

**THE IMPACT OF NKHAKETSE IRRIGATION PROJECT ON THE AGRICULTURAL
LIVELIHOOD OF THE COMMUNITY IN BUTHA-BUTHE, LESOTHO**

BY

NKOEBE DAVID MALIKHI

(201701870)

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Supervisor: Mr. Sets'abi Sets'abi

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DECLARATION BY CANDIDATE

I, Nkoebe David Malikh, hereby declare that this dissertation is my original work and that it has never been submitted before for examination to any other university or for another qualification. Works of other people used in this dissertation have been correctly acknowledged as such.



DEDICATION

This dissertation is dedicated to my beloved mother, Malebohang Malikhi, my late father Bereng Malikhi, my late brother Lebohang Malikhi and my grandmother, Malerato Chitja.



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I appreciate and give thanks and praise to my author Almighty God for His grace and for seeing me through this study. I also acknowledge the dedication of Mr. Sets'abi Sets'abi, my promoter, for accepting me as his Master's student and for his invaluable guidance, patience and understanding throughout the study; indeed he was more than a father to me. My gratitude also goes to the entire Faculty of Humanities and the Department of Development Studies for the support given me during my studies. My classmates are highly commented and wholeheartedly thanked for their support. The same sentiments are accorded to Mr. Kananelo Moea for scholarly and brotherly concern. Many thanks also to those whom I had the opportunity to interview and for their commitment and sharing of experiences that enriched this study.

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ABSTRACT

The aim of this study is to determine the impact of Nkhaketse Irrigation Project on the livelihood of the communities around the project. Furthermore, the study investigated how the challenges such as low crop yield affected farmer's livelihoods in the area. Irrigation farming has been identified as the backbone of rural development in the world in general and Lesotho in particular. Irrigated agriculture is seen as an important mechanism for creating jobs, poverty reduction and most particularly, to improve livelihoods and food security. In order to achieve the above objective, the study used qualitative research method in gathering data from the main specific objective formulated which was to identify the factors hindering the effectiveness of farmers working on Nkhaketse Irrigation Project.

The result of the study shows that farmers are plagued with major challenges on the irrigation project which has hindered livelihoods in Nkhaketse Irrigation Project. These challenges include the following; lack of market, unskilled labour, lack of capital, restricted fields, lack of transport and theft of crops. Other challenges raised are financial support to the farmers on the project, low level of education among farmers, lack of ownership of land by farmers and lack of proper sanitation (clean water, sewerage and toilets) in the irrigation project. The study finally recommends that the establishment of cooperative will enable farmers to have access to market and capital. This will also enable them to have powers to influence the decision making process of the project to solve the problems that are facing their project. Furthermore, it was recommended that a well-fenced project on the project and a self-managed and sustainable security system supported by the government (Ministry of Agriculture) and other stakeholders would minimize theft of crops on the scheme.



Contents

DEDICATION.....	ii
ACKNOWLEDGEMENTS.....	iii
ABSTRACT.....	iv
LIST OF ACRONYMS.....	x
CHAPTER 1.....	1
BACKGROUND TO THE PROBLEM AND ITS SETTING.....	1
1.0 Introduction.....	1
1.1 Background of the Study.....	1
1.2 Problem Statement.....	7
1.3 Objectives.....	7
1.4 Research Questions.....	8
1.5 Hypotheses.....	8
1.6 Significance of the Study.....	8
1.7 Assumption of the Study.....	8
CHAPTER 2.....	10
LITERATURE REVIEW.....	10
2.0 Introduction.....	10
2.1 Economic Contribution of Irrigation Project and Livelihoods of the Community.....	10
2.2 Scarcity of Water and the Livelihood of the Community.....	12
2.3 Community Participation and Performance of Irrigation Project.....	13
2.4 Low Crop Yields.....	16
2.5 Theories on Effectiveness of Irrigation Project on the Livelihood of the Community.....	16
2.5.1 Sustainability Theory.....	17
2.5.2 Classical Contingency Theory.....	18
2.5.3 Complex System Theory.....	20
2.6 Irrigation Revitalization.....	23
2.7 Strategic Partnerships.....	23
2.8 CHAPTER SUMMARY.....	24
CHAPTER 3.....	26



RESEARCH METHODOLOGY	26
3.0 Introduction	26
3.1 Research Paradigm	26
3.2 Research Methodology	28
3.3 Description of the Study Area	29
3.4. Description of Research Design	29
3.5. Units of Analysis	30
3.6. Sampling Techniques	30
3.6 Purposive Sampling	31
3.7. Data Collection Techniques	31
3.7.1 Data Collection Instruments	32
3.7.2 Interviews	32
3.7.3 Semi- Structured Interviews	33
3.8. Data Analysis	33
3.8.1 Qualitative Data Analysis	33
3.8.2 Thematic Analysis	34
3.8.3 Rigour in Research	35
3.8.4. Transcription	36
3.9. Research Ethics	36
3.9.1. Informed Consent	37
3.9.2. Protection of the Vulnerable Participants	37
3.9.3. Beneficence	37
3.9.4 Justice	38
3.9.5 The Right to Fair Treatment	38
3.9.6 The right to Privacy	38
3.9.7 Confidentiality	38
3. 9.8 Chapter Summary	39
CHAPTER FOUR	40
DATA ANALYSIS, PRESENTATION AND INTERPRETATION OF FINDINGS	40
4.0 Introduction	40
4.1 Description of Nkhaketse Irrigation Project	40
4.2 Demographic characteristics of respondents	41
4.3 Production of crops before irrigation project	42



4.3.1 Production of Crops after Irrigation Project.....	42
4.4 Themes and Categories.....	43
4.4.1 Market Failure.....	44
4.4.2 Water Suppliers, Energy, Irrigation Method and Equipment.....	45
4.4.3 Small Fields and Low Crop Yield.....	47
4.4.4 Unskilled Labour.....	47
4.4.5 Financial Support and Distance from Home to the Irrigation Project.....	48
4.4.6 Capital.....	49
4. 5. The Livelihood of the Community.....	49
4.5.1 Conflicts among the Farmers.....	50
4.5.2 Lack of Proper Monitoring and Evaluation.....	51
4.6 Recognised Satisfaction with Land Size and Form of Ownership.....	52
4.7 Diseases and Weed Management.....	52
4.8 Contribution of Benefits from the Project to People’s Livelihoods.....	53
4.9 Discussion of Results.....	54
4.9.1 Market Failure.....	54
4.9.2 Lack of Capital.....	54
4.9.3 Scarcity of Water.....	55
4.9.4 Theft of crops.....	55
4.9.5 Transportation.....	56
4.9.6 Chapter Summary.....	57
CHAPTER 5.....	58
SUMMARY OF THE STUDY FINDINGS AND RECOMMENDATIONS.....	58
5.0 Introduction.....	58
5.1 Summary of the research findings.....	58
5.2 Conclusion.....	59
5.3 Recommendations.....	60
5.3.1 Market.....	60
5.3.2 Capital.....	60
5.3.3 Transport.....	61
5.3.4 Theft of crops.....	61
5.4 Limitations of the study and recommendations for further studies.....	62
5.4.1 Limitations of the study.....	62



