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SOCIO-ECONOMIC ANALYSIS OF REVITALIZATION OF IRRIGATION SCHEMES CASE OF INSUKAMINI IRRIGATION SCHEME GWERU DISTRICT, ZIMBABWE.

Submitted by

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DECLARATION

I, Mutindi Hardlife, declare that this dissertation titled "SOCIO-ECONOMIC ANALYSIS OF REVITALISATION OF IRRIGATION SCHEMES CASE OF INSUKAMINI IRRIGATION SCHEME GWERU DISTRICT, 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, Dr Govere, 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

This research study is dedicated to my parents (Roti Mutindi and Ruth Mutindi), who has been a constant source of love, support, and encouragement throughout my life. And to my brother (Robert Mutindi) who instilled in me the value of hard work and perseverance. I hope this work will make you proud. This work is dedicated to you both, with gratitude and love.

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Finally, I would like to thank my colleagues and friends, River Rumbidzai, and Deve Vimbai who have supported me throughout this journey, providing valuable feedback, encouragement, and motivation. Their presence has made a significant difference in my life and work.

ABSTRACT

One recent program implemented in Zimbabwe to enhance smallholder irrigation in arid to semi-arid regions is the Smallholder Irrigation Revitalization Initiative (SIRI), a seven-year program that began in 2016 and ended in 2023. The SIRI's primary objective was to achieve food and nutrition security while assisting rural households in becoming more resilient to the impacts of economic volatility and climate change. The objective of this study was to evaluate the socioeconomic analysis of the revitalization of the Insukamini irrigation scheme in Zimbabwe's Gweru area. Participants' answers were gathered using both quantitative and qualitative data collection methods, including focus group discussions (FGDs), key informants, and a structured questionnaire. 68 irrigators were sampled using a multistage cluster sampling technique. As the Insukamini irrigation scheme was split into four blocks—Block A, Block B, Block C, and Block D, 17 scheme beneficiaries were chosen using a stratified random sampling technique to ensure that the sample represented all irrigation blocks (clusters). SPSS software was used to process the data. The frequency distributions of the replies were shown in tables. Additionally, the percentages and response counts for every survey item were summarized using frequency distributions. The findings showed that smallholder irrigation revitalisation has the potential to significantly raise incomes and profitability, notwithstanding certain challenges. According to the study's findings, SIRI is reducing poverty and enhancing smallholder farmers' profitability and revenue generation in spite of present obstacles.

Keywords: Smallholder Irrigation Revitalisation, Household Dietary diversity and Irrigation

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LIST OF ACRONYMS AND ABBREVIATIONS

SIRI……Smallholder Irrigation Revitalisation Initiative

FGDs…… Focus Group Discussions

SPSS…… Statistical Package for Social Sciences

HDDs…… Household Dietary Diversity Score

IFAD……. International Fund for Agricultural Development

FAO…… Food, Agricultural Organisation

NGO……. Non-Governmental Organisations

GOZ……. Governmental of Zimbabwe

SIRP……Smallholder Irrigation Revitalisation Programme

NIB…… National Irrigation Board

SSA…… Sub-Saharan Africa

NDS……. National Development Strategy

TCPL…….Total Consumption Poverty Line

DA……Development Agents

HYV…… High Yield V varieties

ILO…….International Labour Organisations

ZNSA……. Zimbabwe National Statistics Agents

SMEs……. Small and Medium Enterprises

GPM…… Gross Profit Margin

ROI…… Return on Investment

BCR…… Benefit Cost Ratio

GM…… Gross Margin

TR……Total Revenue

TVC……Total Variable Cost

TFC……Total Fixed Cost

TC…… Total Cost

CHAPTER 1

INTRODUCTION

1.1 BACKGROND OF THE STUDY

Agriculture is the backbone of Zimbabwe's economy, supporting a number of sectors including as manufacturing, apparel and textiles, export businesses, and the populace (Mutambara et al., 2014). More than 70% of Zimbabwe's workforce is employed in the agricultural sector, which also provides 60% of the raw materials used by the nation's industries and accounts for 40% of all export earnings (IFAD, 2016). The agricultural industry contributes 15–18% to Zimbabwe's GDP. Furthermore, almost 70% of the working population in the country is directly dependent on agriculture (Ministry of Lands, 2018). World Bank Report, 60% of Zimbabwe's working population is either directly or indirectly employed in the country's agriculture industry or subsector. The figures demonstrate that Zimbabwe's economy is based primarily on agriculture and will remain so for some time to come. Because of this, the sector remains crucial, and economic performance is mostly linked to advancements in the agriculture sector through downstream value adds (African Union Commission, 2022).

Within this agricultural landscape, smallholder farmers constitute the majority of agricultural producers, particularly in provinces like Midlands where they account for over 80% of farming households(World Bank,2017).Historically, these smallholder farmers have faced numerous challenges including limited access to water resources, erratic rainfall patterns, and deteriorating irrigation infrastructure that have significantly constrained agricultural productivity and household livelihoods(FAO,2021). The Midlands Province is characterised by its semi-arid climate with annual rainfall averaging between 450-600mm, represents a region where irrigation development has been crucial for agricultural sustainability (Manyakaidze, 2023). The deterioration of irrigation systems severely impacted

agricultural productivity and consequently, household livelihoods among smallholder farmers (Duker, 2023). Recognizing this critical challenge ,various stakeholders including the Government of Zimbabwe ,International development partners and community based organisations have implemented Smallholder Irrigation Revitalisation Initiatives(SIRI) aimed at rehabilitating defunct irrigation infrastructure and establishing new systems where necessary(Chisadza,et al 2020).These initiatives have been designed not only to address the technical aspects of irrigation but also to enhance the socio- economic conditions of farming communities through improved agricultural productivity, income generation, and food security(Nyoni,2024).

Gweru District, located in Midlands Province, Zimbabwe, is a significant agricultural hub that contributes substantially to the local economy and food security (Mutsvangwa, 2010). The district's landscape is characterised by diverse crop and livestock production, supported by existing infrastructure and services. Agricultural services in Gweru are varied, with farmers cultivating crops such as maize, wheat, soybeans (Marongwe, 2011).The district's fertile soil and favourable climate make it an ideal location for a range of crops, allowing farmers to capitalize on these natural advantages. The district benefits from irrigation infrastructures in the province, although specific details on irrigation schemes within the district are limited (IFAD, 2017).

The communities benefit from food aid programs such as (NGOs) Non-Governmental Organisation, World Vision, Plan International and FAO (Food, Agricultural Organisation. Due to these poor agricultural productivity and poor standard of living, in the area, it makes the need for irrigation development. Therefore the Government of Zimbabwe (GOZ) has identified an irrigation development as a prerequisite for drought mitigation. This brought about the introduction of Smallholder Irrigation Revitalisation Initiative (SIRI).The Government of Zimbabwe together with the International Fund for Agricultural developed the Insukamini Irrigation Scheme in Gweru District Midlands.

Under the same Initiative, the following are some of the irrigations developed including the Tshovani in Masvingo, Guyu and Silabhuwa in Matabeleland South,

Banga in Masvingo.All these irrigation schemes were successful according to SIRP report for 2023, but however the Insukamini irrigation scheme is still undermined. The impacts of the scheme are yet to be recognized since the smallholders are still poorly standardly living.

Therefore, this paper seeks to assess the effects of these Irrigation Revitalisation Initiatives on household livelihoods among smallholder farmers in Zimbabwe's Midlands Province. Specifically, it aims to assess the transformation in household livelihoods before and after the implementation of these initiatives, examining change in income levels, crop yields, challenges and overall quality of life using the Insukamini as the case study.

1.2 STATEMENT OF THE PROBLEM

Since agriculture is seen as the foundation of rural populations' livelihoods, irrigation revitalisation primarily supports household livelihoods in these areas (Habtu, 2024). Nonetheless, in Zimbabwe's Gweru area, which is primarily classified as agro-ecological (3), some rural households are unable to meet their nutritional needs and food requirements, or they are unable to supplement their income (Kaini, 2020). This is in spite of the fact that irrigation farming in rural areas could raise people's standard of living. In light of this, the study should provide information on how the revitalisation of irrigation schemes contributes to revenue generation, profitability, and food dietary diversity. It should also identify strategies that can be used to maintain community development based on the revitalisation of the Insukamini irrigation scheme in Gweru District.

1.3 ESEARCH QUESTIONS

1. What is the contribution of revitalization to household income levels?

2. What is the contribution of revitalization on Household Dietary Diversity?

3. Is the revitalization of Insukamini irrigation scheme profitable to smallholder farmers?

1.4 RESEARCH OBJECTIVES

1.4.1 MAIN OBJECTIVE

To assess the contribution of smallholder revitalisation initiative to household livelihoods amongst smallholder farmers of Insukamimi irrigation scheme.

1.4.2 SPECIFIC OBJECTIVES

1. To determine the level of income generation derived from revitalizing the scheme.
2. To determine the contribution of revitalizing the scheme on Household Dietary Diversity.
3. To determine the level of profitability amongst smallholder farmers of Insukamini irrigation scheme.

