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DEPARTMENT OF AGRICULTURAL ECONOMICS, EDUCATION AND EXTENSION

A Socio-Economic Analysis Of The Use Of Drip Irrigation Kits In Smallholder Tomato Production

A case of Marondera District ward 15 Chidanga irrigation scheme

Bindura University of Science Education

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A DISSERTATION SUBMITTED TO BINDURA UNIVERSITY OF SCIENCE EDUCATION IN PARTIAL FULFILLMENT OF THE REQUIREMENTS OF THE BACHELOR OF AGRICULTURAL SCIENCE HONOURS DEGREE IN AGRICULTURAL ECONOMICS AND MANAGEMENT.

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DEDICATION

The following dissertation is dedicated to my parent Mr and Mrs Magora, my siblings, Augustine Madzokere, Mr Masvikeni, Fortunate Mijeri and the rest of my classmates. May the almighty richly bless you all, thank you for all your support.

DECLARATION

By signing below, I certify that the research project "Socio-economic Analysis on the use of drip irrigation by small holder tomato farmers" is authentic and true. I've submitted A Case of Chidanga Irrigation Scheme, Marondera District, to the Department of Agricultural Economics, Education, and Extension at Bindura University of Science Education in an effort to partially fulfil the requirements for the award of the Bachelor of Agricultural Science Honours Degree in Agricultural Economics and Management. For the purpose of awarding a degree or certification, no institution or institute has acknowledged the dissertation's conclusions.

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ABSTRACT

Drip irrigation systems is seen the solution to several challenges of dry land cultivation and increasing the output of irrigated cultivation. Most smallholder farmers in Zimbabwe lack access to established commercial markets due to a lack of or restricted access to knowledge, resources, and institutions that can help smallholder farmers produce for formal markets. The major objective of the study, was to evaluate the socio economic factors that affect the use of drip irrigation by small holder farmers. The study also focused on three specific objectives which are, to establish the prevalence of drip irrigation in Marondera District ward 15, to identify key determinants that influence the uptake of drip irrigation and to determine the socio economic effects that affect profitability of tomatoes under drip irrigation.

Primary data was collected using structured questionnaires from 40 randomly selected small holder tomato farmers. Secondary data was collected using journals, books and articles. Qualitative data was analysed using descriptive statistics such as frequencies, percentiles and means and this was done using SPSS. The majority of the respondents were female and attained up to tertiary level. The demographic characteristics that was questioned were marital status, level of education, age as well as gender an

The factors influencing the farmer's decision to use drip irrigation were examined using binary logistic regression analysis model. The prevalence of drip irrigation by the small holder tomato farmers was calculated using a formula. The findings showed that drip irrigation is the most prevalent type of irrigation in Chidanga Marondera District and the main issue facing these tomato farmers is shortage of water as well as access to market information. The decision of a farmer to use drip irrigation was found to be significantly influenced by source of water, area covered under drip irrigation, availability to extension services, and educational level. In light of these findings, it was determined that small holder farmers need to have access to market information so that they will yield more profits thereby alleviating poverty and upgrading living standards.

It was recommended that the small holder farmers should engage in other farm activities such as cattle rearing so that they will be able to boost the project of tomatoes. Recommendations were also given to the policy makers as well as for further researches

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CHAPTER ONE

1.1 BACKGROUND OF THE STUDY.

There are 13 million people living in Zimbabwe, a small nation in southern Africa, and 7.1 million of them depend on agriculture for a living. Milk, vegetables, meat, beans, maize, groundnuts, grains, and legumes are mostly produced. The few large commercial farmers with the best agricultural land cultivate cash crops like tobacco, cotton, and flowers. 40% of exports and 70% of the population's income come from agriculture.

The economy recently collapsed, causing chaos across all industries. Depending on how employment is defined, the unemployment rate is pegged at 90%. (Mlambo 2017, BBC 2017).

Despite the fact that the potential of small holder tomato farmers is frequently underutilized, smallholder farmers form the backbone of many African economies. The term "smallholder farmer" can mean many different things depending on the situation, the nation, and even the biological zone. The terms "smallholder," "small-scale," "resource-poor," and occasionally "peasant farmer" are frequently used interchangeably. Smallholder, in general, only refers to their sparse resource endowment in comparison to other farmers in the sector. Smallholder farmers are also those who cultivate one or more income crops and one or more subsistence crops on tiny pieces of land, primarily using family labour (Kay and Brabben 2000). One of the primary characteristics of smallholder farmers' production systems is their use of rudimentary, antiquated technologies, low returns, and significant seasonal labour changes and the importance of women in production. Individual traits, farm size, resource allocation between food and cash crops, livestock, and off-farm activities, usage of external inputs and hired labour, the proportion of food crops sold, and household spending patterns vary among smallholder farmers (FAO 2000).

Smallholder farmers have a significant impact on the establishment of rural poor people's lives. Despite the fact that smallholder farming is crucial for ensuring household food security, its productivity is rather low. In order to assure long-term food security, smallholder farmers must dramatically boost their productivity. This can be done, for example, by enticing smallholder farmers to pursue sustainable intensification of output through better inputs, or, in the instance of tomato production, by enticing them to use drip irrigation to combat climate change.

The Solanaceae family, which also contains peppers and eggplant, includes tomatoes, which are the most widely cultivated produce in southern Africa. Although it is grown as an annual crop, tomatoes are essentially perennial plants that are regarded to be delicate warm season crops. This type of vegetable needs an appropriate water supply to survive; otherwise, the plant will wilt. It is susceptible to frost and won't grow continuously outside in most regions of the country. The International Panel on Climate Change (IPCC) report states that throughout the past 100 years (1906–2005), the average global surface temperature has increased by 0.74°C (Rosenzweig et al., 2007). The average rate of global warming is therefore currently fluctuating.

The rate of warming during the past 50 years has increased by about double compared to the last 100 years. Climate change has the potential to make a number of Zimbabwe's water problems worse, such as supply shortages and declining groundwater levels. Through the incorporation of sustainable water development and management into national strategies, the World Bank Group collaborated with the government to address climate challenges and their effects on the availability of water. Because of the extreme temperatures we have been experiencing worldwide, many water basins have dried up, necessitating the installation of irrigation facilities for small-scale tomato farmers.

Because of this problem of climate change, irrigation is necessary in Marondera to provide reliable quantities of high-quality tomatoes. Significant irrigation began in Mutare, Zimbabwe, where water was channelled from the Odzani River which then irrigated 1 900ha. Around 1990, private farms accounted for about 80% of irrigated land, followed by Arda schemes with 15% and public communal schemes with 5%. Sprinklers currently cover around 34 of the total irrigated area, including some communal and low-veld-common surface projects. Despite being a relatively recent concept, drip irrigation is gaining popularity in the horticultural sectors and also sectors in floriculture. Tomatoes are frequently produced in sandy soils with little water holding capacity, and rainfall amounts are frequently unpredictable during the growing season. Due to a number of circumstances, commercial tomato cultivation demands additional irrigation. Studies on irrigation in the Southeast demonstrate that, compared to dry land cultivation, irrigation significantly boosts annual tomato yields by at least 60%. Tomato quality grown with irrigation is also substantially higher. Crop losses caused by extreme drought are eliminated by irrigation. Sun scalding, dry rot, and flower and young fruit loss are all symptoms of moisture stress in tomatoes. The stages of transplanting, flowering, and fruit development require the most watering. Several

irrigation techniques, including micro-irrigation, also known as localized, and drip irrigation, can be utilized successfully on tomatoes in the southeast.

1.2 PROBLEM STATEMENT

The issue of food security is now a global one. By 2050, the demand for food, fuel, and fibre will have increased by 70%. (FAO, 2009). Due to the tiny incomes earned by most smallholder farmers in Zimbabwe, the issue of food insecurity and poverty has been brought on by the problem of climate change. According to several research, the demand for tomatoes and tomato-related products will rise over the next three to four decades due to population expansion, income development, and urbanization (Capper, 2013; Thornton, 2010; Smith et al., 2013b). Other obstacles include a lack of money, inadequate infrastructure, education, and knowledge on how to set up and use irrigation kits as well as ways to lessen climate change's consequences, which may be the reason for the food insecurity.