5.4.2 Recommendations for further studies.....	62
APPENDICES.....	74
Appendix A: A LETTER OF INTRODUCTION TO UNDERTAKE RESEARCH.....	74
APPENDIX 2: INTERVIEW GUIDE.....	76



LIST OF TABLES

Table 4.1 Agriculture Related Site Specific

Table 4.2 Themes and Categories



LIST OF ACRONYMS

AIP	Adoptive Information Processing
CCT	Classical Contingency Theory
FAO	Food and Agriculture Organization
FDGs	Focused Group Discussions
GDP	Gross Domestic Product
IMT	Irrigation Management Transfer
IWMI	International Water Management Institute
KII	Key Informants Interviews
LEMA	Lesotho Enterprise the Mechanical Agriculture
NGOs	Non-governmental Organisations
PIM	Participatory Irrigation Management
SDGs	Sustainable Development Goals
SSA	Sub-Saharan Africa
UN	United Nations
WCED	World Commission on Environment Development
WUE	Water Use Efficiency
ZIS	Zamyokwe Irrigation Scheme



CHAPTER 1

BACKGROUND TO THE PROBLEM AND ITS SETTING

1.0 Introduction

This chapter presents the background to this research study which is on the effects of irrigation projects on improving the livelihood of the farmers who are involved. The study was conducted in the district of Botha-Bothe in Lesotho. It firstly provides the context in which other irrigation projects operate globally, regionally and locally. This is followed by the problem statement of the study, objectives, research questions, and hypotheses, significant of the study, assumption of the study as well as delimitation of the study.

1.1 Background of the Study

Throughout the history of mankind irrigation has been an important game-changer in agricultural production. Farmers have long relied on traditional irrigation methods to water their crops, but as technology advances, so do the tools available for them. Irrigation can play an important and dynamic role in improving livelihoods, especially in areas where rain fed farming has been predominantly practiced. The general argument in support of this line of thinking is that the intensification of agriculture and improvements in productivity not only increase the prospects of economic growth but also reduces poverty. The assertion has, however, been put to question by scholars like Ndayisaba and Mulyungi (2018). Development that has been made in refining project management tools and techniques. However, there is a huge number of projects, which have unsuitable project management strategies globally such as over budget, shortage of stakeholder contribution in project activities, deprived project planning, poor risk management, inferior level of leadership skills, insufficiency of financial resources as well as lack of day tracking of progress of project activities (Ndayisaba and Mulyungi, 2018).

Globally, irrigation plays a significant role in food production necessary to support



population growth (U.S Census Bureau, 2022). Since the world population has grown to more than 8 billion, agriculture is a requirement for production of extra food for the increasing population (U.S Census Bureau, 2022). Furthermore, irrigation is a keystone in global food security. Therefore, relative high crop yields farmers with manageable water supply can play a pivotal role in feeding millions being added to the current population (Peter and Gleik, 2014).

Recent evidence suggests that, 53% of the world food supply is grown under irrigation (FAO, 2021). In modern years, growing emphasis has been located on smallholder irrigation as a means of promoting socio economic development in less disadvantaged areas. In certain regions, production was improved, however this was due to centralized planning with inadequate participation of stakeholders (Thomas and Stilwell, 2013). As a result, it was not maintainable. Therefore, that limit the irrigation projects to supply enough food for the communities.

It has been argued that, water being a keystone in all ecosystems have to be cared for by users and governments (Daily, 2014). In another study, Cai and Rosegrant (2013) found that agriculture absorbs 72% of the world's fresh water and that the use of water for irrigation is not adequate in many countries. Kirda and Kanber (2012) suggest that maintainable methods of drought alleviation and the increase in production has to be adopted. Advocating for effective irrigation, water management accelerated during the late 1960's and early 1970's (Kirda and Kanber, 2012). The emphasis in general was on irrigation scheduling at farm level, but Wickham and Takase (2016) as confirmed by Stevens (2020), illustrate that effective larger quantity water distribution at system level is a precondition for structured farm irrigation water management.

Perret, Farolfi and Hassan (2016) are of the opinion that although irrigation previously played a pivotal role in the food supply as well as world economics for practically a century, it faces a diversity of challenges to-day namely: shortage of irrigation efficiency, public demand for alternative water uses, shortage of maintenance and often socio-economic disparities. Peter and Gleick (2014) are of the view that there has been an incredible slowdown of irrigation development carried about by lower commodity prices, relatively high energy costs and disapproving economic conditions. In 2018, there were



2.3 billion people living in countries such as Iraq and South Sudan with water deficiencies, with 721 million of them in countries with high or critical levels of water stress (UNEP, 2021). According to statistical information from the Food and Agriculture Organization (FAO) and United Nations (UN), the factual global irrigated area is 2.75 million km² (AQUASTAT, 2014).

The wastewater consumed and generated by agricultural irrigation cannot be ignored. Municipal wastewater is the major source of wastewater used directly in agriculture with 11% of global water withdrawals from municipalities. 8% of global water is cleared as wastewater. Thus, about 330 km³ of municipal wastewater may be consumed to irrigate 40 million hm² of agricultural land per year (Mateo-Sagasta et al., 2015), representing 15% of the total irrigated area.

Typically, agricultural irrigation is described as a complex system with tightly interlinked elements, including food production, energy, land, and water and carbon emissions. Of these, water, energy and carbon emissions are the most directly and closely connected elements of the irrigation process. Chen et al. (2019), Li et al. (2022b) and Emde et al. (2021) use an example of these various concepts as evidence that energy is used in water extraction and distribution, water is strongly linked with energy production and all these processes generate a substantial amount of carbon emissions.

Studies under climate change and irrigation management validate that higher temperature would change the implications of irrigation on water in agriculture (Kamali et al., 2022). Precisely, irrigation intensity in Korea would upsurge to 849 mm y⁻¹ in 2020-2099 under the MIROCESM scenario (Lee et al., 2020). Global irrigated land may escalate to 0.35×10⁹ ha with the effect of 3°C warming (Rosa et al., 2020), which will add water and energy consumption in agriculture.