1.5 SIGNIFICANCE OF THE STUDY\JUSTIFICATION

To the researcher

The researcher will broaden his understanding on the contribution of smallholder irrigation revitalisation initiative on income generation, profitability and food security to rural household's livelihoods. It will also enable the researcher to gain research skills, and experience to conduct research in the future and to combine academic theories with practical procedures.

To smallholder farmers of Insukamini irrigation scheme

Farmers will be assisted on whether to invest more into irrigation farming or not after observing the results on the contribution of revitalisation to income generation, profitability and food security in meeting their household requirements. Also the

results of the study is likely to generate awareness to farmers on how to tackle some of the challenges faced in production and some new ways which can be adopted to earn more income and profitability to meet household food and income requirements more effectively.

1.7 SCOPE AND LIMITATIONS OF THE STUDY

The study was explicitly focused on assessing the socio-economic analysis on revitalisation of irrigation schemes within the confines of Insukamini Irrigation Scheme found in communal areas of Gweru. This geographical focus allows for a detailed exploration of local conditions, challenges, positive and negative effects and benefits associated with the initiative. The target population comprises smallholder farmers actively participating in the irrigation scheme, including both male and female farmers. A gender-inclusive lens is essential for understanding who makes farming decisions and how work is shared. This study therefore asks how the revival of small-scale irrigation schemes affects farmers' earnings, profit margins, and the variety of foods their families eat. Over the chosen time frame, we will track household income, consumption patterns, profitability, and wider community benefits. The research will also review the policies, support programmes, and institutions that shape smallholder irrigation in Zimbabwe and examine how they influence profits, income, and diet at the household level.

Limitation of the study

The researcher faced some limitations in accessing accurate and up-to-date data on agricultural productivity and household incomes, as some farmers may be reluctant to disclose financial information. Furthermore, since the research was mainly focusing on Insukamini Irrigation Scheme, the researcher faced some challenges in transferring the findings to other regions with different socio-economic and environmental conditions. The researcher also faces some financial and time constraints in data collection.

1.8 ORGANISATION OF THE RESEACH

Five chapters made up the study. The introduction, which opens the first chapter, includes the study's history, issue statement, research questions, research aims, significance, scope, and potential limitations. The literature review on smallholder irrigation revitalisation initiatives and their contributions on household income, profits, and dietary diversity are covered in Chapter 2, which also includes reviews from other academics. Along with the conceptual framework and description of the study's variables, it also includes literature on the concepts of agricultural productivity, income levels, and household dietary diversity. Chapter three comprises of the methodology of the research which covers the type of research design, description of the study area, target population, data collection methods, sampling strategy, and data analysis methods. Data processing, presentation, and interpretation of the research findings are covered in Chapter 4. Lastly, chapter five wraps up the entire study by summarising the results, drawing conclusions, and offering suggestions.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

The primary goal of this literature review is to familiarise readers with earlier study findings by other scholars about the contribution of smallholder irrigation revitalisation to household income, profitability, and food dietary diversity in semi-arid regions. The conversation begins by going over the meanings and concepts of some of the most important terminology, such as dietary diversity, food and nutrition security, irrigation and smallholder irrigation revitalisation. Reviews of the conceptual framework of irrigation, the connections between irrigation revitalisation and livelihoods, and an empirical analysis of the study's goals are also included. This conversation aids in determining the holes that earlier researchers left in their work and how the researcher plans to fill them. Additionally, it aids in the ultimate evaluation of how smallholder irrigation revitalisation has affected household

income, profits, and dietary diversification in Gweru.

2.2 CONCEPTS AND DEFINITION OF KEY TERMS

Irrigation

The deliberate application of water to soil or land to promote agricultural and vegetation development is known as irrigation (FAO, 2022). It uses a variety of water management techniques to guarantee that plants get enough moisture, particularly in areas with inconsistent or insufficient rainfall. Twenty percent (20%) of all cultivated land is used for irrigated agriculture, which also accounts for forty percent (40%) of all food produced globally. More crop diversity and production intensification are possible because irrigated agriculture is typically at least twice as productive per unit of land as rain-fed agriculture (World Bank, 2022). In addition to ensuring maximum crop yields, efficient irrigation systems can reduce the dangers connected to conventional rain-fed agriculture (SIRP, 2022).

Smallholder Farmers

Smallholder farmers defined as family-owned agricultural enterprises that typically cultivate crops or raise livestock on small plots of land, smallholder farmers generally operate on two hectares or less, although in some regions, smallholdings can extend up to 10 hectares (FAO, 2021). Despite their small size, smallholder farms contribute significantly to local and national economies, often comprising a large portion of the population living on less than $2 a day. This economic reality underscores their vulnerability and highlights the importance of improving their livelihoods (FAO, 2021).

Smallholder Irrigation Revitalisation

Food insecurity continues to cast a long shadow over Zimbabwe and, by extension, its economic prospects. Because the country leans so heavily on rain-fed

smallholder farming, every drought or shift in rainfall patterns (Musemwa et al., 2022) sends shockwaves through rural livelihoods. Crop failures are now common, and the resulting food shortages ripple outward, stalling wider economic activity.

Lower harvests immediately squeeze export volumes (Moyo et al., 2020). Agriculture traditionally supplies a major share of Zimbabwe's foreign currency, so diminished output weakens the trade balance and curtails the nation's capacity to import fuel, machinery, and medicines. The knock-on effect is higher inflation and shrinking household purchasing power (FAO, 2022). To keep people fed, the government must import grain and mount emergency relief operations (IFAD, 2020). Those outlays drain resources from infrastructure, health, and education, stunting long-term growth.

Hunger also leaves a human toll. Malnutrition, especially in children, blunts cognitive development and future productivity (Mupangwa et al., 2022). A less healthy workforce raises public-health costs and lowers output, dimming Zimbabwe's growth horizon. Recurrent food crises can fuel social tension and political unrest, further unsettling an already fragile economy (Roder, 1965). And when agriculture stalls, downstream industries—from milling to transport—slow as well, dragging overall productivity.

Irrigation offers a proven escape route. Where farmers tap reliable water, they often out-earn dry-land peers and even the former workforce of large commercial estates (Roder, 1965). Expanding irrigation in communal areas boosts yields per hectare and buffers harvests against drought (Mupangwa et al., 2022). With steady water, growers can diversify crops, adopt new methods, and lift both output and profits (FAO, 2022; IFAD, 2020).

Recognising this potential, the government joined forces with agencies such as IFAD to launch the Smallholder Irrigation Revitalization Programme (SIRP, 2022). The initiative repairs aging schemes, introduces climate-smart practices, and trains farmers to run systems sustainably. By strengthening smallholders, SIRP aims to shore up food security, cut poverty, and energise growth (IFAD, 2020). Given that Zimbabwe must secure about 2.1 million tonnes of maize each year (Musemwa et

al., 2022), an honest audit of current food stocks could guide fresh public investment in irrigation, helping the country meet that staple demand.

Food Security

Food security exists when all people, at all times, enjoy physical, economic, and social access to sufficient, safe and nutritious food that meets their dietary needs and cultural preferences for an active, healthy life (FAO, 2021). Stability, availability, access, and utilisation are the four facets of food security. Food availability denotes the actual existence of enough amounts and quality of food, whether locally produced or imported (Mhembwe, 2019). Access denotes the ability of a household to access food, both physically and financially. Utilization refers to whether households have the resources and knowledge to prepare and consume food safely and healthily to meet all physiological needs. The ability of the food system to endure shocks such as natural disasters, economic downturns, or conflicts is referred to as stability. Food security may be attained by addressing all these dimensions. Food security is influenced by various elements, including population growth, wealth, global warming, and climate change, a shortage of arable land, poor soils, and insufficient water for irrigation, technological hurdles, conflict, and poverty. (Abu, 2017). A home that is food secure can always gets enough different foods to suit its nutritional demands. Hunger, malnutrition, ill health, and in severe situations, even death, can be caused by household food insecurity.

Contribution to Food Security

Rain-fed agriculture and irrigation are not antagonistic; rather, they are complementing. When and where water is limited, irrigation scheme revitalisation can help with agricultural diversification, improve food self-sufficiency, boost rural income production, generate foreign exchange, and create jobs (Hanjra et al. 2009).. (FAO, 2011) defined food security as existing ‘when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life. Issues

related to food supply, distribution and the overall aim of meeting the nutritional needs of all members of the household show that food security is clearly linked to its availability and safety. A typical example can be found in Kenya where under the National Irrigation Board (NIB), rice has been used as the main crop, accounting for 90% of rice produced in the Kenya (Kimani et al., 1992).

Smallholder irrigation development has shown throughout the developing world that it can be used as a key drought mitigation measure and as a vehicle for the long-term agricultural and macroeconomic development of a country (FAO, 2000). Successful smallholder irrigation schemes can result in increased productivity, improved income and nutrition, employment creation and food security. Numerous empirical studies across the world have shown that revitalisation of irrigation schemes has positive impact on food security and poverty (Anwar et al., 2013). With this in mind, many developing countries affected by droughts and floods promote irrigation interventions to reduce poverty and to promote food security.