The government will give priority to the communities and small-scale farmers who were harmed when the Muchekeranwa dam was built in the Marondera district this year. At the moment, the dam is at its full capacity and is already spilling. The first irrigation area will be 70 ha, and more hectares will be added progressively.

Irrigated agriculture contributes significantly to improved livelihoods and global food security, particularly in Africa. Due to climate change, precipitation has decreased and weather patterns have fluctuated more, which has a negative impact on dry land rain fed agriculture (Kurukulasuriya and Mendelsohn, 2006).. In order to combat climate uncertainty and increase agricultural productivity, irrigation development has received widespread recognition (Alawa et al., 2014). Farmers must, however, employ some climate-adapted practices, such as drip irrigation. Investments in water storage are becoming more and more important due to climate change and the uncertainties it causes in rain-fed agriculture (Mongi et al., 2019). This makes irrigation in Zimbabwe a crucial alternative for achieving food security and reducing poverty, particularly in this time of global food crises.

Despite the advantages and importance of drip irrigation to farmers' lifestyles, smallholder farmers in Zimbabwe do not favour it because it is expensive to install as well as to maintain thus droughts are becoming more common, and many people have experienced famine and hunger on numerous occasions. In order to increase the food security of the rural community and to lessen reliance on the unpredictable rains, the government of Zimbabwe has been launching and implementing drip irrigation projects in conjunction with non-governmental

organizations and in the case of Marondera ward 15 world vision was the non-governmental organisation. Drip irrigation uses the least amount of water while increasing crop output, quality, and farmer income. However, smallholder farmers are still slow to adopt drip irrigation, and those who tend to use drip irrigation will either stick with it for one season or stop using it altogether. However, there is still poor adoption rate of drip irrigation among smallholder farmers, and those who do embrace it either utilize it for one season or abandon it altogether.

However, the goal of this study was to determine why small-holder farmers in Zimbabwe, specifically Marondera District have a small rate of adoption and why other farmers are not even adopting it at all. More specifically, the study aims to clearly highlight the socioeconomic analysis of the usage of drip irrigation systems in small-scale tomato production. It is necessary to pinpoint and look into the factors that contribute to the limited adoption of drip irrigation by smallholder farmers in Zimbabwe, Marondera district.

1.3 OBJECTIVES

1.3.1 Main Objectives

The main objective of this study is to undertake the socio-economic analysis of the use of drip irrigation kits in small holder tomato production in Marondera District.

1.3.2Specific objectives

(1)To establish the prevalence of drip irrigation in Marondera District.

(2) To identify key determinants that influence the uptake of drip irrigation

(3) To determine the socio economic factors affecting profitability of tomatoes under drip irrigation.

1.4 Research questions

(1)What is the rate of prevalence of drip irrigation by small holder tomato farmers in Marondera district?

(2) What are the determinants that influence the uptake of drip irrigation kits by small holder tomato farmers in Marondera?

(3) What are the socio economic factors affecting profitability of tomato production under drip irrigation in Marondera district?

1.5 Research hypotheses

Ho Small holder tomato farmers see drip irrigation as costly to install that why its uptake is still low.

Ho There are determinants that influence the uptake of drip irrigation kits by small holder tomato farmers in Marondera such as level of education of the small holder farmers.

Ho There are complementary services such as extension services to increase uptake of drip irrigation by small holder farmers.

Ho There are a number of constrains faced by farmers using drip irrigation kits.

Ho Education level, age, gender, garden size and irrigation system significantly affect adoption of drip irrigation positively.

1.6 Significance of study

Production of tomatoes is regarded as a crucial socio-economic change instrument in rural areas. It has been that this study would highlight the present issues smallholder tomato growers are facing and provide solutions for the identified socio-economic constraints in order to increase smallholder farmer's profitability and this will assist farmers in understanding the benefits of tomato farming and may inspire them to experiment with drip irrigation on their tomato crop in order to overcome their skepticism about agriculture, improve farmers' livelihoods and increase food security as well as the supply of tomatoes and tomato-related products to the country.

Scope and limitation of the study

There are a lot of limitations that are centred on the issue of the use of drip irrigation like the issue of drip irrigation being expensive. The study only focused on Chidanga area in Marondera district and not the whole province due to some factors such as lack of finance

1.7 Overview of the research field

Marondera, in Mashonaland East, Zimbabwe, is a city that was formerly known as Marandellas and is situated about 72 kilometers east of Harare.. The first usage of it by British colonialists during the colonization of Zimbabwe was as a rest stop en route to Harare. The town was later destroyed during the 1896 Shona uprising and relocated 4 miles (6 km) north to the Beira-Bulawayo railway line.

According to Köppen Cwb, Marondera, which is located on the highveld plateau, has a subtropical highland climate. The city has a sunny climate, with warm to hot days in the summer (October to April), followed by afternoon thunderstorms and cool evenings, and dry, sunny days in the winter (May to September) and followed by chilly nights. Due to the city's high elevation, temperatures are often quite mild, with an average maximum daytime temperature of 25.6 °C (78.1 °F) in January and an average maximum of roughly 16 °C (61 °F) in June. The sunniest season of the year is winter, which features pleasant days and chilly nights with lows of 5 °C (39.4 °F) in June and July. Occasionally, the temperature falls below freezing at night causing frost.

Wintertime cold fronts frequently pass across the city, bringing with them cool southerly breezes but also gloomy sky. The 850 millimetres of rain that fall on average each year are primarily concentrated in the summer. Throughout the year, especially in the spring, there may be sporadic showers.

Organisation of the study

The study is divided into five chapters. The first chapters contains the introduction, background of the study as well as the problem statement. The second chapter has literature review. The third chapter contains the methods employed in the study (methodology). Chapter four has the presentation of data and interpretation. Chapter 5 includes conclusion and recommendations.

1.8 Chapter Overview

The study's background information, the problem statement, and the study's goals have all been covered in this chapter. The significance of the study, as well as its restrictions and boundaries, were also discussed. The purpose of the study is further explained, along with the main points on which the investigation will concentrate.

CHAPTER TWO

Literature Review

2.1 Introduction

The goal of this grounded research project, which combines qualitative and quantitative methods, is to determine the socioeconomic analysis of the usage of drip irrigation kits in small-scale tomato production. This chapter's major goals are to provide an overview of how small-scale tomato farmers in Marondera have used drip irrigation and to analyze the socioeconomic factors that have an impact on their decision to do so. This chapter also examines literature reviews on the socio-economic barriers that small-scale tomato farmers faced in using drip irrigation.

Overview of Drip irrigation

Land and water represent the country's fundamental needs for agriculture and economic growth. By 2025, 1/3 of the world's population will face total water shortage. Agriculture consumes over eighty percentage of the exploitable water supplies of the world. The global productivity of the agricultural sector & the expected rate of development in GDP entirely rely primarily on the sagacious utilize of the obtainable water supplies. Therefore, this Micro Irrigation scheme which aim to increase the region under the efficient irrigation techniques via irrigation by Drip technique. Drip irrigation is the effective way of delivering irrigation of water directly to soil in the plant's root areas, reducing typical mislaying such as soil erosion, deep percolation and runoff. This also permits fertilizers, nutrients, & other water-soluble substances to be used along with irrigation water, leading to higher yields and improved production results. Drip irrigation systems is seen as the solution to several challenges of dry land cultivation and increasing the output of irrigated cultivation. In view of all these, the present research was planned to research the degree of advantages obtained from drip irrigation in horticultural crops and to recognize the constraints faced by farmers in the adoption of the drip irrigation in horticultural crops.

2.2 History on the use of drip irrigation kits in Zimbabwe

In Zimbabwe, dry or semi-arid regions make up about 80% of the country's agricultural land (Jacobs, Chitima, Klooster, & Bwanali, 2013). Zimbabwe is classified into five agro-ecological zones known as natural regions (NR) based on the amount of growing days per season and the rainfall pattern (Bird, Shepherd, Scott, & Butaumocho, 2002; Vincent & Thomas, 1961) . The semi-arid regions of Zimbabwe are categorized as NR III, IV, and V. In these areas, semi-extensive (NR III and IV) and extensive (NR V) farming is advised (Bird et

al., 2002). Due to the unpredictable and intermittent nature of rainfall in arid and semi-arid areas, supplemental irrigation is required for productive agriculture. As a result, irrigation helps farmers develop crops by acting as a mitigating tool against mid-season dry spells and droughts and dry spells in the middle of the growing season, which allow irrigators to extend the growing season and increase production. The government of Zimbabwe wants to develop irrigation systems in order to increase crop production and ensure food security (Chazovachii, 2012; Jacobs et al., 2013).