It has been acknowledged that a series of climate change risks such as global warming, water shortage, and energy scarcity are attributable to agricultural irrigation globally. To ease these climate threats, numerous water conservation, energy saving, and carbon emission reduction measures are continually being proposed, including renewable energy, emission trading scheme and water-saving irrigation (He et al., 2022; Zhang et al., 2022). Among them, solidifying the promotion of water-saving irrigation methods



and improving water consumption efficiency are measured to be the achievable and widely used methods for achieving sustainable water development in agriculture (Bwambale et al., 2022).

Similarly, a considerable volume of literature has been published on the effects of water-saving irrigation method from various irrigation spatial scales comprising field experiments, cities, countries, and globe (Islam et al., 2022; Jägermeyr et al., 2015; Liu et al., 2022; Wang et al., 2019), and their effects seem to be working as expected. Zhou et al. (2020) mentions the special situation of China as an example that a widespread slowdown of water use growth rates ranges from $10.66 \text{ km}^3 \text{ y}^{-2}$ before 1975 to $3.59 \text{ km}^3 \text{ y}^{-2}$ in 2013 given that water use intensities reduction of irrigation and industry caused by water-saving methods. However, some observers claim that refining agricultural irrigation efficiency may interrupt the regional water cycle balance by decreasing water returning to the ecological environment (Grafton et al., 2018) and the irrigation efficiency, measures, effects and technologies play numerous roles from one place to another (Lankford et al., 2020).

In Africa, agriculture remains the key source of livelihoods to an enormous proportion of people resident. It is estimated that nine out of ten people in rural areas develop their livelihoods agriculture and agriculture-related activities (Moari, Akudugu, Dittoh, 2017). Rural livelihoods are, however, currently going through stress because of the adverse effects of climate change. Crop yields remain to decline, as rainfall patterns are now unpredictable. The key to getting out of this phenomenon is to institute devices that ensure a constant supply of water for production purposes and one of such mechanisms is the provision of irrigation facilities (Moari, Akudugu and Dittoh, 2017).

Samakande and Manzunqu (2014) is of the view that irrigation projects have a role to play in the decrease of poverty and food insecurity. Poverty, food security and rural development are combined concepts which have caused concern globally and governments are trying their best to battle this problem. In recent years, large irrigation projects seem to have been a disaster in most African countries (Samakande and Manzunqu, 2014). Currently, smallholder irrigation farmers who stay in the rural areas have been targeted by food insecurity. This is due to poverty and food insecurity that



affected them most severely (Chigerwe et al. 2014).

The major challenge fronting water resource managers in coming years is to secure enough water for irrigation. This is particularly so in countries where population growth is very high. In Sub Saharan Africa, water insufficiency together with very high levels of malnutrition often occur (Rockstrom, Barron and Fox 2013). Therefore, irrigation in Africa is not effective and the livelihood of the community will not improve through many irrigation projects.

FAO (2012) argues that 70% of Africa's tremendously poor populations live in rural areas and depend primarily on agricultural production for their livelihoods. Most of these agriculture dependent communities have slight chance of escaping poverty and becoming food secure without a substantial changes in development strategy because the very nature of their farming systems keeps them hindered in poverty (FAO, 2012). More reliable access to water, especially in the form of smallholder irrigation has a superior potential to diminish hunger, raise incomes and improve development prospects in the region.

A broader perspective has been adopted by Bjornlund et al., (2020) who argues that the irrigation development's potential cannot be ignored especially in rural development. It has a great potential for rural development and can meaningfully contribute to attaining Sustainable Development Goals (SDGs) of eliminating poverty (SDG 1) and hunger (SDG 2) (Bjornlund et al., 2020). Unfortunately, only around 4% of the total cultivated area in sub-Saharan Africa (SSA) is fortified for irrigation while the average rate of expansion of irrigated area has been only 2–3% over the last 30 years. Despite its present suboptimal state, irrigated agriculture is assessed to contribute around 25% to the total value of agricultural outputs across SSA (Bjornlund et al., 2020). That will enable farmers to irrigate a gigantic land so that their livelihood improve.

Over-all, the amount of irrigation systems in Africa is quite modest comparing to other countries of the world. Bazin et al. (2017) supports the evidence that in Asia 32.4 % of the total cropland is under irrigation and in Africa it is only 6.1 percent. Nevertheless, in Sub-Saharan Africa, the percentage is even lower; 3.5 % of the total cropland is irrigated (George et al., 2017). Furthermore, the irrigation costs are doubly so increased



compared to other continents and the topography of the landscape is uneven which complicates irrigation constructions (Sato Altamirano, 2019). Lobell (2014) shares his sentiments that to meet the population growth, agriculture in the developing countries needs to produce more crops per liter of water. Cereal production needs for more than the half of the irrigated land in Africa and globally, 31% of the total agriculture area is irrigated (Djagba, 2014).

About 85% of the total water withdrawals in Africa are consumed by agriculture and in the semi-arid regions the percentage is somewhat higher. In those areas, the water that is consumed for irrigation represents a foremost part of the water resources (Lobell, 2014). International Water Management Institute (IWMI) claims that during an average rainfall year, rain-fed agriculture evaporates 20 percent of the rainwater, comparing to 3-6 percent of irrigated lands. Rain-fed agriculture uses a large quantity of water, because of its huge area, which could instead be consumed to river runoff. However, Bazin et al. (2017) claims that rain-fed agriculture is common, and in his major study he uses an example that in Sub-Saharan Africa about 95 percent of the total cereal area emanates from that kind of agriculture, and is very essential for those people that live in rural areas that do not have access to irrigated land.

Bureau of Statistics (2012) emphasizes the issue that the cultivated land in Lesotho is basically confined to the lowlands and foothills on the western border and Senqu river valley in the south. Much of the rest of the land area is utilized for extensive livestock farming. Smallholder farmers whose farms are commonly less than one hectare in size dominate the agricultural production. Therefore, this implies that land for irrigation in Lesotho is very limited such that farmers are not able to produce enough crops.

Bureau of Statistics (2012) continues to elaborate more on the arable land which is estimated at 334 000 hectares of which 330 000 hectares were cultivated while 4 000 hectares were under permanent crops. Simultaneously, production yields have deteriorated since independence as reflected in a dependence ratio of 32 in 1965 to 52 in 1990 (UNDP, 2021). Nonetheless, Sechaba, (2014) estimated that if current trends in population growth and agricultural production continue, Lesotho would face soon difficulties of producing enough food to meet the demand.