Globally, food projections indicate that food prices in the next three decades will likely be stable or decline, but progress in reducing malnutrition in developing countries will be slow (FAO 2012). According to FAO (2012), Statistics have shown that small shortfalls in crop productivity growth would lead to rising food prices and worsening malnutrition (FAO, 2012). Increased food production from irrigation is essential, and will require the expansion of irrigated area and water supplies, and improved efficiency of the use of existing water supplies.

Food and Nutrition Security

Food and nutrition insecurity remains a global concern and is more prevalent among Sub-Saharan African (SSA) countries, including Zimbabwe. Thus, the Zimbabwean government pledges in its National Development Strategy 1 (NDS 1) to support and guarantee food and nutrition security for every citizen (FAO, 2022). The NDS 1 seeks to enhance food self-sufficiency from 45% to 100% (between the years 2019 and 2030), reduce food insecurity to less than 10%, and restore the country's bread basket status by the year 2025 (World Bank ,2020). In Zimbabwe, an estimated 29%

of the urban population (1.5 million people) and 19% of the rural population (1.9 million people) are food insecure (ZIMvac, 2022). It is reported that the high rate of poverty is the leading cause of food and nutrition insecurity in the country. Approximately 71% of the population is classified as poor, with 29% of them being extremely poor based on the local Total Consumption Poverty Line (TCPL), which is set at USD 2.31 per day(Banana et al.,2020) . Furthermore, food and nutrition insecurity were made worse by the COVID-19 pandemic's disruption of the nation's food supply systems. The Zimbabwean government has prioritised the development of smallholder irrigation and the rehabilitation of dilapidated irrigation infrastructure, as stipulated in NDS 1 as strategies to enhance food and nutrition security.

2.2 EMPIRICAL LITERATURE REVIEW

Contribution of revitalisation to household income and profitability levels

In rural areas, irrigation revitalisation makes a substantial financial contribution at the family level. Since the majority of rural households are unemployed, most families earn relatively little money, which may not be sufficient to pay for necessities. Cooking oil, paraffin, and other home necessities are paid for with the money received from the sale of crops. Members can also pay for their children's tuition and exercise materials among other educational necessities. Irrigation revitalisation has a long-term economic impact on rural households' income and, ultimately, livelihoods, according to earlier case studies (Kundlande et al., 1994).

Food production from irrigated farms is a major source of wealth creation to the extent that it is the basis for economic growth in a number of localities. The income generated provides funds for purchaser of irrigation development to make up an important and growing proportion of the products used before by processing firms. It is crucial to remember that cooperation is uncommon in rural areas and that when it does occur, it might not be effective enough to draw in big businesses. However, this should not compel one to draw the conclusion that irrigation revitalisation has no beneficial impact on rural livelihoods, regardless of how minor.

Contribution of revitalisation of irrigation schemes to Household Dietary Diversity (HDD)

The range of food groups or types consumed over a given time period is referred to as dietary diversity (Gernaat et al., 2022). By classifying food groups according to their nutrient content, the dietary diversity evaluates a household's dietary variety score (Mupangwa et al., 2022). An increase in dietary diversity enhances a household's likelihood of achieving food security (FAO, 2021). Dietary diversity can be measured at the household or individual level, with the Household Dietary Diversity Score (HDDS) indicating a household's ability to access food and its socioeconomic status (Kennedy et al., 2011). The Household Dietary Diversity Score (HDDS) counts the number of food groups a household consumes over a set recall period—usually the previous 24 hours (Mason et al., 2020). Repeated studies show that revitalising irrigation schemes is positively associated with greater household dietary diversity (Makonnen et al., 2022). However, critics argue that the HDDs has limitations, such as only being effective in households that consume common foods like cereals, vegetables, and meat (Swindale, 2007). Moreover, there is no consensus on the ideal number of food groups that indicate adequate dietary quality (FAO, 2008).

2.4 CONCEPTUAL FRAMEWORK

Irrigation revitalisation -Household Livelihoods Linkages

Irrigation revitalisation is necessary for advancing rural development and enhancing the all-year-round livelihoods of poor rural farmers (Mupaso et al., 2014). (Moyo et al. 2016) anticipated that irrigation protects against mid-season dry spells and droughts, enabling irrigators to cultivate crops year-round and boost production. Conversely, small-scale irrigation is seen as essential to increasing agricultural productivity and progressively enhancing rural communities' resilience, and it is being explored more and more as a way to lessen the effects of climate change and variability (Sakaki et al., 2011). Numerous factors need to be taken into account in order to improve small

-scale irrigation schemes and raise household incomes. Factors such as high water and labour supply, provision of credit services and agricultural chemicals, good irrigation infrastructure and management practices, support of government and development agents (DAs) are all very essential. Therefore, by using these inputs, we can increase rural people's household incomes, livelihood diversification, agricultural intensification, productivity, employment opportunities, income variance and resilience to risk, and participation in community decisions (Chiroro et al., 2015)

The conceptual framework below illustrates the pathways through which the (SIRI developments influence household's livelihoods in rural areas, thereby reducing the present chronic failure to meet food requirements and income generation problem in particular and poverty in general. Revitalisation of Irrigations serves as a productive asset, transforming agricultural livelihoods through five key pathways which include crop yield, household dietary diversity, productivity, agricultural intensification, household income, crop diversification and employment opportunities which can ultimately lead to changes in household livelihoods (Smith et al., 2018).

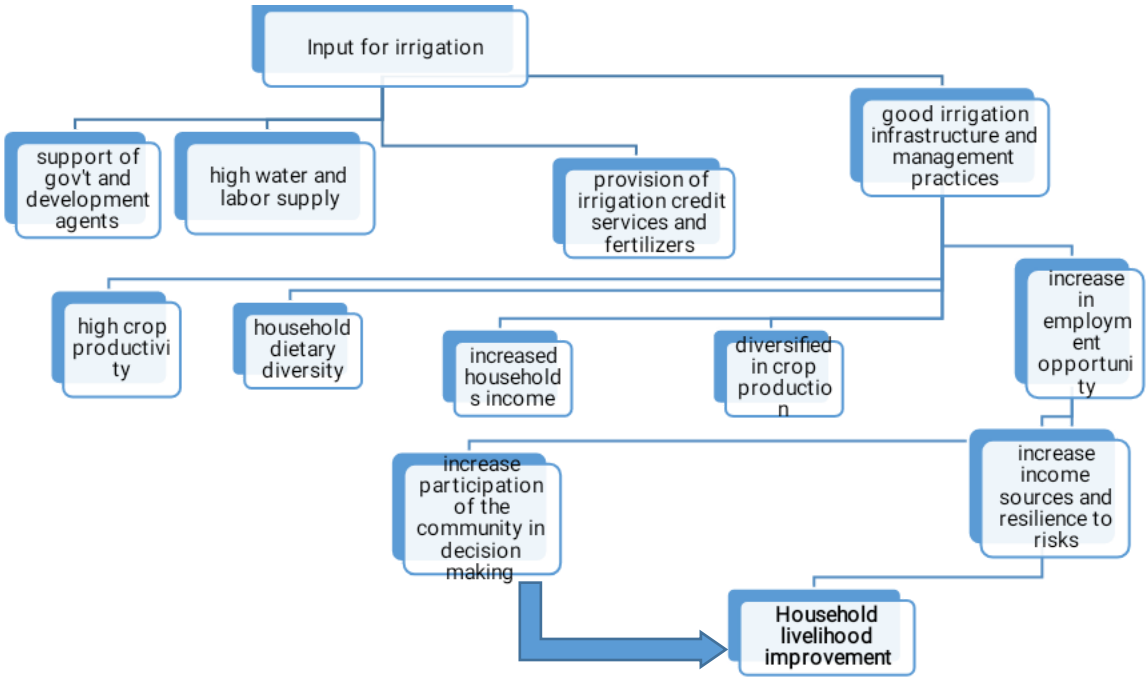


Figure 2. 1: Irrigation –Household livelihoods

Source: Smith et al., 2018

As illustrated above, the five main pathways which include the high productivity, agricultural intensification, household income, crop diversification and employment opportunity are explained below.

High Crop Productivity Pathway

Yield increases because of additional plant water availability and the linear relationship between transpiration and yield (World Bank., 2019). Revitalisation of irrigations makes control of the quantity and timing of water availability more precise, supporting crop establishment, growth, and yield. It can make crop production

possible in places where rainfall and soil moisture are insufficient or intensify production through second and sometimes third cropping's. Water availability through irrigation reduces the risk of crop failure. This in turn increases the expected return on complementary investments, such as seeds and fertilizer (Namara et al., 2012). Traditional varieties provide returns even when water supplies are limited, while high yield varieties (HYVs) provide no return.

Increased Household Income Pathway

There is clear evidence that taking part in irrigated farming lifts household income, raises spending on food, and broadens the mix of foods eaten. Bhattarai et al. (2022) explored this link in four South Asian nations and observed that families connected to rehabilitated canals earned, on average, one-quarter more than neighbours lacking such water. Their advantage came from bigger harvests and the chance to branch out into several farm enterprises made possible by a steady flow of water (Pandy, 2022).