According to Nyagumbo and Mugabe, Zimbabwe has developed a number of water-saving technology for dry land crop production. There aren't many water-saving methods for gardening, despite the fact that farmers spend more time irrigating and there is more water lost to evaporation. To conserve water for vegetable production, low head drip irrigation systems have been introduced. Distribution of the kits was intended to increase gardening activities and raise household nutrition and food security. As part of continuous humanitarian relief efforts, over 70 000 low-cost, low-head drip irrigation kits have been provided to households throughout Zimbabwe's rural districts since 2002 up to date

Nevertheless, new insights from Asia, Namara and Company. (2005) Zimbabwe and Polak and Yoder, 2006. Concerns about the suitability of drip kits as a component of humanitarian aid programs were discussed in detail by Moyo et al. in 2006. The drip kits in India, along with other technology geared toward the poor, were funded and not distributed for free.

According to Maisiri et al. (2011), Moyo et al. (2020), Rohrbach et al. (2013), and IWMI, Zimbabwe's experiences with drip irrigation kits, especially those supplied as part of drought relief initiatives, are relatively extensively documented. Technical comparison of the effectiveness of inexpensive drip irrigation with traditional irrigation.

(Brassica napus) research demonstrated that despite the fact that drip irrigation did save more than 50% of the water used, there were no appreciable yield differences or labor advantages because farmers manually filled the drip drums. A variety of NGOs' drip kit projects were evaluated by Moyo et al. in 2006, and they came to the conclusion that they were underperforming because a number of prerequisites were not satisfied, most significantly consistent access to a water source. Their key discovery was the unsustainable nature of the cheap drip irrigation equipment offered as part of emergency relief initiatives. In a study that encompassed Zimbabwe and Eastern and Western India as well as Zimbabwe, Namara et al

(2006) analyzed bucket and drum drip irrigation kits and came to the conclusion that farmers' gains in Zimbabwe's current macroeconomic conditions tend to be limited.

2.3 SMALL HOLDER FARMERS

Smallholder farmers vary in terms of their personal characteristics, farm size, resource allocation between food and cash crops, livestock, off-farm activities, use of external inputs and hired labour, percentage of food crops sold, and family spending patterns (Pienaar and Traub 2015; Khapayi and Celliers 2016). (Baloyi 2010) uses farm size as the most prevalent indicator of smallholder farmers. According to (Hazel et al., 2007), smallholder farmers are those who rely mostly on household members for labour or those whose primary goal is to produce the majority of the household's staple food needs. Other academics place a strong emphasis on the fact that smallholder farmers have access to scarce resources including land, capital, labour, and skills. According to the Rural Development Strategy of the World Bank, smallholder farmers work on less than two acres of cropland and have a modest asset base (World Bank, 2017). Smallholder farmers have lower resource endowments than other farmers in the industry, according to Jagwe et al. (2010). Combining these categories in relation to this study, smallholder tomato farmers are defined as those who have only a maximum of 0, 5 ha of arable land, which also results in confined yields for a single farmer to meet specific market demands.

2.4 TOMATOES

Warm-season crops like tomatoes are delicate, adore the sun, and can't withstand frost. It is crucial to avoid planting seeds too early. Except in zone 10, where tomatoes are a fall and winter crop, the soil is typically not warm enough to plant tomatoes outdoors until late spring or early summer. According to Werinporn and Geoffrey Savage (2022), one of the most economically and nutritionally significant crops in the world is the tomato. Tomatoes are negatively impacted by drought stress and need a lot of water to grow successfully. The physio-chemical properties of commercial tomatoes grown under water stress have, however, only been studied in a small number of research.

Challenges faced by the drip irrigation farmers

A challenges faced by the farmers had the issue of the un-availability of standard products, no follow-up service rendered by the drip agents, higher starting investment costs, and lacks of

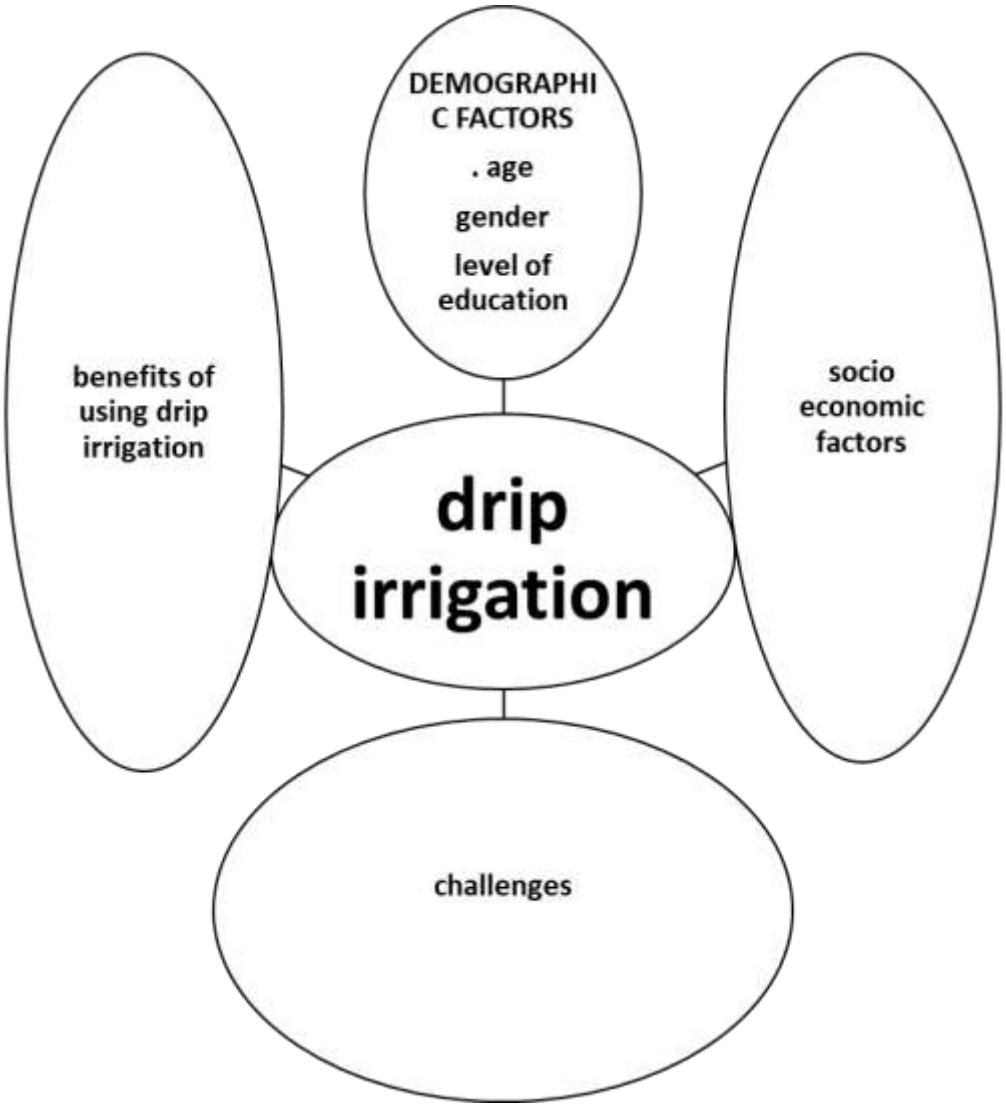
funds to cover the full investments under drip irrigation & delay in loan penalties, leakage in new drip process.

The advantages faced by the farmers are water-saving, standardized implementation & simple irrigation system, & the restrictions are the issues of the non-availability of quality content & the shortage of drip agent follow-u facilities. From the report, it is clear that the drip irrigation companies, funding organizations and others have sufficient model spare parts and other necessary steps to ensure a suitable situation for proper implementation of the drip irrigation systems.