Water resources such as surface and ground water, are abundant in Lesotho. The average rainfall is 760mm per annum, fluctuating from 300mm per annum in the western lowlands to 1600mm per annum in the north eastern highlands, (United Nations Statistics, 2012). Surface water resources are assessed at 4.73km³ per annum, which is far in excess of the country's requirement, (United Nations Statistics, 2012). Despite the accessibility of water; effective allocation of water is a key problem in Lesotho. Water is not always where it can readily be consumed (United Nations Statistics, 2012). Due to the geographical situation, water is mostly abundant in the mountains where arable land is less available. In the lowland areas, water is often found in the valleys, but it is slightly below the level of arable lands, and therefore requiring to be pumped to the arable lands (United Nations Statistics, 2012).

FAO, (2020) shares the sentiments that although Lesotho's main natural resource is water, drought occasionally affects agricultural production leading to substantial decrease in the contribution of the Gross Domestic Product (GDP) and forcing the country to apply for support from the international community. According to a Government Report (2021), the possibility of adding food production through area expansion is tremendously limited which leaves only one option namely to strengthen production from irrigation schemes. In recent years, many irrigation development projects were launched in Lesotho including Nkhaketse Irrigation Project at Ha Rasekila, Buttha-Buthe, most of them being funded by external donors.

Public-supported irrigation development projects have been generally ineffective due to a top-down and supply-driven approach followed by the government, donors and with little consultation and participation by farmers (FAO, 2020). Similarly, the scarcity of water made Nkhaketse Irrigation project to collapse and unable to produce quality crops for the community to such an extent that since 1987 irrigation farmers were not able to make profits on this project.

Initially, Nkhaketse Irrigation Project was commonly considered successful and gave rise to the development of other irrigation schemes in 1968. However, this irrigation project produced low crop yield. One of the foremost constraints was that farm machinery was generally provided by the Lesotho Enterprise the Mechanical Agriculture



(LEMA) and broken machinery had to be taken to South Africa for repair. Another restraint was the universal poor management and the unwillingness of farmers to provide labour which led farm operations regularly being carried out late or not at all. The general low morale on the project probably rooted in social issues, for instance, the uneven distribution of profits which penalised small holders (MOA, 2014).

1.2 Problem Statement

All the irrigation projects which have been developed in Lesotho were either funded by the government or by international donors. Some irrigation projects are currently considered functional but are highly dependent on government subsidies and financial support. Poor performance of these irrigation projects has led to low crop yields to such an extent that since 1987 irrigation farmers were unable to make profits on these projects (Bureau of Statistics, 1994). It appears that problems still continue to plague farmers working on irrigation projects, most particularly Nkhaketse Irrigation project to an extent that food deficiencies and hunger continue to persevere in the area thereby, compromising livelihoods. Therefore, it is necessary to make assessment of how the problems are affecting farmers in the Project making it hard to contribute to the livelihood in communities around the project.

1.3 Objectives

- To determine the economic contribution of Nkhaketse Irrigation Project on the livelihoods of the communities around the project.
- To assess the effect water scarcity on agricultural livelihood of communities around Nkhaketse Irrigation Project.
- To determine how Nkhaketse irrigation project ought to be sustainable and profitable to the community.
- To assess the reason Nkhaketse Irrigation Project produce low crop yields for the livelihood of the communities around the project.

1.4 Research Questions

- How does the economic contribution of Nkhaketse Irrigation Project improve the



livelihoods of the communities around the project?

- How has the scarcity of water negatively affected household food production?
- How does Nkhaketse irrigation project ought to be sustainable and profitable to the community?
- Why Nkhaketse Irrigation Project does produce low crop yields for the livelihood of the communities around the project.

1.5 Hypotheses

Hypothesis 1: lack of skilled farmers on the irrigation project impacts negatively on irrigation development.

Hypothesis 2: participation of farmers in the development and implementation of the project is pre-requisite for the production of enough crops for the communities.

1.6 Significance of the Study

The significance of the study is to evaluate the effectiveness that Nkhaketse Irrigation Project has on the livelihood of communities around the project in Botha-Bothe.

1.7 Assumption of the Study

Assumption of the study were at the sampled population represents the overall population of membership of the irrigation project. The researcher also assumed that the experiences of the membership of the project are representative of other members that may not be around at that time. The method of data collection used were truthful and gave correct information freely and that the chosen respondents gave requisite information freely. The study also assumed that there was no thoughtful changes in the composition of the target population that might have affected the effectiveness of the study sample. Finally, the study assumed that the information given by stakeholders was correct and the authorities granted the needed permission to collect data to the right people.



1.8 Delimitation of the study

The study was on the effectiveness of Nkhaketse Irrigation Project on the livelihood of communities around the project. The various stakeholders within Nkhaketse including registered members of the irrigation project and some of the households formed the population for the study.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

The core of the problem addressed in this study revolves around how irrigation projects affect the livelihood of the community. Large scale irrigation systems are often viewed as failing to consistent injection of outside capital for operations and maintenance as indicated earlier in the background of the study. Irrigation is also associated with negative externalities. This chapter provides an extensive literature and related to the



effectiveness of irrigation projects. This literature review summarises a diverse spectrum of views about irrigation system and also this chapter presents the knowledge gap the study seeks to fulfill.

The objective of this chapter is to unpack the literature on how the livelihood of the communities are affected by the irrigation projects. To achieve this objective, this chapter is subdivided into five parts. The first part looks at the concept of contribution of irrigation project and livelihood of the community and how they are measured. The second part looks at the scarcity of water and the livelihood of the community while the third section looks at the community participation and performance of irrigation project. Last but not least this chapter looks at the low crop yields. Finally the last part of this chapter comprises the conclusion which summarizes the content covered in this chapter.

2.1 Economic Contribution of Irrigation Project and Livelihoods of the Community

Irrigation agriculture is an essential component of any strategy to increase global food supply. Agricultural yields will result in lower food prices, higher employment and a more rapid agricultural and economic development (Chenje et al, 2013). The spread of irrigation has been a key factor behind the rear tripling of global grain production since the 1950s. Chenje et al (2013) assert that agriculture is the backbone of economy in almost every country and as such irrigation is a very important agriculture practice to the country especially Lesotho. This is the case given that the country suffers periodic droughts. Thus, irrigation offers greater yields than dry land since more than one crop can be grown annually. Levels of output in terms of quantity are higher in irrigation schemes than dry land areas suggesting that there is more intensive crop production in irrigation schemes than in dry land.

