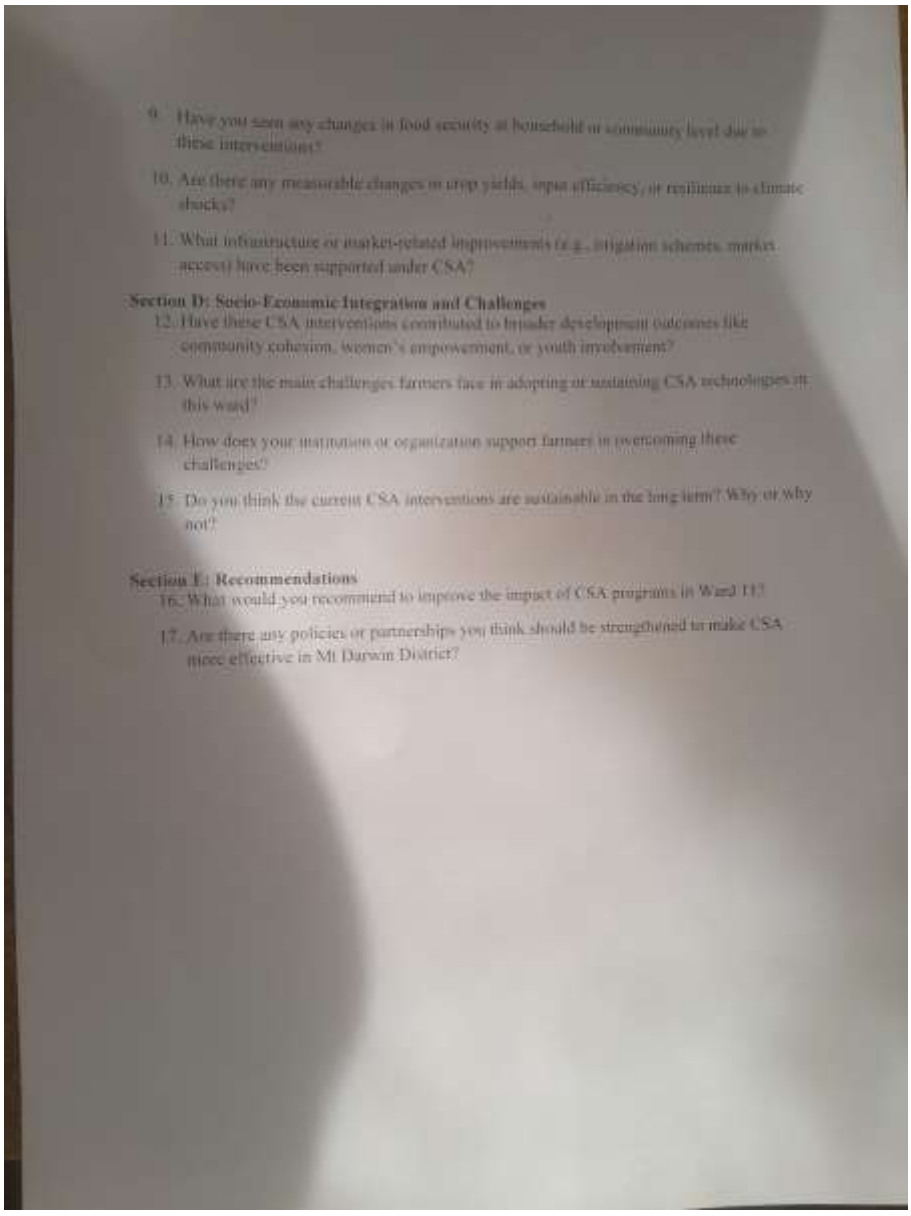
1. Can you briefly describe your role or responsibilities related to agriculture in Mt Darwin District?
2. How long have you been involved in CSA-related work or agricultural development in this area?

Section B: Government Interventions in CSA

3. What CSA technologies or programs has the government introduced in Ward 11, Mt Darwin?
4. Which stakeholders (e.g., government departments, NGOs, private sector) are involved in implementing CSA interventions in this ward?
5. What mechanisms are used to deliver these interventions (e.g., through AGRITEX officers, farmer training programs, input distribution)?
6. In your opinion, how well have these interventions been received by smallholder farmers in the community?
7. Are there specific groups (e.g., women, youth, vulnerable households) that are prioritized or excluded in these interventions?

Section C: Effects of CSA on Household Welfare

8. Based on your observations, how have CSA technologies affected household income levels in this ward?



9. Have you seen any changes in food security at household or community level due to these interventions?
10. Are there any measurable changes in crop yields, input efficiency, or resilience to climate shocks?
11. What infrastructure or market-related improvements (e.g., irrigation schemes, market access) have been supported under CSA?

Section D: Socio-Economic Integration and Challenges

12. Have these CSA interventions contributed to broader development outcomes like community cohesion, women's empowerment, or youth involvement?
13. What are the main challenges farmers face in adopting or sustaining CSA technologies in this ward?
14. How does your institution or organization support farmers in overcoming these challenges?
15. Do you think the current CSA interventions are sustainable in the long term? Why or why not?

Section E: Recommendations

16. What would you recommend to improve the impact of CSA programs in Ward 11?
17. Are there any policies or partnerships you think should be strengthened to make CSA more effective in Mt Darwin District?