The findings showed that the majority of gout irrigation farmers had reported benefits such as water savings, labor cost savings for irrigation, improved yields, energy savings, labor savings, improved product quality, reduced weed production, expanded product self-life and standardized energy distribution. The challenges faced by the farmers had problems with the non-availability of good material, no drip agency follow-up facilities, high initial expenditure costs, lacks of funds to finance full holdings under drip irrigation, delay in loan penalties, and leakage in the new drip scheme.

2.5 Conceptual framework

The tomato is one of the most important crops in New Zealand and the rest of the world, both commercially and nutritionally. Due to their high water requirements, tomatoes are badly harmed by drought stress. However, just a few research studies have examined the physicochemical characteristics of commercial tomatoes grown under water stress.



2.6 Drip kit irrigation system

According to Van Leeuwen, the effective use of water is considered to be essential for crop and vegetable production in arid and semi-arid regions of sub-Saharan Africa (2002). This is mostly true due to rising populations, increased need for food production, and growing water competition. By improving agricultural output per unit of land and water and increasing cropping intensity by growing a crop during the dry season, drip irrigation gives smallholder farmers a way to get the most out of their fields. According to Polak and Yoder (2006), drip irrigation systems are typically employed for commercial crops (vegetables and fruits). Some regions of Africa use small-scale drip irrigation systems; for instance, Rohrbach claims that Chapin bucket kits are used in Kenya, Tanzania, Malawi, Zambia, and Uganda (2006).

Although a few kits are in use in Kenya and Tanzania, the water boys bucket has primarily been employed in Uganda. Drip irrigation methods have reportedly been employed successfully by resource-constrained farmers in other parts of the world, such as India. Most small-scale drip irrigation systems work with low pressure, typically between 1 and 5 m head.

2.6.1 Economic importance of drip irrigation

The majority of tomatoes are cultivated in Zimbabwe and are a significant vegetable crop. In the research area, which is located in the province of Masvingo, water is a constraining issue for tomato production. Currently, bucket and furrow irrigation are the most used techniques, although drip irrigation is gaining popularity due to its inherent benefits. Therefore, tomato producers can benefit from a socioeconomic analysis of drip kits in order to make wise judgments about their drip irrigation investments. A prior ten-year study in Turkey comparing the yield of olive production under drip irrigation to furrow irrigation revealed a difference of 1.2 tons/ha (57%) in favor of drip irrigation (3.3 tons/ha under drip and 2.1 tons/ha under furrow irrigation), according to Cetin, B. et al. (2004). Given the increased yield brought about by drip irrigation and the high market price of olives, Cetin (2004) believed that olive cultivation under drip irrigation was economical in the research area despite the comparatively high initial expenditure. Drip irrigation ended up being a successful investment for the olive farmers.

A small-scale farmer can purchase and install a drip irrigation system for a relatively inexpensive initial expenditure, according to Infonet-Biovision (2010). This investment will pay for itself if used to cultivate crops for the market during the first season and boost family food production, especially during protracted dry spells.

2.6.2 Benefits of using drip irrigation

Many claims about the benefits of drip irrigation have been and continue to be made, according to FAO (1998). The following benefits of drip irrigation are currently recognized. Evapotranspiration has less of an evaporative component. Localized irrigation has a higher level of built-in management, which significantly lowers deep percolation and runoff losses and results in improved irrigation efficiency. Drip irrigation is therefore seen as a water-saving device, and the small wetted area inhibits weed growth. It is adaptable to all types of plots, is wind-free, and has lower labour and running costs. Only routine equipment inspections for filtering and control, as well as the proper dripper operation, require human interaction. Additionally, there is a decreased chance of fungi illnesses and decreased

sensitivity to salt water use. Spraying saline water poses little threat of harm to the aerial sections of plants.

Due to the very small aperture of the water emitting devices, which makes drip irrigation systems prone to clogging, effective filtration and occasionally chemigation are required. The lateral lines might sustain damage from rodents, dogs, and other animals looking for water. The method might not be cost-effective for crops with extremely high population densities due to the numerous laterals and emitters needed. Drip irrigation has a system investment cost that is rather expensive. Because the root zone's spatial development is constrained and concentrated around the dripper, plants are more vulnerable to wind throw.

CHAPTER THREE
RESEARCH METHODOLODY

3.1 INTRODUCTION

In some literature it has been noted that some researchers use the terms methods and methodology interchangeably. This chapter describes the methods the author employed to carry out the research. It is important to underline that these variables must be anticipated in order to achieve reasonable success in all areas where possible, even though absolute control of all study components is not always possible. In addition to the research strategy, data collecting, and research reporting, this chapter will also discuss research technique, research philosophy, and research approach. It also provides the description of the different instruments that were used by the researcher in the process of data collection. Research design, a brief description of the study area, analytical framework and model specifications are some of the issues that were clearly explained and discussed in this section.

3.2 RESEARCH PHILOSOPHY

Positivism and phenomenology are two viewpoints that support research philosophy (Saunders et al., 2000). Phenomenology serves as the study's guiding principle. The need to understand a situation and understand how "reality operates behind the scenes" is at the heart of phenomenology (Saunders et al., 2000). According to Giorgi (as stated by Stones, 1988), the fundamental phrase in phenomenological investigation is "describe." In this study, the researcher made an effort to provide an honest, truthful, and factual description of the event. The study of social and psychological processes from the viewpoint of those immediately impacted is known as phenology (Kruger, 1999). In order to fully understand a phenomenon, phenology study examines the viewpoints of those who have experienced it. Each person's experiences vary. The perspectives of phenomenology and positivism are two that underpin research philosophy (Saunders et al., 2000). The researcher tried to give a fair, accurate, and true account of what happened in this study. This study included both quantitative and qualitative research approaches and the qualitative approach is regarded as beneficial in this study due to its special ability to enable the researcher to get closer to the subject for in-depth investigation of the phenomena under review. Because the survey method is related to the deductive method, it was utilized to gather data. The majority of the survey was built around a questionnaire to give the researcher more control over the study process.

3.3 DESCRIPTION OF STUDY AREA

This case study was undertaken with small-scale producers of tomatoes in Ward 15 Marondera District. The study covered tomato production that are income generating mainly

grown in irrigation schemes. Ward 15 was purposively chosen because it had the largest number of irrigation schemes in the District. Marondera District is among the main horticultural growing areas in Mashonaland East Province. Marondera district is located 72 kilometres east of Harare. The district's capital is Marondera town, a small town. The district is located in Natural Region 2B, which has three distinct seasons, a warm wet summer (November-April), a cool dry winter (May-August), and a relatively short hot dry spring (September-October) (Matikiti, 2015). The district is well-known in the country for smallholder farmers' vegetable production, particularly for crops such as tomatoes, carrots, peas, and butternut.

To ensure that the survey will get to the heart of the research problem and enable the researcher to answer the research objectives and questions, the study was conducted at Chidanga Materera Irrigation Scheme in Ward 15 Marondera district.

RESEACH DESIGN

Objective	**Data type**	**Analytic tool**
Objective 1		
To establish the prevalence of drip irrigation in Marondera District.	**Qualitative**	**Descriptive statistics, calculation**
Objective 2		
To identify key determinants that influence the uptake of drip irrigation	**Quantitative**	**Binary logistics regression**
Objective 3		
To determine the socio economic factors affecting profitability of tomatoes under drip irrigation.	**Quantitative**	**Leaner regression**

3.4 SAMPLING PROCEDURES

. Without sampling, the researcher wouldn't be able to look at the entire population (Fraenkel and Wallen, 2001). Constraints on time and money also made it difficult to poll the entire population. Data could be easily analysed, and conclusions could be drawn, thanks to sampling. Sampling techniques are categorized as either probability-based or non-probability-based. There is a known non-zero probability that each person in the population will be picked for a probability sample. Examples of probability techniques include stratified sampling, systematic sampling, and random sampling. Non-probability sampling involves selecting members in a non-random manner from the population quota sampling, snowball sampling, convenience sampling, and judgment sampling

The researcher employed mixed sample strategies that combined random and non-random sampling techniques.. Focusing on specific characteristics of a population that were of interest allowed the researcher to successfully address the research issues. Selection of organizations and personnel employed by recipient institutions was accomplished by deliberate sampling. The researcher performed stratified random sampling to find the agronomist of the Marondera district ward 15.