According to the World Bank (2012) more than 70% of the poor people live in areas relying mostly on agricultural activities and sometimes mining and finishing for survival. Makumbe, (2015) goes on to argue that about half of the family heads in the informal sectors are employed as peasant farmers. With population ever increasing, the land set aside for irrigation farming has been excessively subdivided rendering most units sub-economic in Gezira irrigation scheme (Makumbe, 2015). Makumbe, (2015) also



postulates that land is deteriorating very rapidly in Manicaland and in most cases farmers do not have access to or the buying power to purchase certified seeds and fertilizers.

According to Burrow (2014), small holder irrigated horticulture had proven to be a viable and attractive option for poor farmers in African countries. Burrow (2014) further asserts that returns from intensive irrigated horticulture even on tiny plots could greatly exceed returns from rain fed cereal production. In many developing countries, small scale irrigation schemes were counted on to increase production, reduce unpredictable rainfall and provide food security and employment to poor farmers. The same sentiments were echoed by Gor Cornist (2016) when asserting that some of the small scale irrigation projects have been discovered primarily for income generating such as the peri-urban areas in Kumasi and Vegetable growing in Arusha Ghand. More so, irrigation farming is the source of income for the disadvantaged rural people that are mostly women, widows, and orphans.

Chenje et al (2017) states that the aim of irrigation is to increase crop production and grow crops in areas where such an activity would normally be impossible due to lack of water. Punnet (2012) gave an example of the Martha Fenai Pradesh scheme in India, which has been successful. Sharma and Sharma (2017) highlight that small scale irrigation projects brought abundant supplies of water for domestic purposes in India where cities such as Delhi and Jupor depend on canal water for public water supply whereas in Africa there is a shortage of water for irrigation of crops.

Under the irrigation project, villagers grow two or three crops instead of one and new crops that have been introduced such as onions, bananas and higher yielding varieties are common. Irrigation farming is viewed as a cheap substitute for costly disaster relief by the governments. According to Kadzombe et al (2015), instead of importing food relief thereby wasting foreign currency, farmers are assured of a constant source of food and money by establishing irrigation schemes. This is supported by Meinzen-Dick et al (2018) who assert that the greatest food deficits in Zimbabwe appear in dry land areas of Natural Region five. In their study they noted that fewer irrigation schemes ran out of food during the year than in dry land areas.



2.2 Scarcity of Water and the Livelihood of the Community

Msingo (2012), Mujere, Chazovachii et al., (2010) postulate that unavailability of water affects crops. Kundlande (2013) showed that crop production in most areas is common in dark grey soils as well as brown thick soils which need large amounts of water to be saturated. In times of water crisis, the water table goes down forcing farmers to abandon their work. This possibly means that farmers do not enjoy the fruits of irrigation farming, thus affecting their livelihoods at that time.

Water resources scarcity and irrigation development as well as improper, insufficient and unsustainable food security interventions can be a major impediment exacerbating household food (in)security through abridged agricultural manufacture. Manzungu (2013) points out that, food shortages has been caused by a multiple of factors, among the main ones is the deficiency of water to produce crops and animal husbandry in several places in Zimbabwe. Manzungu (2013) further asserts that water scarcity in Matabeleland Province and an inadequate implementing strategy have been identified and regarded as the most militating factors to agricultural production.

Soil type and climatic conditions are the major determinants of agricultural production in any region. Agriculture is the sector that contributes significantly to the welfare of people, and thus water is an important input to food production. The land in Zimbabwe is divided into five distinct natural regions based on temperature, rainfall pattern and topography (Perret et al 2013). However, the quantity of water available at irrigation schemes is not always adequate, and not constantly available throughout the year depending on the water source and the rainfall season. Water scarcity is compounded by the fact that farmers give each other turns to irrigate their plots and thus they tend to over-water their fields when it is their turn to irrigate, due to their fear of not having adequate water in the watering cycle (Perret et al 2013). If irrigation canals are not maintained, they tend to break down, and in some cases develop cracks with time resulting in high water leakages and losses. For example, Perret et al (2013) note that in spite of rehabilitation works at Thabina irrigation scheme in Limpopo province, farmers continued to complain about the low capacity of the main canal and a lack of water in winter.



An essential issue related to water management is irrigation scheduling. Irrigation scheduling ensures that adequate water is applied at different stages of plant growth thus preventing over- and under-irrigation of the plots. Studies by Fanadzo et al (2010a), Fanadzo et al (2010b), Bembridge (2000) and Machethe et al (2004) agree that smallholder irrigators do not practice proper irrigation scheduling resulting in under- or over-irrigation of their crops. This is also related to the fact that the extension officers assisting the farmers may themselves also not have the knowledge on proper irrigation scheduling. This applies to Nkhaketse Irrigation Project that farmers may lack knowledge on irrigation scheduling and the leaders in that project may not have enough knowledge on proper irrigation scheduling.

In South Africa, the Limpopo government Recharge programme favored replacing of canal schemes with modern irrigation technology such as micro-irrigation and floppy sprinkler systems (van Averbek, 2018). Denison and Manona (2017) note that this attempt has had high failure rates in South Africa and is developmentally unsound. The challenges of these new technologies include difficult and costly maintenance required from the farmers, high energy costs, and lack of community participation in the designs. Denison and Manona (2017) explain that gravity fed canal schemes are more appropriate and are equally water efficient depending on scheme layout, water management and maintenance of the canals.

2.3 Community Participation and Performance of Irrigation Project

It is a fundamental right that communities should have a say about the interventions that affect their lives. Kumar (2012) indicates that participation is a key instrument in creating self-reliant and empowered communities, stimulating village-level mechanisms for collective action and decision-making. It is also believed to be instrumental in addressing marginalization and inequality, through elucidating the desires, priorities and perspectives of different groups within a project area (Kumar, 2012).

Participatory Rural Appraisal (PRA) method now dominates in the implementation of development interventions at the village level in African Countries. Community participation in rural irrigation development involves an act of sharing common to all participants as stakeholders for the development process (Harvey and Reed 2017;



Kakumba, 2010). In this case, each participant is directed towards a specific goal, which is shared by others within the development process. In a wide range of literature, a descriptive definition of participation programs would imply the involvement of a significant number of local persons in situations or actions that enhance their well-being (Harvey and Reed 2017; Kakumba, 2010). Therefore, in this context of development, community participation refers to an active process whereby beneficiaries influence the direction and execution of development projects rather than merely receive a share of project benefits.