Across sub-Saharan Africa, a multi-country investigation reached a similar conclusion: once old schemes were revived, participating households recorded incomes roughly thirty per cent above earlier levels (World Bank, 2023). Greater yields were only part of the story; dependable irrigation also opened room for high-value cash crops that generated extra cash for rural households. Seeking the underlying drivers, Kumar et al. (2024) studied Indian villages and confirmed that revitalised systems promoted diversification, a pivotal source of income growth. They noted that farmers with functioning canals were far more inclined to plant vegetables and fruit, keep livestock, and run other non-crop ventures, all of which combined to lift overall earnings (Kumar et al., 2024). These empirical findings collectively underscore the transformative role that reliable water infrastructure plays in rural livelihoods.

Crop Production Pathway

Reliable water changes everything for a smallholder. When an irrigation scheme is

revived, farmers no longer have to gamble on erratic rain, so they start to diversify. Kumar et al. (2023) show that irrigated households are far more likely to plant fruit and vegetables—crops that fetch higher prices than maize or sorghum—and the extra cash is often reinvested on-farm.

Revitalised canals also make it possible to squeeze two or even three harvests into a single year (Johnson, 2024). Double- and triple-cropping maximises every hectare and spreads risk: if one crop fails or market prices crash, others can cushion the blow (Lee, 2024).

Patel et al. (2024) add another layer: dependable water gives farmers the confidence to try new ideas. They experiment with intercropping, agroforestry, and improved seed varieties, all of which boost biodiversity, build healthier soils, and cut losses to pests and disease. In short, revitalised irrigation promotes a more diverse, resilient, and profitable farming system.

Employment Opportunity Pathway

Research demonstrates that revitalising irrigation systems affects employment by ramping up farm productivity. According to the Food and Agriculture Organization (FAO, 2020), dependable irrigation can, in certain contexts, double average crop yields outright for smallholders worldwide. This surge in output translates into expanded production targets and, consequently, heightened demand for field labourers locally. Reliable water lets farmers expand acreage and diversify crops, prompting them to recruit seasonal and permanent workers for land preparation, weeding, harvest, storage, and sales (World Bank, 2017).

An International Labour Organization assessment (ILO, 2019) notes that refurbishing canals and pumps itself generates thousands of construction, transport, and engineering jobs for local residents.Though temporary, these earnings circulate within rural economies, cushioning households from poverty during the rehabilitation phase financially.
Operating schemes then broaden employment beyond classic farming through

profitable downstream value chains.As yields climb, many growers venture into milling, drying, or direct marketing to capture additional margins locally.

This evolution encourages the rise of agro-based enterprises that supply processing, packaging, refrigeration, and distribution services, each supplying technicians, drivers, clerks, and managers (Singh, 2021). In districts already served by revitalised networks, farmers increasingly purchase quality-enhancing equipment, unlock urban and export markets, and thereby generate even more diverse, sustained employment opportunities across the entire local economy.

2.5 INSIGHTS FROM LITERATURE REVIEW

Irrigation revitalisation consistently emerges as a game-changer for farm productivity. FAO (2020) reports that dependable, well-timed water can, in some settings, double yields, while Namara (2012) explains that the key lies in matching water delivery to each crop's growth stage. With the threat of moisture stress removed, farmers are willing to invest in high-yield seed, fertiliser, and other inputs because the risk of total crop failure drops sharply.

Higher yields quickly translate into higher incomes, especially when market access and favourable prices coincide. Pandy (2022) found that irrigating households earn about 25 percent more than rain-fed neighbours, chiefly because they harvest—and often sell—larger surpluses. A World Bank (2023) review of sub-Saharan Africa paints a similar picture: families linked to rehabilitated schemes lifted their earnings by roughly 30 percent once reliable water was restored.

Access to irrigation does more than raise output; it encourages farmers to diversify. Studies by Kumar et al. (2023) and Johnson et al. (2024) show that steady water supplies make it feasible to grow high-value fruits and vegetables and to run two or even three cropping cycles a year. That diversity spreads climatic and price risk and keeps land working year-round. Patel et al. (2024) add that farmers with revitalised schemes are more willing to trial new varieties, intercropping, and other sustainable

practices, further strengthening resilience.

Finally, the employment ripple is substantial. FAO (2020) and the World Bank (2017) note that expanded acreage and multiple harvests drive up demand for field labour. The benefits start even earlier: ILO (2019) documents thousands of construction and transport jobs generated while canals, pumps, and roads are being refurbished. Once water is flowing, higher farm output supports agro-processing, packaging, and marketing enterprises, creating a wider array of non-farm jobs for rural households (Singh, 2021).

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

Research is the careful, objective investigation of facts that allows scholars to identify problems, test explanations, and reach reliable conclusions. It involves the systematic study of existing information and sources so that new insights can be generated and sound solutions proposed. In the context of the present study, that investigation centres on how the revitalisation of smallholder irrigation schemes affects household food diversification. Following Dawson's (2002) description of the research process—redefining a problem, formulating hypotheses, collecting and organising evidence, and drawing reasoned inferences—this chapter details the procedures used to gather, analyse, and present the data. It outlines the unit of analysis, the sampling strategy, and the specific tools employed to obtain information on household diets, crop choices, and irrigation performance. The chapter also situates the study geographically, defines the target population, and explains how sample size was determined. It then describes the instruments and protocols used during fieldwork, distinguishes between primary and secondary data,

and sets out the statistical and qualitative techniques applied in the analysis. Collectively, these elements form the research design that guides every stage of the inquiry.

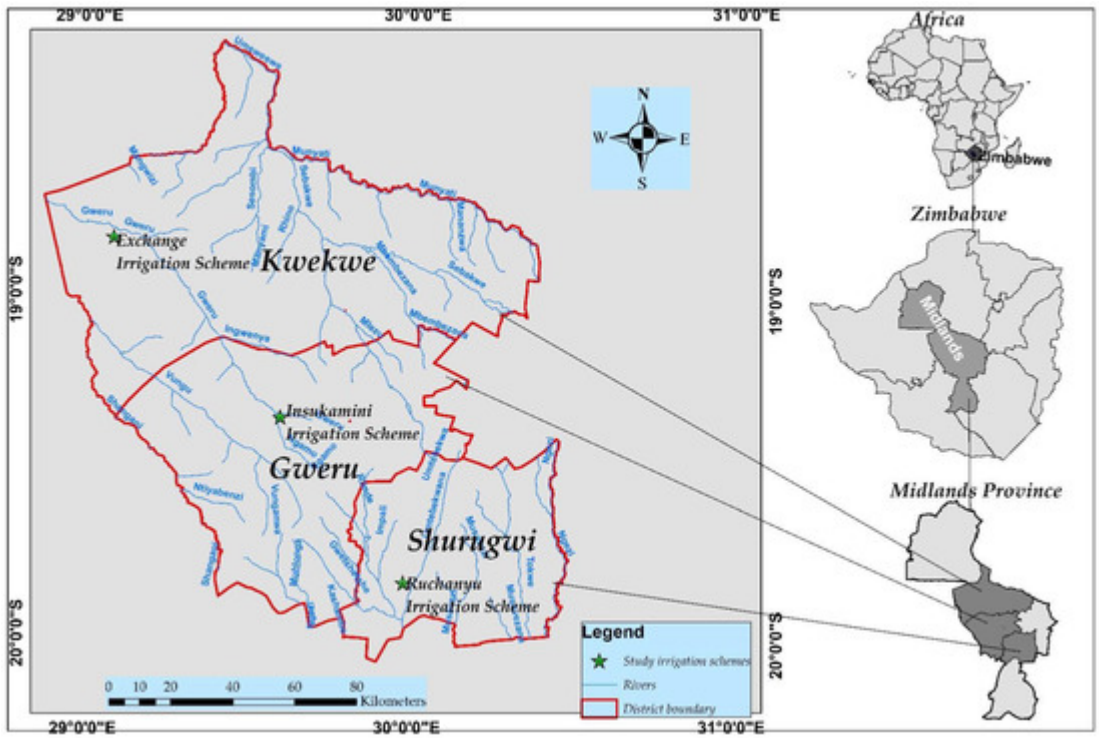
3.2 DESCRIPTION OF STUDY AREA

3.2.1 Location

Gweru, the administrative heart of Zimbabwe's Midlands Province, sits on a plateau roughly 1 200 m above sea level. From this vantage, the city anchors a district that blends fertile farmland, expanding suburbs, and stretches of natural woodland, giving it strategic weight for both agriculture and commerce. The 2022 census conducted by the Zimbabwe National Statistics Agency (ZNSA) put the district's population at 231 675. Of greater concern, the same survey recorded a poverty incidence of 38.4 percent, meaning more than a third of residents fall below the national poverty line. Such figures point to persistent gaps in access to basic services, low household incomes, and limited asset ownership—conditions that hinder social mobility and stall local development. Against this backdrop, efforts like the Irrigation Revitalisation Initiative take on added significance: by equipping smallholder farmers with reliable water, the programme aims to lift farm productivity, raise earnings, and soften the district's poverty burden.