Ward 15 was purposively chosen because it had the largest number of irrigation schemes in the Marondera District, about four of them (Agritex Marondera).The researcher applied the criteria of availability and willingness to cooperate of the selected farmers. The respondents for the survey questions were chosen using stratified random selection. This brings the overall number of interviewed farmers in the scheme to 40.

3.5 SAMPLE SIZE

The number of people who were sampled on this survey is 40 farmers.

3.6 DATA COLLECTION TOOLS

Both secondary and primary data collection methods were used in undertaking this research. Primary data refers to raw data that is the original straight from the interviewees while secondary data is already processed data and may be in the form of reports, publications, and or stored in any other forms soft or hard copies (Nyariki, 2009).

3.7 SECONDARY DATA

The major secondary data collection method used was review of literature. Irrigation schemes reports from AEOs, journals, and textbooks were the main sources were secondary data was gathered. Review of literature helps to set the context for the research study and provide evidence on other models used for data analysis in other locations and their results used to detect the knowledge gap. According to Saunder et.al, (2009) secondary data is the data collected for other purpose other than for the researcher is using it.

Both quantitative and qualitative research methodologies were used by the researcher. Three distinct methods, including a survey questionnaire given to farmers, recipients of drip irrigation kit programs were employed to collect data both basic observation and informants. A farmer survey questionnaire was utilized to collect data quantitatively. Direct observations and in-depth interviews with important informants were used to gather qualitative data.

Quantitative data (number of farmers under drip irrigation) and qualitative information (socio-demographic characteristics like gender, age, and marital status were gathered. The price of inputs, such as seeds, seedlings, and insecticides (copper ox chloride, cabryl, mancozeb, and dimathoate M45), synthetic fertilizers, organic manure, and the effects of transportation on marketing were noted and taken into consideration. The additional socio demographic aspects of the questionnaire that are connected to drip users include: land sizes, marital status, education level, gender of the respondents, and resource endowments. The availability of extension services, etc. Interviews and questionnaires were favoured since they provide farmers' active involvement in sharing information and creating space for further insights within the respondents.

3.8 INTERVIEWS

Interviews were used in the study's execution. Face-to-face communication with the interviewee increased participation and allowed for mutual understanding. The interviewee was picked for the unique contribution they made to the study. Interviews provide a more comprehensive understanding of the situation by delving deeper into the meanings of the subject. The advantages of interviews, according to Mason (2002), include the fact that they offer additional insight into topics that were not covered in the research proposal material. Dilon (1993) goes on to stress the value of interpersonal relationships. Interviews are by far the most flexible and adaptable method of data collection. An interview fosters trust and understanding between the parties involved in the disclosure of personal information. The researcher will then be able to learn the interviewee's true intents, viewpoints, and

impressions. Face-to-face interviews had the more impact in getting information from the small holder farmers in Marondera district as they disclosed everything when the researcher was talking to them directly and this is because some of them were afraid to state some of the things in the questionnaires because they feared that stating their problems or challenges on paper would cost them and this led to their cooperation and the highest response rate. But however, conversely, subjectivity and prejudice have shown to be a drawback while conducting interviews, since some of the participants have a tendency to provide answers that the interviewer anticipates rather than providing the actual facts.

As the researcher interviewed one of the farmer in Marondera and he gave detailed information on how they operate the pumps and how they clean the drip emitters when they block and this is shown by the image above.

3.8 QUESTIONNAIRES

The researcher used surveys, which had the benefit of including dates, guaranteeing that data was recorded with its precise dates. According to Brink (1996), a questionnaire is a self-report tool in which respondents submit their responses to the printed questions in a document. This makes it easier to archive the data for use in the future. Another benefit of using questionnaires is that they can collect information to a degree that personal interviews just cannot. The distribution of the questionnaires used both random and purposeful sampling. Because survey replies are anonymous, participants are more inclined to be truthful when answering questions about delicate subjects. But as this study has shown, questionnaires are not very reliable, as shown by the fact that some respondents did not respond, did not return them, or even chose answers without completely understanding the questions, highlighting the drawback of using them.

The image shows some of the small scale farmers in Marondera with the researcher and these farmers were given questionnaires to answer about how they are irrigating their tomatoes under drip irrigation as well as stating the challenges that they are facing due to the use of drip irrigation.

The household survey was conducted in November 2022. Randomly selected 40 farmers in irrigation scheme were interviewed at their homestead or in the field as they will be conducting their farming operations. The questionnaire collected both qualitative and quantitative data from the irrigation plot holders or representatives concerning their perceptions on collaborative marketing to supply formal markets as well as strategies to make

the collaboration sustain at a mutual benefit for all. Open ended questions offered farmers the opportunity to describe the challenges they are encountering in the use of drip irrigation in their own words. The survey shall be participatory in nature hence respondents will be participating in giving responses. Participatory approaches will be used such that the research will benefit the farmers rather than just the researcher and end users of this report like policy makers hence guaranteeing that the value of research will lie in the changes it brought to the scheme rather than merely in the knowledge gained. In trying to achieve this aim the researcher will take time to explain the nature of the study and discuss pertinent issues of interest to farmers. Farmers will be mobilized through local structures and the purpose of the study outlined.

A pre-test survey will be conducted first, with required modifications made by identifying and rephrasing difficult questions and those with multiple meanings. A permission to conduct a research study must also be requested and granted by the District Agricultural Technical and Extension Services Officer prior to the pre-survey. The goal of the study will also be explained to the scheme's responsible authorities, which include the Agricultural Technical and Extension Services (AGRITEX) Officers at the District Offices and at the scheme, as well as the scheme's chairpersons. In order to keep respondents' attention and allow farmers to clarify topics, personal interviews will be used instead of alternative approaches such as telephone interviews or postal questionnaires. As a result, personal administration of surveys will help to alleviate the problem of misinterpretation of words or questions, allowing farmers who cannot read or write to provide information.

The questionnaire was written in English and then distributed and interpreted in Shona (the local language) to farmers who do not understand English properly. Farmers' demographics, production, challenges, markets, socio-economic factors affecting farmers, and farmer-business linkages were all included of the structured questionnaire. The questionnaire help to acquire information about farmers' attitudes, thoughts, and perceptions towards the use of drip irrigation. Information on the reasons why would one opt to or not use drip irrigation as well as the prospective consequences on the net returns of each decision were also gathered by the questionnaire.

3.9 FOCUS GROUPS

According to Krueger (1994), a focus group is an in-depth interview that is performed in a group, with the proposal, size, membership, and interviewing methods defining the meeting characteristics. The focus or subject of analysis is the group's internal interaction. The participants have an impact on one another through their contributions to the discussion and replies to the ideas. In this case the promoted conversations with comments and topics. The group chat transcripts, along with the researcher's thoughts and annotations, are among the technique's most significant data points, according to Morgan (1988). Meeker and Escobar (2014) claims that a facilitator leads the group of participants while they listen to a presentation.

The themes that will be covered will help the group have a lively and organised conversation. The researcher was able to gather data during the discussion due to participant participation, proving the value of focus groups. However, conducting focus groups has its own disadvantages, such as complicating data processing. Statements should be understood in the social atmosphere that the group's action produces. Agronomist Manhamo helped the researcher in gathering small holder tomato farmers and this made it easy for the researcher to discuss with the farmers.

3.10 OBSERVATIONS

According to Shuttleworth (2009), an observation is the covert monitoring and documentation of research participants' behaviour in unobtrusive settings. The researcher visited Marondera District Ward 15 to observe the use of drip irrigation by small holder farmers. The researcher made observations on her own and noticed that there are a number of farmers using drip irrigation and the layout of the drip kits was done by World Vision as a way of improving the community by giving them a way of earning income. The benefit of observation is that it enables the researcher to gather first-hand data from witnessed life experience. However, the outcomes from observations might be skewed.