In accordance with Naika and Siddaramaiah (2016), participation includes management of skills, mobilization of community members, conflict resolution and institution building among extension personnel. This means that people's dependence on government supports as well as making the public self-sustaining. Additionally, this is because it facilitates mobilization of local resources and simplifies implementation of the project at a micro level. The importance of community participation in irrigation projects is often emphasized, but this must start at the beginning of the project cycle. If there is the need for a handover from agency to community, then the project is already flawed (Thorpe 2012). Community participation including the simplest of involvement from early on in the project enhances the future sense of ownership but ongoing motivation is required for continuing participation. Against this backdrop, enabling communities to manage their own irrigation facilities means that the promoting agencies should be facilitators rather than implementers (Ockelford and Reed, 2012). This may involve a major shift in the way an organization carries out its work, a shift that may not be easy to achieve.

Effective collective action for resource management in the case of irrigation, requires that the beneficiaries prepare and agree on a set of rules of restrained access to the resource; make arrangements for financial, labour or other contributions required for the management of the resource and lay out a system of enforcement of the use of restrictions and community contributions (Gebremedhinet et al., 2012). Participatory irrigation management has been considered as the driving force in the effective and efficient irrigation management by participating and involving the farmers in planning,



operation and maintenance of the irrigation system (Gulatiet et al., 2015). Therefore, it is appropriate for community participation in order to see the growth of any project whatsoever.

The public involvement of stakeholders in developing projects is widely recognized as a fundamental element of the process. Timely, well-planned, and well-implemented public involvement programs have contributed to the successful design, implementation, operation, and management of irrigation programme proposals (UNEP, 2016). It is widely recognized that participation in community agricultural schemes often means no more than using the service offered or providing inputs to support the irrigation project (Smith, 2018). This is contrasted with stronger forms of participation, involving control over decisions, priorities, plans and implementation or the spontaneous, induced, or assisted formation of groups to achieve collective goals. Therefore, in the project, people have to share knowledge and work together to accomplish their goal.

Garces-Restrepo et al. (2017) note that the underlying assumption is that greater participation by the farmers would induce a sense of ownership and responsibility, and hence improve resource use efficiently. Some governments in Sub-Saharan Africa hands over management of smallholder schemes to the farmers in the face of IMT. Due to budgetary reprioritization as well as the need for IMT in the late 1990, in South Africa, financial support for management, operation and maintenance of smallholder irrigation was withdrawn (Maritz, 2012), and ownership and management responsibilities were handed over to the farmers. In 2002, 57 countries, representing 76% of the FAO-irrigated area of the world, had embarked on some form of reform which included IMT (Garces-Restrepo et al., 2017).

Some countries such as South Africa, however, opted for participatory Irrigation Management (PIM), a moderate reform of just increasing farmer participation in irrigation management rather than replacing the role of government as in IMT (Giordano et al. 2016) while some, like South Africa, adopted both reforms. However, analyses as to whether the objective of improving irrigation performances was fulfilled have painted a gloomy picture as successes have been reported in countries such as Turkey, Mexico, USA and New Zealand (Shah et al. 2010) and failures or no change being reported in the



developing world. A decline in the cropping intensity and an increase in the irrigated area were reported in the Senegal Valley, while in Nigeria an improvement in water delivery to tail end farmers in the Kano project was recorded following the adoption of IMT (Shah et al. 2012).

2.4 Low Crop Yields

Rural poverty is an important development challenge in Africa (Laker, 2014) and irrigation has long been viewed as an option for improving rural livelihoods (FAO, 2011). However, most of the smallholder irrigation schemes (SIS) that were established in Africa have performed poorly (Bembridge, 2012; Crosby et al., 2000; Oosthuizen, 2002; Perret et al., 2003; Denison and Manona, 2007), whilst in other countries irrigated agriculture has managed to address rural poverty and unemployment (Ferguson and Mulwafu, 2014). The poor performance of many SIS in Africa has been attributed to socio-economic, political, climatic, edaphic and design factors (Bembridge, 2012), but Crosby et al. (2000) indicate that farmer practices may actually be constraining performance, identifying low yields as evidence of poor farmer performance.

In light of the foregoing paragraph, Manona (2017) recommends that crop production approaches including farmer training be considered alongside all other issues during revitalization of SIS to improve on performance. However, little attention has been given to the study of cropping systems and management practices in SIS (Machethe et al., 2014), and to whether these factors could account for observed poor performance. De Lange et al. (2020) note that research and expenditure have tended to focus on infrastructure, and that often this has proved to be fruitless because the human capital was not developed to utilize and maintain the infrastructure effectively.

In tandem, Monde et al. (2015) note that despite having access to an average of 4.2 ha of irrigated land per farmer, most farmers at Zanyokwe Irrigation Scheme (ZIS) were poor, with monthly incomes lower than the 2005 poverty datum line of ZAR626.98 per adult equivalent. They also found that both cropping intensity and yields were low, with farmers attributing low crop performance indices to lack of adequate tillage services, fertilizer, seed, chemicals and irrigation equipment. The low levels of crop productivity noted in many SIS in Africa imply low water use efficiencies (WUE), as available



evidence indicates that water at the source is rarely limiting (Machethe et al., 2014; Stevens, 2007). With the growing scarcity of water, significant increases in water productivity will have to come from improved agronomic practices rather than increasing the area under cultivation (Machethe et al., 2014).

2.5 Theories on Effectiveness of Irrigation Project on the Livelihood of the Community.

Irrigation has a long history spanning over 400 years. Records reveal that irrigation has existed for years globally and this was the era of slave trade (19th century) where slaves were used to construct the rice schemes (NIB 2010). The section of this chapter presents the main theories that have been used to assess and help understand how the irrigation projects effect the livelihood of the community. Basically, this section looks at key theory which is sustainability theory and it is supported by classical contingency theory. Complex system theory and the theory of change are the theories which still apply in this study but this study is focused on only the above mentioned theories. Finally, the chapter looks at the irrigation revitalization approach which is postulated by Cousins (2013).

2.5.1 Sustainability Theory

The theory that will be used to undergird this study is sustainability theory (ST). The concept sustainability can be traced back to 1970 and later popularized by World Commission on Environment Development (WCED) - a branch of United Nations. The argument in the theory is that the resource in the environment that people live is finite (CEC, 2013). In the WCED report namely our common future, the concept sustainable development and sustainability began to take shape and later became popular with environmental conservation. According to WCED, sustainable development is a development that meets the needs of current generation without compromising the ability of future generation to meet their own needs (WCED, 1987). In the context of this study therefore, the concept sustainability is about people being able to maintain and sustain the project or programme outcome by their own assets or resources while not compromising the needs of future generation. Sustainable development (SD) is a development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs and expectations (CEC, 2013).