Population pressure compounds these challenges. With 53.6 inhabitants per square kilometre, Gweru District is markedly more crowded than the national average of 35.5 people per square kilometre (ZNSA, 2022). Much of that density reflects the city's pull as a provincial economic and administrative centre; rural migrants arrive in search of jobs, schooling, and public services unavailable in their home wards. While this inflow stimulates local markets, it also strains infrastructure and public budgets. In short, Gweru's relatively high poverty rate and population density underscore the urgency of targeted interventions that can expand livelihoods, strengthen food security, and foster inclusive growth across the district. In terms of the district's area coverage, Gweru District makes up approximately 4.3% of the total land area of the Midlands province, which is 159,213 square kilometres (ZNSA, 2022).

The map of the study area is shown below in Figure 3.1, which highlights the location of Insukamini Irrigation Scheme in Gweru District, Midlands Province. Additionally, the district's proximity to Harare, approximately 270km, and its rural setting makes it an ideal location for studying the socio-economic analysis of revitalisation of irrigation schemes and its contributions to household income, profits and dietary diversity. Gweru has Shurugwi district to the southeast, Chirumhanzu to the east , Insiza District southwest, Bubi District to the west, Nkayi District northwest and Kwekwe District north.



Gweru district Figure 3.1: Study map of Midlands Province

Source: Author

3.2.2 Population and Area Coverage

Gweru District, the focus of this study, has a population of 231.675 individuals, according to the 2022 population census (ZIMSTAT, 2022). The district's residents are spread across 28 wards. Women make up roughly 54 percent of the population

and men about 46 percent. Within this landscape, the Insukamini irrigation scheme—focal point of the present study—extends over wards 25, 26, and 28. The system supplies water to some 300 farming households, each averaging 3.3 members (Ministry of Agriculture, 2020).

3.2.3 Climatic Conditions

Gweru District, situated in central Zimbabwe, sits within Natural Region III and experiences a semi-arid climate shaped by both altitude and broader southern-African weather systems. Annual rainfall averages about 600 mm, most of it falling during the hot, wet season that stretches from November to March. Because the district lies roughly 1 450 m above sea level, temperatures remain more moderate than in the country's lower-lying areas, yet the summer months can still turn quite warm when afternoon storms roll through. Outside the rainy season, skies are mostly clear and humidity is low, giving way to cool, dry winters.

3.2.4 Agricultural Activities

Gweru District in central Zimbabwe supports a varied agricultural economy that underpins most household livelihoods. Farmers devote much of their land to staple cereals—maize, sorghum, and millet—which secure local food needs. Several cash crops, notably tobacco, cotton, and soybeans, provide vital income and link smallholders to national and export markets. Livestock is equally important. Large herds of beef and dairy cattle mirror the animal's cultural and economic value, while goats, sheep, and village poultry supply meat, milk, eggs, and quick cash when required. This mixed-farming portfolio spreads risk, improves household nutrition, and buffers families against erratic weather or price swings. Recently, many producers have embraced rehabilitated irrigation schemes to lift yields and quality, especially for water-sensitive, high-value horticultural crops. Access to reliable water has encouraged year-round production, enlarged marketable surpluses, and strengthened the district's overall food security and income base. Extension services increasingly support these changes with training and inputs.

3.2.5 Economic Activities

Gweru's economy rests on four main pillars—agriculture, mining, manufacturing and trade—each weaving together to sustain livelihoods across the district. Fertile surrounds supply grain, beef and horticultural produce, while the city's proximity to rich seams of gold, chrome, iron, asbestos and limestone anchors a busy mining sector. Raw minerals, in turn, feed local factories that turn out textiles, dairy goods and construction materials. One standout is the Bata Shoe Company, among Zimbabwe's oldest manufacturers and still a major employer. Gweru's industrial footprint is reinforced by its position on the Harare–Bulawayo highway and the national rail line, which cut transport costs and speed goods to market. Those arteries also fuel a vibrant trading scene: farmers, miners and factory owners funnel output into city depots and wholesale yards, where it is sorted, priced and dispatched nationwide. A growing network of small and medium-sized enterprises rounds out this commercial ecosystem, supplying everything from mechanics' services to retail staples and thereby deepening local economic resilience.

3.2.6 Insukamini Irrigation Scheme

The Zimbabwean government first created the Insukamini irrigation scheme in 1988. With a 38x106 cubic meter (m3) capacity, the Insukamini dam can supply 600 mega litres of agricultural water annually. With an annual allocation of 12 mega litres per hectare, the available water can sustain the development of 50 hectares, and it has been extended to 200 hectares under irrigation revitalisation. The region is perfect for any kind of irrigation system because it is primarily level with a 2.5% slope. The soils are somewhat deep clay loams that are naturally fertile. The plan makes use of the canal system and extracts water from the Insukamini dam. It is situated in Midlands's province's region three and is owned collectively, roughly twenty-five miles (25 km) away from Gweru. Insukamini irrigation is located in Gweru District's wards 25, 26, and 28. Despite the arid surroundings, the irrigation system creates a verdant haven of life that can be seen for miles. Blocks A, B, C, and D, is the four (4) blocks (clusters) that make up the Insukamini irrigation plan.

3.3 RESEARCH DESIGN

The study adopted a cross-sectional design because it offers a fast, cost-effective snapshot of current conditions. A cross-sectional survey collects information from a sample of the population at one point in time, capturing prevailing characteristics, attitudes and behaviours without the long follow-up required in longitudinal work (Maier et al., 2023; Zangirolami et al., 2018). To build a rounded picture of the irrigation scheme, the research team blended quantitative and qualitative tools. Household questionnaires generated numerical data on production, income and diet, while semi-structured interviews with beneficiary families and agricultural extension officers added context. Focus-group discussions and field observations further enriched the evidence base. Together, these methods delivered timely, reliable insights into the current performance of the revitalised scheme and its effects on participating households.

3.3.1 Research Approach

Both quantitative (home survey questionnaire) and qualitative (focus group discussions, key informant interviews, and field observations) methods were used to collect the data. Demographic information, household dietary diversity, observed crop improvements, household incomes, and household participation were all gathered through the household survey questionnaire. Tables that offered a more thorough examination of the results were then produced using the supplied data.

3.4 SAMPLING TECHNIQUES AND SAMPLE SIZE

To choose the participants, the study used a multistage cluster and purposive sampling technique. Block A, Block B, Block C, and Block D are the four (4) blocks (clusters) that make up the Insukamini irrigation scheme.

STAGE 1:

Gweru District was purposively chosen as the study area in the first stage due to its high number of revitalised irrigation schemes and drought frequency. Next, the

Insukamini irrigation scheme within the district was selected, the largest in the district, was selected using purposive sampling. The scheme covers wards 25, 26, and 28 and has undergone expansion under the Smallholder Irrigation Revitalisation Initiative (SIR1). The Insukamini irrigation scheme is divided into four (4) blocks (clusters), that are Block A, Block B, Block C and Block D.

STAGE 2:

The researcher used the sample size determination formula developed by Krejcie & Morgan (1970), which offers a reference for choosing a suitable sample size given a known population size of 300 scheme beneficiaries. The sample size calculation formula is as follows:

$$S = \frac{X^2 NP(1-P)}{d^2(N-1)+X^2P(1-P)}$$

S = required sample size

X^2 = 95% or 1.96 (confidence level)

N = Population size

P = 0.5(population proportion)

d = 0.05(degree of accuracy)

THEREFORE: $S = \frac{1.96^2(300\times0.5)(1-0.5)}{0.05^2(300-1)+(1.96^2\times0.5)(1-0.5)}$

S= 67.844

S= 68

From the calculation above, 68 households were sampled at first and these households were taken across all blocks.

STAGE 3:

Since the Insukamini irrigation scheme was divided into four (4) blocks (clusters), Block A, Block B, Block C and Block D.The researcher obtained a list from both 4 extension officers as each and every block had own extension officer. The list indicated number of households in each and every block.

Table 3.1: shows number of households per each block of Insukamini Irrigation Scheme

BLOCK NAME	BENEFICIERIES		TOTAL
	FEMALE	MALE	
BLOCK A	30	45	75
BLOCK B	39	36	75
BLOCK C	36	39	75
BLOCK D	45	30	75

TOTAL	**150**	**150**	**300**

From the given table above, this tells the researcher that the scheme consist of 150 males and 150 females and they were all equally distributed across all the blocks, each block consist of 75 households, however the researcher only requires a sample of 68 households. A stratified random sampling was employed dividing the whole sample by the number of blocks. This result in 17 households being obtained from each block and they were randomly selected using a balloting method. This method was applied using slips of paper, 17 were written YES and the rest with NO and the ones who picked YES are the ones interviewed. The result of the random sampling method was given below:

Table 3.3: Sample size per irrigation block of the Insukamini irrigation Scheme

BLOCK NAME	SAMPLE IRRIGATORS		TOTAL SAMPLE
	FEMALE	**MALE**	
BLOCK A	9	8	17
BLOCK B	11	6	17
BLOCK C	0	17	17
BLOCK D	13	4	17
TOTAL	**33**	**35**	**68**

From the table above 68 households were sampled and the sample was taken across all four blocks. 68 households were selected from the table above, and the sample was drawn from each of the four blocks.