3.11 DATA ANALYSIS TOOLS

The data analytical tools outlines the analysis procedures that shall be employed per each and every objective.

Using relevant charts and frequency tables, descriptive analysis was conducted to gauge the severity of the challenges faced by farmers. Regression analysis was used to analyse and determine the socio-economic factors affecting profitability of tomatoes under drip irrigation

and also likert scale was used to identify key determinants that influence the uptake of drip irrigation by small holder tomato farmers in Marondera district ward 15.

To establish the prevalence of drip irrigation in Marondera District will be presented using the formula for calculating prevalence and also SPSS will be used to calculate the prevalence of drip irrigation on the farmers of Marondera district ward 15. Also the challenges faced due to the use of drip irrigation will be analysed using SPSS descriptive analysis.

3.12 CONCLUSION

This chapter described and addressed the research methodology. Both qualitative and quantitative methodologies were used in the investigation. Since surveys are the most typical method used in social research, they were chosen.

CHAPTER FOUR

Data Presentation and Discussion

4.1 .INTRODUCTION

The study's findings are presented in this chapter. Descriptions of the demography of the sampled farmers in Marondera district are presented in this chapter. Frequency tables and graphs were utilized to display the findings about farmer participation in drip irrigation, farmer gender, age, level of education, marital status of the farmers, and extension service availability, were discussed in this chapter. This chapter also includes a presentation of the regression model's findings.

4.2 DEMOGRAPHY CHARACTERISTICS

VARIABLE		FREQUENCY	PERCENTAGE
AGE	- 20 and below	4	9.8%
	21-35	14	34.1%
	36-50	14	34.1%
	51-65	6	14.6%
	Over 65	2	4.9%
GENDER	– male	17	41.5%
	Female	23	56.1%
M. STATUS	– Single	11	27.5%
	Married	25	62.5%
	Divorced	4	10%
LEVEL OF EDU	- primary	7	17.5%

Secondary	20	50%
Tertiary	13	32.5%

4.3 INTERPRETATION AND DISCUSSION

4.3.1 LEVEL OF EDUCATION

A sample of forty (40) respondents were sampled during the research. This suggests the level of education the farmer has obtained. Primary, secondary, and tertiary were found to be the three groups that the sampled farmers fell into. The table above is the one that shows how frequently each category occurs. The table demonstrates that there are 7 farmers with the percentage of 17.5% using the drip irrigation method that have completed their primary schooling. 50% of drip users have reached secondary-level education and the number of this category is 20 farmers, whilst the other 32.5% reached the tertiary level with 13 farmers in this category.

4.3.1.1 DISCUSSION

50% of the sampled farmers have at least secondary education, which supports the notion that highly educated farmers are capable of adapting to contemporary practices and changing farming requirements (Qaim and Rao, 2012). They are more likely to comprehend and be knowledgeable about the use and benefits of drip irrigation. 17.5% of the sample only completed primary school, and the number of these farmers is a small number and it is safe to assume that these farmers do not know the benefits of using drip irrigation because of their level of literacy. However, (Sudhanva Dhananjaya) march 1 2021 stated that yield in the education context is not just the quantity, it is the right mix of imparting knowledge, experience about the real world, a better-fit into the real world that we live in. As for the tertiary level, these farmers were not much in the area of study which is Marondera District Mahusekwa Chiota (Chidanga Materera) most of them did not attain tertiary level and the few numbers are the agronomists that were assisting the researcher in obtaining data and a few graduate trainees.

4.3.2 AGE

The table above shows that the number of the farmers from the sample size was forty (40). From the age below 20 there were 4 farmers with 9.8%, the age 21-35 there were 14 farmers with a percentage of 43.1%, 36years- 50years has got 14 farmers with 34.1%, 51years-65years has 6 farmers with a percentage of 14.6% and those over 65years are just 2 farmers and they only contribute 4.9%.

4.3.2.1 DISCUSSION

It was discovered that only 9.8% of farmers with below 21 years use drip irrigation and this is because these farmers are still young and for them to be able to install and operate drip kits and as for the farmers over 65 who contribute 4.9% of the total farmers and these are farmers who has always been there in the farming industry who have fear of the un-known. This is supported by the study of Sahara et al. (2015) who indicates that long-experienced farmers had low willingness to take the risk of shifting from the traditional practices of irrigating their tomatoes to modern farm practices of using drip irrigation This is corroborated by a study by Sahara et al. (2015), which found that long-tenured farmers were less ready to assume the risk of converting to contemporary farming techniques.

However, it was envisaged that individuals that use drip irrigation would be in a better position to enhance tomato quality as well as the quantity of the tomatoes which they produce under drip irrigation and these are farmers between the ages of 21-65years.

4.3.3 GENDER

From the data obtained most of the farmers out of the 40 who answered the questionnaire 17 were male and 23 were female and 14 females under bucket system. The percentage of the number of female in this survey in percentage is 56.1% and that of male is 41.5% and this was presented on a bar-graph as shown above. The gender of the respondents is very important and in this case the number of the female farmers because the researcher found out that the program of starting irrigation in the area of study was implemented by the world vision and this was mostly for woman empowerment so the number of female.

4.3.3.1 DISCUSSION

In this study it was discovered that most of the farmers were female and this is because the use of drip irrigation in this area was introduced mainly by world vision as a way of improving the community and poverty alleviation but mainly as a way of empowering women in this area so that is the reason why the female farmers contributed 56.1% of the farmers who were surveyed. Another reason is that in this modern time men have found a lot

of jobs to give them money for example, mining so most men are doing that leaving a lot of females in the farming industry.

4.4 DETERMINING THE PREVALENCE RATE OF DRIP IRRIGATION IN MARONDERA DISTRICT WARD 15.

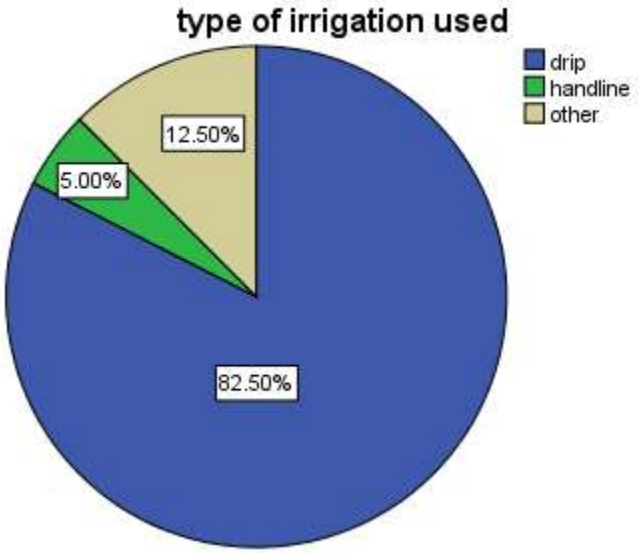
The objective of the study was to establish the prevalence of drip irrigation in Marondera district the researcher used the formular for calculating the percentage of prevalence,

$$\text{PREVALENCE} = \frac{\text{number of farmers under drip irrigation}}{\text{Total population}}$$

$$= \frac{34}{40} \times 100$$

$$= 82.5\%$$

The prevalence rate of the farmer that are under drip irrigation is 85% and this can also be shown by the pie chart below,



The chart shows that drip irrigation had 82.50%, hand line had 5% and 12.50% were the farmers who were using other types of irrigation besides hand line hand drip irrigation. The data was analysed using SPSS and the number of farmers under drip irrigation were 33 farmers, 2 farmers using hand line irrigation and 5 farmers using other types of irrigation other than drip irrigation and hand line irrigation.

4.4.1 DISCUSSION

The formula show that the rate of prevalence of drip irrigation is 82.5% and this shoe that drip irrigation has occurred frequently other than all the other types of irrigation and this is also shown by the chart above which shows that drip irrigation is the frequently used. The use of drip irrigation is the most prevalent because when it stated only a few farmers had joined but more farmers joined when they saw the yield of those who joined first and they were motivated. More boreholes were drilled and some pumps were provided by the world vision. However, some farmers were not willing to join world vision because those who joined were supposed to pay back a certain percentage to the world vision so they started their own irrigation using their self-made kits and pumping water from the dam and the river using solar, electricity and also generator.