Theory of sustainable development holds that in order for one to know what is a sustainable development, knowledge of what is important for the viability of the systems and how that contributes to sustainable development is necessary (CEC, 2013). When assessing the community capacity in managing projects, understanding sustainability issues is important. The capacity of a community to manage a project in itself is an indicator of sustainability. When considering the protagonist of sustainability theory, any capacity building strategies need to examine the interconnected nature of both the local and larger networks which is also a systematic factor, (CEC, 2013). The theory of sustainable development further indicates that the concern of SD is management of the process of change, not on setting an end goal with fixed outcomes (CEC, 2013). Sustainability theory suggests that human and social capital should be treated much like natural resources (CEC, 2013). Efficient and effective use of these resources provides long-term, sustainable benefit to local communities (CEC, 2013). Hence, this study borrows ideas from sustainable development theory emphasis that capacity assessment is crucial foundation for community participation in development projects. This theory is applicable to this study because the purpose of the study is to evaluate the effectiveness that irrigation project has on the livelihood of communities around that project.

2.5.2 Classical Contingency Theory

Pinto and Slevin (1987) introduced Classical Contingency Theory (CCT) which suggests that different external conditions to an organization require different organizational characteristics, and that the effectiveness of the organization is contingent upon the goodness of fit between structural and environmental variables (Shenhar, 2011). CCT posits that there is no one best way to organise a corporation, to lead a company or to make decisions (Fiedler, 1964; Vroom and Yetton, 1973). The approach to poverty reduction in social fund-supported communities is a process of development-focused collaboration among various stakeholders.

Classical Contingency theory posits that collaboration increases the productivity of resources and creates the necessary and sufficient conditions for community-driven development (Zulu and Chileshe 2008). Community-driven development represents a



people-centered approach to social change, whereby local actors take the lead in conceptualizing projects and programs that address social and economic needs. Local actors are fully involved implementing in such projects and programs. A major hypothesis embedded in this stakeholder involvement theory is that the greater collaboration, the greater the productivity of the resources and more favorable the conditions for community-driven development (Zulu and Chileshe 2008). Stakeholder involvement, therefore, is a key element of development-focused collaboration.

Members of communities that received social fund assistance for projects attempted to deal with local level poverty related problems by following a four stage process, that is, identifying problems and priorities, motivating and mobilizing, working together as well as creating an enabling environment. CCT suggests that there is no 'silver bullet' to improve the working of any organization (Kloezen 2002). Applying this statement to the problem of the study, it suggests that there is no best way to organise and manage an irrigation project or to improve its performance. Instead, the optimal course of action is contingent upon its internal and external situation. There are clusters of contingency factors that define the external task environment of irrigation projects in different parts of the world. Irrigation systems in China, North Korea, and Myanmar face totally different contingencies compared to irrigations systems in central Asia or in peninsular India; and those in high-income Malaysia face an altogether different set of contingencies that is encouraging it to revert to the estate mode of irrigation agriculture that was practiced in colonial Africa (Kloezen 2002).

There is, thus, no point in comparing the performance of an irrigation system in one cluster with that in another, though comparative performance analysis within clusters may make sense if key contingencies were identified and factored in properly. The strategies for improving the performance of irrigation systems under these different contingencies clusters – as well as the notion of management performance itself- have to be defined in a context-specific framework simply because what would work under one contingency cluster is unlikely to work in another. Similarly, there is no silver bullet that can revitalize irrigation project. The need is for a granular context variables of irrigation systems in different socio-political settings to evolve a change management



roadmap for each contingency cluster (Ertsen 2007).

On the other hand, Fiedler's model helps this theory to be stronger since it gives organizations a rapid method to identify a particular group of the best (Ertsen 2007). The theory includes a least-loved colleague scale, which helps identify the management of human relations orientation and task orientation of potential leaders (Ertsen 2007). Leaders with a task orientation are best suited to groups in which they define tasks with a high level of control and supervision. On the other hand, leaders can be a relationship orientation to use to get the job done their personal skills and can deal with complex problems when taking decisions.

CCT has been designed as a contingency model and is not intended to describe all possible situations because the model is flexible enough to fit all kinds of group leaders and group relationships (Ertsen 2007). The margin as a group has a leader with low human relations skills. Fiedler's model still gives management the ability to make an effective group with clearly defined roles and increasing the capacity of the leader to rewards or provide information to punish their subordinates.

CCT enables managers create by adapting a number of variables. According to Fiedler's contingency model, there is no just one type of successful leadership style, but each type of leader can thrive in the right group sites (Ertsen 2007). The model provides a number of factors that may change management to improve efficiently. A leader can be effective in a group while the group is highly structured and clearly defined roles. However, CCT is leader position power. Position power is determined at the most basic level of rewards and punishments that the leader has officially at their disposal to either reward or punish members of the group based on performance. The more the power the leader has, the more favorable the situation.

2.5.3 Complex System Theory

The other theory that was used to underpin this study is complex system theory. Ludwig Bertalanffy is the father of Complexity Theory from mid late 20th then Zimmerman (2001) modified the theory and this was found in Sociology. In trying to unravel the challenges irrigation systems face, it is necessary to distinguish the research methodologies that



have delivered technological advancement from approaches needed to understand the agricultural system as a whole. This system understands systems as reductionist. Reductionist approaches break down larger systems into components in order to infer cause- and effect relationships without the interference of the rest of the system. Reductionism has produced individual technologies that perform in predictable ways. The larger agricultural context into which these technologies are deployed is a complex socio-ecological system where dynamics and interaction between its many subsystems often give unpredictable and even highly surprising outcomes (Ostrom, 2009; Van Mil, Foegeding, Windhad, Perrot and Van der Linden, 2014).

The value of the AIP lies in the inclusive nature of the stakeholders, representing traditional entities (agricultural engineers, irrigation management committees and water authorities) as well as stakeholders not normally associated with irrigation schemes. The AIP stakeholders therefore represent the larger socio-ecological system within which the irrigation scheme functions. It is multidisciplinary in nature and establishes cognitive diversity (Mitchell and Nicholas, 2006), increasing the capacity to analyse and solve technical problems and address systemic challenges. While these stakeholders may have the same or similar overall goals, their individual objectives (and therefore their requirements and contributions) will differ markedly. For example, the objectives and needs of input suppliers are different from those of producers, whose objectives and needs are in turn different from those of output markets and other value chain stakeholders. (Mitchell and Nicholas, 2006). Although these objectives are different, they are often complementary and mutually beneficial, fostering trust and respect of the roles of different stakeholders and their contribution to the functioning of the larger system.