3.5 DATA COLLECTION METHOD

Table 3.4 Summary of data collection

OBJECTIVES	DATA TO BE GATHERED	DATA GATHERING TOOL	RESPONDENTS
1. To determine the level of income generation derived from revitalising the scheme.	Fixed and variable Cost incurred and revenues generated by beneficiary irrigators.	Household Survey questionnaire and face to face interview	Household members or beneficiary irrigators
2. To determine the contribution of revitalising the scheme on	Number of food groups (out of 12 food groups) consumed by each household in the	(HDDS) Household Dietary Diversity Questionnaire, face to face interviews	Household members or beneficiary irrigators

Household Dietary Diversity.	past 24 hours.		
3. To determine the level of profitability amongst smallholder farmers of Insukamini.	Total revenues generated, Total costs (fixed and variable costs) incurred.	Household Survey questionnaire, face to face interviews	Household members or beneficiary irrigators

Source: Survey Data (2025)

The table above presents a summary of the data collection methods which are discussed below.

3.5.1 Data Types and Sources

In order to collect primary data from Insukamini irrigation scheme beneficiaries, this study used a mixed-methods approach that combined quantitative and qualitative data collection techniques. To collect the numerical data, the team administered a pre-tested, structured questionnaire that captured household dietary diversity scores, demographic details, cropping practices, average annual income, profit levels, and any recent shifts in livelihood status. To complement those figures, researchers held key-informant interviews with local leaders and extension staff, as well as focus-group discussions with irrigators themselves. These conversations explored the day-to-day challenges of running the scheme and the perceived impact of reliable water on household welfare. Combining surveys with interviews and group dialogue allowed the study to triangulate evidence, strengthening both the validity and the reliability of its findings while adding the richer, experience-based insights that

numbers alone cannot provide.

3.5.2 Data Collection Techniques

The research team designed a structured questionnaire to gather detailed household -level information. It was first drafted in English and then translated into Shona so that every respondent could follow the questions comfortably. The instrument combined mostly close-ended items with a few open-ended prompts, yielding both the quantitative data required for statistical analysis and the qualitative insights needed to understand respondents' perspectives. Four principal themes were covered: household demographics, dietary diversity (HDDS), income and profit attributable to the revitalised irrigation scheme, and broader socioeconomic characteristics. This blend of question types and thematic areas provided a balanced picture of how the scheme is influencing household livelihoods. Additionally, two focus group discussions (FGDs) were conducted; each comprising 8-10 randomly selected beneficiary men and women of Insukamini irrigation scheme. The FGDs aimed to gather qualitative insights and challenges faced by farmers after the revitalisation, and the effects on their livelihoods. The output from the FGDs informed the design of the household questionnaire and provided supplementary qualitative evidence. Furthermore, key informant interviews were conducted with conveniently selected informants, AGRITEX extension officers and the lead farmers, to gather expert insights into farming standards, current production status, and effects of the irrigation scheme. This multi-faceted approach ensured a rich and comprehensive dataset, enabling a deeper understanding of the research topic.

3.6 METHODS OF DATA ANALYSIS

Table 3.5: Summary of data analysis

OBJECTIVES	DATA COLLECTED	DATA ANALYSIS TOOL

1. To determine the level of income generation derived from revitalising the scheme.	Fixed and variable Cost and revenues incurred by beneficiaries.	• Descriptive statistics • Gross profit margin(model) • Return on Investment • Cost benefit Ratios
2. To determine the contribution of revitalising the scheme on Household Dietary Diversity.	Number of food groups (out of 6 food groups) consumed by each household in the past 24 hours.	• Calculate (HDDs) • Descriptive statistics
3. To determine the level of profitability amongst smallholder farmers of Insukamini.	Percentage of households whose income increased. Percentage increase in income for beneficiary irrigators.	• Descriptive Statistics • Gross Profit Margin • Return on Investment • Cost benefit ratios

Source: Survey Data (2025)

The table above presents a summary of the data analysis method discussed below.

3.6.1 Data Analysis

To determine profitability, gross margins per individual family were determined. According to Andrés et al. (2011), this is the revenue less all variable expenses. Data presentation was done using tables. The costs considered here were inputs costs (fertilizer, fungicides, pesticides, herbicides, and seed), repairs and maintenance costs, labour costs (from planting up to harvest), fuel, rent and transportation costs. Profitability has numerous measurements, with exotic names and abbreviations, which is an indication that there is not a single way to express profitability (Lutzs, 2010). This study has found Gross Profit Margin (GPM), Return on Investment (ROI) and Benefit Cost Ratio (BCR) significant in the analysis of profitability of Revitalising irrigation scheme. (Gambo, 2015).

Model Specification

Gross Margin Model

GM = TR – TVC

Profit = GM – TC

TC = TVC + TFC

Gross Profit Margin = Profit\TR x 100

Return on Investment = Profit\TVC x 100

Benefit Cost Ratio = TR/TVC

Where:

GM = Gross margin

TR = Total revenue

TVC = Total variable cost

TC = Total cost

TFC = Total fixed cost

3.6.2 Statistical Analysis

After data collection, cleaning, editing, and coding, the data was entered into the Statistical Package for Social Sciences (SPSS) programme version 20.0 software for analysis. A mixed-methods approach was adopted, combining both quantitative and qualitative data analysis techniques. The quantitative data was analysed using descriptive statistics, such as frequency distribution, charts, mean, maximum, minimum, percentage distribution, and standard deviation. Additionally, the Gross Profit Margin, Return on investment and Cost Benefit ratio was utilised to analyse the amount of revenue generation and the profitability levels of beneficiary irrigators. The Household Dietary Diversity Score (HDDs) were derived utilising the frequency-of-occurrence questions. To provide meaning to all of the text, audio, video, and picture data gathered from key informant interviews and focus group discussions, a theme (thematic) analysis was used to analyse the qualitative data.

3.6.3 Quality Control Procedures

To reduce researcher and respondent bias, some methodological quality control procedures were followed. These included randomization in respondent selection, augmenting the questionnaire with face-to-face-interviews and field observation (triangulation), pilot-testing of research instruments, uniformed day of visit, data cleaning and strict management.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 INTRODUCTION

The study's results and analysis are presented in this chapter, which is broken up into three smaller sections. The demographic details of the respondents (beneficiary irrigators) are shown in the first subsection, which evaluates the gender, age, and educational attainment of the household head. Using descriptive statistics like mean, percentages, and frequencies to characterise the features of sampled households across multiple explanatory variables, the second subsection illustrates how revitalisation contributes to household dietary diversity among smallholder farmers of the Insukamini irrigation scheme. The impact of revitalisation on revenue generation and profitability is the subject of the third subsection.

4.1 DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

A total of 68 beneficiary irrigators composed the study sample. Of these 68 farmers 35 (51, 5%) were male and 33 (48, 6%) were female. In terms of the age, majority of the respondents ranges between 45 – 50years (29, 4%) followed by 50 – 60 which constitute 22.5%. This shows that majority of the smallholder farmers of Insukamini under study were not too old. The results presents that the young age are less involved in the irrigation scheme, as the results shows only 5 in 68 farmers ranges between 20-30 and very few above 55 years of age.

The level of education on average was the primary level (47.1%) followed by no education level (26.5%) and about 16(23.5%) attained tertiary level. Also, during the study, respondents were asked to indicate their marital status. Additionally, respondents were asked to identify whether they were married during the study. According to this study, marital status is a factor that significantly affects family issues. It was found that 17.6% and 14.7% were widowed and single, while 58.8% and 8.8% were married and divorced. Due to the labour supply, married couples are likely to be more productive than single people. As a result, they can divide up farm chores

like irrigation and/or non-farm activities. These findings are consistent with those of Stancanelli et al. (2012), who discovered that marriage affects the production process by increasing the amount of labour available in the home.

Table 4.1 showing demographic characteristics (Gender and Age)

CHARACTERISTICS	FREQUENCY	PERCENTAGE
SEX		
Female	33	48.6
Male	35	51.5
TOTAL	68	100.0
AGE		
20-30	5	7.4
30-45	16	17.6
45-50	20	29.4

50-60	15	22.5
61 and above	12	23.5
TOTAL	68	100.0

Source: Survey Results 2025

Table 4.2 showing demographic characteristics (level of education and marital status)

CHARACTERISTICS	FREQUENCY	PERCENTAGE
Level of education		
1.No education	18	26.5
2. Primary	32	47.5
3.Secondary	2	2.9
4.Tertiary	16	23.5
TOTAL	68	100.0

Marital Status		
1.Married	40	58.8
2.Single	12	17.6
3.Divorced	6	8.8
4.Widowed	10	14.7
TOTAL	68	100.0

Source: Survey Results 2025

4.2 AVAILABILITY AND CONSUMPTION PATTERNS

Table 4.3 Household Dietary Diversity Score (HDDS) of Beneficiary Irrigators

Beneficiary Irrigators		Percentage (%)	TOTAL
Household Dietary Diversity(HDD)	Food insecure(1-3 food groups)	10.1%	10.1%

Total	Mildly food insecure(4-7 food groups)	42.2%	42.2%
	Food secure(7-12 food groups)	47.7%	47.7%
		100.0%	**100.0%**

Source: Survey Results 2025

The results of the survey in Table 4.3 shows that out of 68 sampled households of the Insukamini irrigation scheme, beneficiary households had a high dietary diversity of 47.7% for three food groups and a medium dietary diversity of 42.2% for 3 groups. It was found that only 10.1% of beneficiary households had low dietary diversity of less than 1-3 food groups. These results indicate that the revitalisation of Insukamini irrigation scheme contributes more to household dietary diversity as beneficiary households are highly and moderately food secure. These results are further analysed below to observe the statistical significance of beneficiary status to dietary diversity.