4.5 DETERMINING THE KEY DETERMINANTS THAT INFLUENCE THE UPTAKE OF DRIP IRRIGATION IN MARONDERA DISTRICT WARD 15.

Omnibus Tests of Model Coefficients

		Chi-square	Df	Sig.
Step 1	Step	31.044	12	.002
	Block	31.044	12	.002
	Model	31.044	12	.002

The table above is an output of SPSS binary logistic and it shows chi-square of 31.004, with a p value of 12 and significance value of 0.002.

Classification Table[a]

	Observed		Predicted		
			do you use drip irrigation		Percentage Correct
			yes	no	
Step 1	do you use drip irrigation	yes	34	0	100.0
		no	1	5	83.3
	Overall Percentage				97.5

This table is just a classification table showing whether the farmer uses drip irrigation or not.

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	8.906[a]	.464	.812

The table above is the model summary and it shows cox &Snell R Square of 0.464 and Nagelkerke R Square of 0.812

Variables in the Equation

		B	S.E.	Wald	Df	Sig.	Exp(B)
Step 1[a]	Reduction in competition	15.366	8384.099	.000	1	.040	.000

Motivated by other farmers	-18.452	7975.733	.000	1	.014	.000
Motivated by contract farming	1.960	4.888	.161	1	.003	7.099
Water conserving system	2.164	5.020	.186	1	.074	8.703
Area covered	2.888	2.118	1.858	1	.000	17.953
Source of water	.144	1.154	.016	1	.901	1.155
Level of education	.581	1.758	.109	1	.741	1.788
Constant	-13.334	12.829	1.080	1	.299	.000

The variables previously described were considered for the model and their significance was tested. The binary logistic results on the key determinants that influence the uptake of drip irrigation by small holder tomato farmers. The table above shows the significance level of reduction in competition, motivated by other farmers, motivated by contract farming, water conserving system, area covered, source of water and level of education as 0.040, 0.014, 0.003,0,000, 0.073, 0.901 and 0.741 respectively.

The result in the table reveals that the Wald chi-square value was 35.6 with the *P*-value of 1%, so there was a highly statistical significance between dependent variables and independent variables. The Cox & Snell R^2 was 0.464, indicating that the Logistic Regression Model used in the study was reasonably fit.

4.5.1 DISCUSSION

As predicted, it was discovered that the use of drip irrigation had a positive and significant correlation with household education level at 1% in comparison to the base category (not using drip irrigation). When compared to the base category, an increase of one unit in farmers' educational attainment may result in a 1% increase in the likelihood that they will engage in the use of drip irrigation. The exponential beta was 1.788 with a SE of 1.758

correspondingly, showing that farmers' chances of completely engaging in communal selling rise when they become more literate.

Education had a beneficial impact on farmers' decision to use drip irrigation this effect was statistically insignificant (p>0.05) which is p=0.741. It was anticipated that having a higher educational level would boost a farmer's likelihood of using drip irrigation. The likelihood of using drip irrigation improves for every additional level of education. Because they are more likely to possess the knowledge and connections needed to establish and run successful projects of tomatoes under drip irrigation, and farmers who are educated are more likely to comprehend the advantages of using this type of irrigation method.

At (p< 0.05) which is p=0.000, the area covered under drip irrigation appears to be positively and significantly correlated with the use of drip irrigation. A unit increase of 1 or 2 acres of land under drip irrigation per farmer raises the probability of partial and full participation in the use of drip irrigation in tomato production by small holders. Motivated by contract farming is substantially connected with the farmer's decision to use drip irrigation at 1%, p= (0.003), relative to the base category. A farmer who has access to contract farming like that of (world vision) has a higher chance of participating in the use of drip irrigation.

Water conserving system is negatively and insignificantly correlated with a farmer's decision to participate in the use of drip irrigation or not to use at ($p > 0.05$), relative to the base category. Reduction in competition with weeds is negatively and insignificantly correlated with a household's decision to participate in using drip irrigation at $p > 0.05$. These results are in conformity with *a* priori expectations.

4.6 DETERMINATION OF THE SOCIO- ECONOMIC FACTORS AFFECTING PROFITABILITY OF TOMATOES UNDER DRIP IRRIGATION.

Multiple linear regression was used to determine the socio-economic factors affecting profitability of tomatoes under drip irrigation in Marondera district ward 15.

Model Specification and Estimation Techniques

$$p=\beta0+\beta1\ X1+\beta2\ X2+\beta3\ X3+\beta4\ X4+\beta5\ X5+\beta6\ X6+\beta7\ X7+ui$$

p = profitability

β0 = constant

β = coefficient to be determined,

X1 = Capital

X2 =Farm size

X3= transport availability

X4= Level of education attained by the respondents

X5= inflation

X6= market system

X7=access to credit

ui= random error term

Capital, farm size, inflation, transport availability, access to credi just mentioning a few are some of the socio-economic factors that affect the profitability of tomatoes grown under drip irrigation by small holder tomato farmers in Marondera district ward 15. All these factors are independent variables and multiple linear regression analyses the relationship between the independent variables and the dependent variable which is profitability.

Model	Coefficients		Significance
	B	Standard error	
Constant	625.853	191.766	0.003
Capital	9.819	47.348	0.731
Farm size	-11.112	5.268	0.049
Level of education	0.467	21.494	0.245
Delayed payments	18.663	31.036	0.005
Access to credit	8.112	5.267	0.026
Transport availability	-2.522	1.631	0.754
R-square	0.689		
Adjusted R square	0.668		
Durbin Watson value	2.2		

The table above shows the socio-economic factors that affect the profitability of tomatoes under drip irrigation and these factors are capital, farm size, level of education, age, marketing system, occupational status, access to credit, inflation, and level of income, access to market information, transport availability and delayed payments. These factors were given to the farmers in form of likert scale in a questionnaire and the table above shows the levels of significance for each factor. There is a positive relationship between profitability and all the other independent variables.

4.7.1 DISCUSSION

The six factors were highlighted and these factors are the socio-economic factors affecting the smallholder tomato farmers at Chidanga irrigation in Marondera district.

A significant socio-economic factor some of the tomato producers at the Chidanga irrigation scheme were dealing with was delayed payments. The level of significance for this factor is 0.005. This issue was mostly brought up by farmers who have to give their output to the contract farming companies for them to find the market for them and sell their output and then there is late payment. The farmers revealed that it could take even up to 4 months before someone's payment is cleared, even though it was agreed that it would happen in two weeks when the product was delivered. Also the farmers would sell their tomatoes to the people in the community and these people most of them are unemployed so they more time to pay their credit thereby reducing the profits of tomato farmers. The contract farming companies give no specific explanations for the delay, and the lack of a professional attorney to assist the individual farmer in resolving payment disputes made matters worse. As stated by the primary interviewee, "Wholesale firms provide us fair pricing, however if they delay settling the payment, the actual amount value would be reducing each day since it is agreed in $ZW." The farmers underlined that since exchange rates are always changing, the RTGS mode of payment shouldn't take too long.

Some of the farmers were saying transport availability is another factor that is being faced significantly, the availability of transportation was deemed to be a minor obstacle with 0.754 as the level of insignificance. This might be because some farmers who in the area were the survey took place were able to purchase vehicles for use in the transportation industry. Additionally, a large proportion of the farmers' sons have obtained driver's licenses and purchased trucks to facilitate the transport business while also generating income from it, thus transportation is frequently accessible.

Farmers lack access to market information and price trend analyses. They can forecast their production and marketing decisions more accurately as a result. Due to their incapacity to use them and local network issues, the bulk of the scheme's tomato producers lack smart phones with internet connection and even if they have smart phones some of them only know how to answer calls they do not know how to use them to source out important information on the recent price trends. The study discovered that there are various websites, like Musika Analytics, that post and keep information on market pricing. Farmers can make extensive use of these websites on their smartphones to predict their agricultural returns so that they will not run any losses.

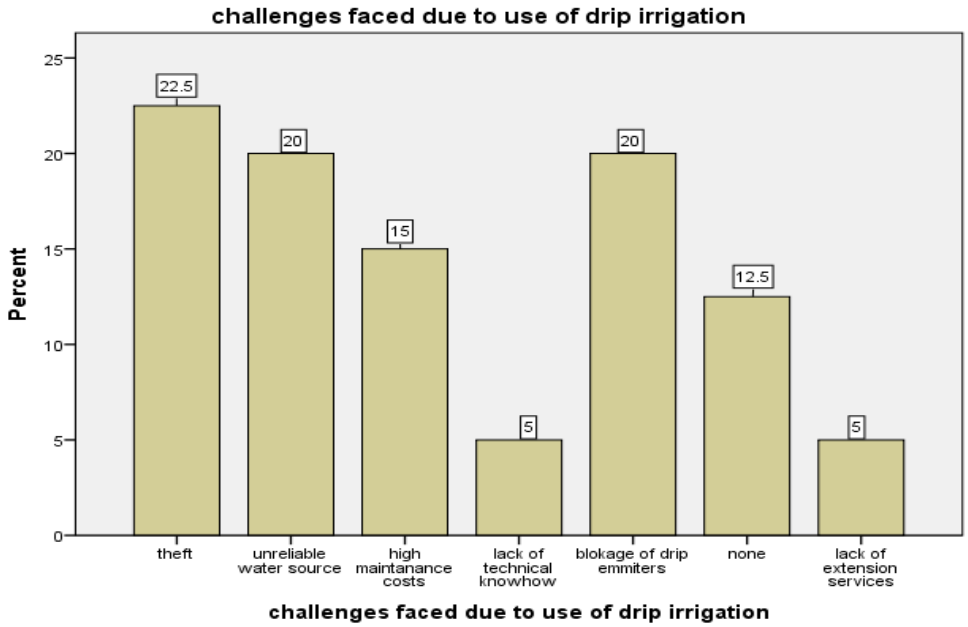
4.7 CHALLENGES FACED DUE TO THE USE OF DRIP IRRIGATION

As a result of the survey, the challenges faced by farmers growing tomatoes under drip irrigation were discovered and ranked according to their seriousness, as shown in the bar graph below. Some of the challenges are lack of technical knowhow, theft, unreliable water source, lack of extension services, high maintenance cost and blockage of drip emitters. This is diagrammatically shown by the bar graph below.

challenges faced due to use of drip irrigation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Theft	9	22.5	22.5	22.5
	unreliable water source	8	20.0	20.0	42.5
	high maintenance costs	6	15.0	15.0	57.5
	lack of technical knowhow	2	5.0	5.0	62.5
	blockage of drip emitters	8	20.0	20.0	82.5
	None	5	12.5	12.5	95.0

lack of extension services	2	5.0	5.0	100.0
Total	40	100.0	100.0	



Theft had 22.5%, unreliable water source 20%, high maintenance cost 15%, lack of technical knowhow 5%, blockage of drip emitters 20%, none with 12.5% and lack of extension services with 5% as shown by the bar chart above.

4.7.1 DISCUSSION

4.7.1.1 LACK OF TECHNICAL KNOWHOW

Lack of technical knowhow is a challenge affecting farmers using drip irrigation .Here, farmers' understanding of how to use drip kit technology effectively was better hence it contributes 5% of the challenges and this is not a large amount and this is so because most of the farmers in the area surveyed were taught on how to operate drip kits by either extension officers or by the by other large scale\master farmers. The chart above that demonstrates that 5% of drip users in the study rated a lesser rate of lack of technical knowledge. This is consistent with Kabutha et al (2000).'s research in Kenya, which found a lack of

understanding of farmers' choices for such irrigation technology due to the region's recent adoption of drip irrigation systems.

4.7.1.2 LACK OF EXTENSION SERVICES

The extent to which farmers have access to advisory or extension services pertaining to their area of production is indicated by the extension services that they have received. This involves attending group gatherings, individual appointments, and farmer visits to organizations that offer extension services, like Agritex. Shown on the chart was a lack of extension service and it reveals that among the sampled farmers who use drip irrigation, 5% rated the issue of a severe lack of extension services as it relates to their production of tomatoes

4.7.1.3 UNRELIABLE WATER SOURCE

Farmers that use drip irrigation rely more on diverse water sources including wells, rivers, and dams with their own systems for directing water to the crop. Reliable water sources would imply that there is enough water readily available for the farmer to plant crops. Additionally, unreliable water supply shows that it is the most challenging obstacle for farmers using drip irrigation. This demonstrates that most of the studied drip farmers considered the issue of an unpredictable water source to be more serious. Unreliable water supply was rated as the second more significant with the percentage of 20% saying that the challenge is affecting them.

4.7.1.4 THEFT

The drip irrigation kits are prone to getting stolen and the farmers pointed out the cases of drip kits being stolen has increased in the area mostly the tanks that they use as reservoir get stolen most of the time and this will leave them with the problem and costs of purchasing new equipment as a result of that. Theft contributed more percentage of 22.5% and most farmers were affected by this challenge.

4.7.1.5 HIGH MAINTAINCE COSTS

Drip kits are expensive to install as well as to maintain as well so this has become a challenge to the farmers because they are left bankrupt because they would have used all their profits in maintaining drip kits.

4.7.1.6 BLOCKAGE OF DRIP EMITTERS

This is a challenge faced by many farmers, mostly those that use water sources like dam, river or even the ones that use borehole system most of them store the water in tanks and if they store water for some time algae will be produced and these will block the emitters.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

The study looked into the socio-economic factors that affect profitability of tomatoes under drip irrigation by smallholder farmers. Some of the socio-economic factors that affect profitability of tomatoes are capital, inflation and level of education just to mention a few. Contract farming companies such as World Vision delayed payments of the money they were owing the farmers and this was made worse by the current economic situation of constantly fluctuating exchange rates, were ranked as the top issues. In order to raise the living standards of smallholder farmers in smallholder farming areas, the government and development organizations must focus on and address three fundamental difficulties. According to the outcomes of binary logistic regression analysis, the amount of engagement of smallholder farmers in engaging in the use of drip irrigation was strongly influenced by factors such as area covered under drip irrigation, source of water, motive behind use of drip irrigation, and educational levels.

5.2 RECOMMENDATIONS

5.2.1 to the farmer

More crucially, farmers should be able to rotate their most lucrative tomato crop inside the drip-irrigated area, thanks to the availability of high coverage drip kits. This might enable them to produce at least one marketable crop and make money during the growing season. In order to draw the necessary conclusions about the socioeconomic effects of drip irrigation, further research is therefore advised, paying particular emphasis to irrigation efficiency concerns and diverse tomato crop varieties. The system for marketing has to be improved. The principal irrigated crops (tomato) are harvested by farmers at around the same dates and are perishable, therefore the marketing channel has an impact on irrigation returns in part because of this. The effectiveness of irrigation will be aided by a strong marketing strategy. This could be achieved by doing a value chain analysis on tomato canning and tomato sauce processing. Farmers in the research area had to go to Harare to obtain inputs because the inputs provided in Marondera were not sufficient to carter for all the farmers, which made it more expensive for them to produce tomatoes. Local agro-dealers should increase the accessibility of supplies in the neighbourhood. According to the study's conclusions, tomato farmers who are a part of a marketing organization may have access to wholesale markets. Farmers should create networks because they promote knowledge exchange and enable them to increase product quality and supply consistency as demanded by the formal market.

5.2.2 to policy makers

In general, smallholder farmers can improve the rural economy by boosting earnings and, as a result, strengthening their capital for subsistence through use of drip irrigation. It is necessary to develop a strategy that supports farmer organizations and encourages smallholder farmers' participation in drip irrigation while taking into account their diverse social and economic circumstances. Intensive extension awareness programs that instruct farmers on how to access, retrieve, and use contemporary technology, where numerous web platforms frequently upload market information and prices, for example Musika analytics platform, radio programs, can help improve farmers' access to market information. Additionally, it is advised that policymakers pay attention to the elements that affect participation decisions and the level of value chain participation improving both the level of engagement among smallholder farmers and the value chain.

5.2.3For future studies

Since this study focuses on the socio-economic factors affecting the use of drip irrigation by smallholder tomato farmers' next studies should look at how to sustain the use of drip irrigation by small holder farmers.

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