Table 4.4 Descriptive Statistics of Beneficiary (HDDs)

Beneficiary irrigators	N	Mean	Std Deviation	Std Error	95% confidence interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Beneficiaries	68	5.9615	.19418	.02623	0.91	1	0	7
Total	68	5.9615	..19418	.02623	0.91	1	0	7

Source: Survey Results 2025

The table above shows that the average mean dietary diversity score for the study area was 5.96. The beneficiary households of Insukamini irrigation scheme, on average, consumed 5.96 food groups out of 12 food groups in the past 24 hours before the survey. The standard error of 0.03 indicates the precision of the mean

estimate, suggesting that if multiple samples of beneficiary households were taken, and calculate the mean HDD score each time, 95% of the time, the true population mean would fall within ±0.03. On the other hand, the standard error is slightly higher at 0.19 for beneficiary households indicating a lower precision in estimating the population mean based on the sample mean. Overall, these results suggest that beneficiary households that had high mean dietary diversity scores have potentially more variability in dietary diversity. Thus, beneficiaries had access, on average, to more diverse food leading to more food security. The difference in the mean diversity scores between food secure and food insecure is significant at a 1% significant level.

4.3 FACTORS INFLUENCING PARTICIPATION IN THE IRRIGATION

Firstly, a summary of the case processing and the distribution of the outcome variable, Dietary Diversity Score (DDS) were presented as shown in table 4.5 below. The results in the table below reveal that most households (48.1%) have a high dietary diversity score (7-12 food groups), indicating food security. This suggests that most households have access to various foods and can maintain a diverse diet. However, a small proportion of households (19.2%) have a low dietary diversity score (1-3 food groups), indicating food insecurity. This suggests that some households may be struggling to access a variety of foods and may be at risk of malnutrition. Furthermore, an even smaller proportion of households (32.7%) have a mildly low dietary diversity score (4-7 food groups), indicating mild food insecurity. This suggests that some households may be experiencing some difficulties in accessing a variety of foods, but are not yet experiencing severe food insecurity. The results also indicate that there may be some missing data, as 16 cases are missing out of a total of 68. However, the analysis is based on a subpopulation of 16 cases, which is 100% valid.

Table 4.5: Summary of the Distribution of Household Dietary Diversity

	N	MARGINAL %
Household Dietary Diversity(HDD)		
Food Insecure (1-3 food groups)	10	19.2
Mildly Food Insecure(4-7 food groups)	17	32.7
Food Secure(7-12 food groups)	25	48.1
Valid	52	100.0
Missing	16	
Total	68	

Subpopulation	16[a]	

Table 4.6 Main sources of household head income and monthly income from all sources

CHARACTERISTICS	FREQUENCY	PERCENTAGE
Main source of Income		
1.Remmitance	1	1.5
2.dry land crop production\sales	1	1.5
3.irrigation plot production	31	46
4.casual labor	1	1.5
5.begging	1	1.5
6.livestock production\sales	1	1.5
7.skilled trade\artisan	1	1.5

8.own business	1	1.5
9. petty trade	1	1.5
10.pension	1	1.5
11.formal salary\wages	1	1.5
12fishing	1	1.5
13.gifts	1	1.5
14.vegetable production	1	1.5
15.small scale mining\mineral sale	1	1.5
16.beer brewing	1	1.5
17.cash transfers	1	1.5
18.cross border trade	1	1.5
19.currency trade	1	1.5
20.gathering natural products for sale e.g.	1	1.5

firewood		
21.collecting scrap metal	1	1.5
22.rentals	1	1.5
23.others	1	1.5
TOTAL	**68**	**100.0**
MONTHLY INCOME FROM ALL SOURCES		
< 5000	19	27.9
5100-10000	12	17.1
10000-20000	35	51.6
> 20000	2	1.36
TOTAL	**68**	**100.0**

Source: Survey Results 2025

4.4 CHALLENGES FACED IN IRRIGATION SCHEME

The researcher identified some challenges which the beneficiary irrigators of Insukamini were facing on their production. Results summarized in Table 4.7 indicate that 51.5% of respondents faced a challenge on market access and pricing, 26.5% gender disparities, 4.4% crop types, 17.6% size of the land (ha). These results are different from the study done by (Mutami et al., 2012) in Exchange irrigation scheme Kwekwe district of Zimbabwe. They showed that about 35% of respondents faced a challenge of poor water management among beneficiaries due to women who were failing to schedule the irrigation , as a result the communal spirit was affected hence reduce production in the scheme.

Table 4.7 Summary of challenges faced by beneficiary irrigators of Insukamini irrigation scheme

CHARACTERISTICS	FREQUENCY	PERCENTAGE (%)
Main Challenges		
Market Access and Pricing	35	51.5
Gender	18	26.5
Crop Types	3	4.4

Farm Size\land(ha)	12	17.6
TOTAL	**68**	**100.0**

Source: Survey Results

4.5 INCOME AND PROFITABILITY

The average profit for a one growing season was $9703, 333 which means the total income exceeds the total costs, meaning the beneficiaries of Insukamini irrigation scheme are earning profits. The average income was $53785, 333 per one growing season. The average Gross Profit Margin (GPM) was 11,955(11.9%), indicating profitability. A higher GPM is an indication of good management or the efficiency with which production is carried on. Return on Investment (ROI) is a way of relating profits to the capital invested, expressed as a percentage. So in this case, the average return of the investments was 72,258(72.3%) which is very high. A very high ROI percentage indicates profitability of the investment relative to the investment's costs. Benefit Cost Ratio (BCR) used to measure the overall relationship between the relative costs and benefits of the project. In this case, the average BCR was 2,653 which is a favourable relationship.

Table 4.8 Summary of level of income generated and profit of beneficiary Irrigators

Sample Size (Beneficiaries)	Gross Margin	Profit	Gross Profit Margin (%)	Return on Investment	Cost Benefit Ratio
68	3657 402,67	659826.64	812.94	4913.544	180.404

AVERAGE	53785.33	9703.33	11.955	72.258	2.653

4.6 SUMMARY OF THE KEY FINDINGS

The study assessed the socio-economic analysis of revitalisation of an Insukamini irrigation scheme among smallholder farmers in Zimbabwe's semi-arid regions. The results obtained from the study revealed that the highest percentage of age of farmers who practiced in the scheme were between 45-50 followed by 30-45 years and majority's farming experience was between 20-30 years. Most (47.1%) of the beneficiaries were educated up to secondary level followed by those with no education and the majority's land size was between 4-5ha. The gross profit model revealed that revitalization of Insukamini irrigation scheme in Gweru district was profitable because for each and every dollar invested the farmer was expected to obtain $2.653. The beneficiaries benefited the socio-economic services from the revitalization, it contributes to income generation of the households, however the beneficiaries has to reduce the proportion of produces they consume for them to increase sales in order to earn more income. The income derived has been used for paying transport cost to the market, buying inputs and purchasing of household requirements food for instance. Assessments have verified that the advantages led to an enhancement of rural residents' quality of life by maintaining food security in the district. Social benefits such as social networks, physical activity, teamwork, stress relief, and community involvement are crucial for livelihood development and community building. The challenges being faced in the scheme are size of the land, gender, market access and pricing and crop types. The study also analysed the household dietary diversity. The beneficiary's food dietary diversity was measured using the household dietary diversity score (HDDs). The results showed that 47.7% of the households in the study area were food secure, 42.2% were mildly food insecure and 10.1% were food insecure.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

This study assessed the socio-economic analysis of revitalisation of Insukamini irrigation scheme of smallholder's farmers in Zimbabwe's semi-arid regions. Effective irrigation revitalisation has been shown to boost sustainable food production by mitigating crop failure risks. Moreover, irrigation revitalisation enables farmers to cultivate multiple crops per year and diversify their crops, thereby prolonging the productive growing season in areas with dry spells. This, in turn, contributes significantly to improved household income generated, profitability and food dietary diversity for smallholder farmers.

The food dietary diversity of beneficiary households of Insukamini irrigation scheme was measured using a commonly used measure of household food security status known as household dietary diversity score (HDDs). The results of the survey indicate that beneficiary households of Insukamini irrigation scheme have a higher dietary diversity.

5.2 RECOMMENDATIONS

In light of the study's results, the following recommendations are suggested to improve household livelihoods in the study area.

1. Programs to help address the issue of food consumption patterns and income generation, which primarily affects rural people more than urban ones, should be made available to rural households. One way to increase household income is to provide skills development initiatives that household members can use to generate income from agricultural projects (such as raising cattle, sheep, goats, bees, and crops while also farming them with irrigation).

2. The government should spend money on education so that students may learn more, which will lessen the number of individuals moving from rural to urban regions in pursuit of higher education. Aside from that, rural schools and residents must be prepared with agricultural knowledge so they may help ensure household food security and generate revenue by comprehending the function of the irrigation farming market.

3. Increasing crop diversity and agricultural output. A greater range of nutrient-dense crops, such as fruits, vegetables, legumes, and whole grains, should be encouraged by policymakers. This can be accomplished by offering farmers instruction on various and sustainable farming methods as well as agricultural extension services. Furthermore, the diversity of agricultural products can be greatly increased by funding research and development to find crop types that are suitable for the regional agro-ecological circumstances.

4. Improving dietary diversity among smallholder irrigating farmers begins with stronger food-distribution and supply chains. Upgrading feeder roads, storage depots and local markets lowers transport costs, cuts post-harvest losses and makes a wider range of foods affordable throughout the year. Investments in small-scale processing and preservation—such as grain milling, solar drying and cold-storage hubs—help stabilise supplies, while farmer co-operatives and direct-to-consumer outlets give producers better prices and consumers fresher, more varied foods.

5. Beyond infrastructure, dedicated programmes should foster crop diversification and nutrition awareness. Short courses can show farmers

how to integrate legumes, vegetables and small livestock into irrigated plots; complementary lessons on meal planning, food safety and child feeding reinforce the value of that new mix. Linking graduates to wholesale buyers and retail stalls then converts extra output into cash, completing the incentive loop that keeps diets diverse.

6. Because gender roles shape who grows, buys and cooks food, opportunities for men- and women-headed households to share experiences are essential. Peer-to-peer meetings, field days and discussion circles allow participants to swap practical tips, troubleshoot common problems and build mutual support, raising dietary standards across the community.
7. All of these measures should be bundled into an intervention package delivered through joint training and capacity-building initiatives. Agricultural extension agents can handle technical modules, while community leaders, health workers and local officials address social networks, credit access and market logistics. By combining skills development with stronger social capital, the package offers smallholder irrigators the knowledge, confidence and connections they need to sustain more diverse, nutritious diets.

5.3 STUDY LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

Although this study sheds light on how irrigation revitalisation can enhance household dietary diversity, income and profits, its findings are constrained by several factors. First, the work examined only one scheme—the Insukamini irrigation project—so the results may not be transferable to other rehabilitated schemes or to semi-arid districts elsewhere in Zimbabwe. Broader surveys that compare multiple sites would help clarify whether the observed relationships hold across varied ecological and socio-economic settings. Second, the cross-sectional design offered just a snapshot of livelihoods at a single moment; longitudinal research that follows the same households through several seasons would capture longer-term trends, reveal how benefits evolve, and control for seasonal shocks. Third, the study relied solely on the Household Dietary Diversity

Score, a useful but partial proxy for food security. Future work should integrate complementary indicators—such as detailed food-consumption records, nutrient-intake calculations, anthropometric measures, and people's own perceptions of food adequacy—to build a more nuanced picture of nutritional well-being. Together, these refinements would deepen understanding of irrigation's full contribution to rural livelihoods.

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APPENDICES

SOCIO-ECONOMIC ANALYSIS ON REVITALIZATION OF AN IRRIGATION SCHEMES CASE OF INSUKAMINI IRRIGATION SCHEME GWERU DISTRICT, ZIMBABWE.

My name is Mutindi Hardlife, a final year student at Bindura University of Science Education, studying a Bachelor of Science Honours Degree in Agricultural Economics and Management. As part of my degree program, I'm required to carry a research and my research is on SOCIO-ECONOMIC ANALYSIS ON REVITALISATION OF IRRIGATION SCHEMES CASE OF INSUKAMINI IRRIGATION SCHEME GWERU DISTRICT, ZIMBABWE. This research will help by identifying challenges and making recommendations. Your household has been selected by chance from a list of families that benefited from Insukamini irrigation scheme. I want to ask some questions related to the project. Participation in this interview is voluntary. The interview would take approximately 35 minutes and your participation in the interview is highly appreciated. Do you agree to proceed the interview?

1. Yes, proceed with the interview
2. No, stop the interview

Please NOTE that all information provided by the respondent is STRICTLY CONFIDENTIAL and will only be used for academic research. Thank you.

Circle the appropriate response

SECTION A: DEMOGRAPHIC INFORMATION

A1 Household Head gender 1=Female 2=Male

A2 Household Head Age 1=0-15 2=15-20 3=20-30 4=30-45 5=45-50

6=50-60 7=61and above

A3 Marital Status of Household Head 1=Single 2= Married 3=Divorced 4= Widowed

A4 Household Head education attainment 1=no education 2=primary 3=secondary 4=tertiary

A5 Household Head health status 1=Healthy 2= sometimes sick 3= sick

A6 How many people including you live in this Household? ……total

A7 Of these people who live with you how many are aged 1=below 18years….. 2=18-35years 3=over35years

A8 Compared with other villagers in this community, in which of the following income categories do your households belong? 1=Well off 2= Average 3= Poor 4= very poor

SECTION B: PARTICIPATION IN PROJECT ACTIVITIES

B1 Since when was your household involved in Insukamini irrigation scheme

(Year)? ……..

B2 In general, regarding how your participation in project activities has impacted on your living conditions, are you? 1= very satisfied 2= moderately satisfied 3=not satisfied at all

B3 Are there other organizations active in your irrigation scheme or community that promote post-harvest handling and storage 1= YES 2=NO

B4 If you answered yes to B3, to what extent is the contribution of the SIRP project to the benefits that have accrued to your household from participating in activities in postharvest handling and storage of agricultural products? 1=0-25%low 2=26-50%medium 3=51-75%high 4=76-100%very high

SECTION C: LAND USE, AGRICULTURAL PRODUCTION AND IRRIGATION

C1 Do you own productive land? 1=YES 2=NO

C2 What is your cultivatable land area ……

C3 What is the size of your irrigated land area ……

C4 Do you practice dry land cultivation 1= YES 2=NO

C If yes, what crops do you grow? …….

C6 Which crops do you grow in an irrigation plot ……..

SECTION D: INCOME AND PROFITABILITY

D1 Do you have off-farm income?

D2 If yes specify ……, ……, ……..,

D3 Do you have source of household income? 1=YES 2=NO (only subsistence farming)

D4 What is your main source of income for your household? (Use codes below and write corresponding code on the right to)

Income source codes

1. Remittance

2. Dry land crop production/sales,

3. Irrigation plot crop production,

4. Casual labour,

5. Begging,

6. Livestock production/sales,

7. Skilled trade/artisan,

8. Own business,

9. Petty trade,

10. Pension,

11. Formal salary/wages,

12. Fishing,

13 gifts,

14. Vegetables production,

15. Small scale mining/mineral sales,

16 beers brewing,

17. Cash transfers,

18. Cross border trade,

19. Currency trade,

20. Gathering natural products for sale e.g., firewood,

21. Collecting scrap metal,

22. Rentals,

D Approximate monthly household income from all sources ($)

1= Less than $5000 2= $5100- $10000 3=$10100- $20000 4= Above $20000

D6 Approximate monthly household income from the irrigation ($)

(1) < 5000 (2) 5100 – 10 000 (3) > 10000

D7 Do you think that the basic food intake of your household has improved since you start market gardening 1= Yes 2= No

D8 Did you or other household members ever skip a meal because there was not enough money (or food) over the last 6 months

1=Once a week 2=Once a month 3= Once in 3 months 4= Once in 6 months 5= Never

SECTION E: HOUSEHOLD DIETARY DIVERSITY

SECTION TWO*: Appendix 2 HDDs Questionnaire*

NUMBER	FOOD ITEMS	1=YES 2=NO
E1	Did you or others in your household consume any sadza, mahewu maize, maize porridge, rice, sorghum, millet, bread, or other cereals yesterday?	…….
	Did you or others in your household consume any	

E2	potatoes, sweet potatoes, yams, cassava, or any other tuber yesterday?	……
E3	Did you or others in your household consume any beans, peas, groundnuts, peanut butter, or cashew nuts yesterday?	…….
E4	Did you or others in your household consume any vegetables (leaves or roots) yesterday?	……..
E5	Did you or others in your household consume any fruits yesterday?	……
E6	Did you or others in your household consume any beef, goat, chicken, or pork yesterday?	……..
E7	Did you or others in your household consume any eggs yesterday?	……..
E8	Did you or others in your household consume any fish or kapenta yesterday?	…….

E9	Did you or others in your household consume any milk, yogurt, or any other dairy product yesterday?	…….
E10	Did you or others in your household consume any sugar, honey, juice, sweets, or any other sugary foods or drinks	……
E11	Did you or others in your household consume any oils, fats, margarine, or butter added to food or used for cooking yesterday?	……
E12	Did you or others in your household consume any tea, coffee, salt, any type of spice, or tomato sauce yesterday?	……..

THANK YOU FOR YOUR PARTICIPATION