Essentially, it is the integration of different types of knowledge from diverse stakeholders that becomes the precondition for problem solving (Berkes, 2007). The process of articulating individual challenges and contributions along the value chain provides a basis for mutual understanding and cooperation among stakeholders. The collective understanding of the systemic challenges they face, and how positive interactions between stakeholders and new configurations can contribute to resolving



these issues, is critical to the success of the innovation process.

Irrigation schemes often fail because of hardware breakdown, and therefore technological fixes are most often the point of intervention. It is argued that hardware failure is a misdiagnosis of the problem. Small-scale irrigation systems have many of the characteristics of complex socio-ecological systems. They have many different actors, and they are composed of numerous subsystems (Swaans et al., 2013). However, they often lack interaction between the different sub-systems and their agents, preventing learning and the emergence of more beneficial outcomes. AIP is therefore effective in bringing a wide range of stakeholders together to forge new ways of doing business around complex agricultural systems (Swaans et al., 2013). Again, the AIP develops greater understanding of the importance of the inclusion of nontraditional stakeholders and the interrelationships between players to work towards mutually agreed goals. It can also bring about systemic change, primarily as a result of the diversity of actors, their interactions and their collective knowledge and skills to define and evaluate improved strategies, as well as the associated rearrangement of institutions (Lam and Ostrom, 2010). This is critical because it goes beyond the single technological approach of traditional irrigation management and takes the first steps towards a situation where institutional reform can facilitate technological development (Clark, 2002).

2.5.4 Theory of Change

Theory of change is the approach that allows flexibility according to the needs of the user or implementer (Vogel, 2012). It provides a detailed narrative description of an impactful pathway and how changes are anticipated to happen, based on assumptions made by the people who are undertaking the work. Vogel, (2012) traces theory of change to development of program theory approaches in the 1960s. These approaches, built on theoretical underpinnings, revolve around clear articulation of the linkages between inputs and outcomes, and the consumption that accompany these linkages with the aim of improving evaluation and program performances (Funnel and Rogers, 2011). Theory of change can thus provide a means to make explicit the implicit, often elusive hypotheses on the processes that bridge the gaps between research design,



outputs, use and outcomes. Theory of change further explains how activities are understood to produce a series of results that contribute to achieving the final intended impacts (Funnel and Rogers, 2011). It can be developed at any level of intervention- an event, a project, a programme, a policy, a strategy or an organization.

Relating this theory to the study, theory of change explains how irrigation project is understood to work. For example, this theory should explain how the irrigation project is effective to the livelihood of the community. Additionally, this theory shows how the project is intended to produce crops for the livelihood of the community (Funnel and Rogers, 2011). This theory would also explain how the project was expected to achieve its intended results of enhancing relevant legal and policy frameworks locally (Funnel and Rogers, 2011). In this irrigation project that provided capacity development to support the development of new policy framework, the sessions should be delivered as intended (Funnel and Rogers, 2011). The material should be relevant and accessible, and the facilitators should be seen credible. Failure to achieve these intermediate results might indicate implementation failure. The capacity development activities might have been implemented adequately. In this case, a failure to achieve the final intended impacts would be due to theory failure rather than project failure (Funnel and Rogers, 2011).

Many theory of change diagrams fail to communicate clearly. Some are too simplistic, omitting important elements and making it seem like the intervention will produce the intended impacts without the need for the support of a favourable implementation environment (James and Cathy, 2011). Some are too complicated, having so many detailed boxes that it is impossible to get a coherent overview of the causal processes (Vogel, 2012). Others are illogical, with boxes linked by an arrow that cannot be explained, or featuring an incoherent mix of positive and negative outcomes, for example, displaying the current problem situation in the final impact box rather than the intended changes (Vogel, 2012). Some evaluations fail to systematically use the theory of change to identify relevant data to be collected or to guide analysis (Vogel, 2012). For example, they do not identify intermediate outcomes, so data is not collected about them, and then if an intervention fails, it is not possible to identify where the causal



chain broke. Again, important aspects of implementation are not identified or addressed in data collection, so it is not possible to determine whether lack of results is due to implementation failure or theory failure – and if the intervention is successful, it is hard to know how to replicate or scale it up due to inadequate information about the features that make a difference.

2.6 Irrigation Revitalization

Revitalization of irrigation schemes is a holistic concept focusing on social upliftment and the creation of profitable irrigation schemes that also benefit the surrounding community (Denison and Manona 2007b: 3). It encompasses the complete overhaul of the 'hardware' and 'software' components of the irrigation system (Mwendera and Chilonda 2013: 68). The components include the physical (irrigation infrastructure), economic (maximization of profits, and allocation of resources), and social-organization (relationships that deal with legislative, policy, and institutional frameworks) components. Revitalization is broader than rehabilitation, which focuses on repairs and improving the physical structures of the irrigation scheme. Revitalization is still the approach being pursued by government at the present moment and was particularly notable in Limpopo (RESIS and later RESIS Recharge) and the Eastern Cape (Green Revolution) (Tapela 2014: 2; Denison and Manona 2007b: 34; van Averbeké 2012: 420). To make the schemes more profitable, in some locations the government has established highly sophisticated agricultural technology such as micro-irrigation and floppy sprinklers, despite overwhelming evidence that such systems were difficult and expensive to maintain and operate compared to gravity-based short-furrow schemes (Cousins 2013: 126).

2.7 Strategic Partnerships

Strategic partnerships came about through further development of the revitalization concept, whereby plot holders provide their land to commercial partners through formal arrangements (such as contracts, or joint ventures). These commercial partners then farm the land using their own inputs, sophisticated and mechanized equipment and share the profits with the plot holders (Tapela 2014: 4). Strategic partnerships have been cited by Lahiff (2008: 19) as an important new departure for land restitution in



South Africa in locations that involve high value land. Although strategic partnership arrangements do provide financial, material, technical and managerial support to farmers, in most cases, this has not resulted in the desired incomes for farmers, while on the other hand they have been reduced to land owners that merely 'observed' the farming operations of others (Tapela 2014 ; Tapela 2008 ; van Averbeke et al 2011).

Even if the long-term plans are to hand over the running of these farms to the original plot holders, this is doubtful if their capacity has not been enhanced to enable them to be independent. In direct contrast, Carriger and Williams (2003) contend that while there are examples of failures in contract farming, successful partnerships offer smallholders an opportunity to make their plots profitable. They further argue that what is required is that governments redesign such schemes to enable smallholders to develop stable alliances with input suppliers and marketers of outputs, and to reduce incentives for default on their commitments by both farmers and companies.

In summary, if strategic partnerships benefit the larger community, this is more positive than when it only provides monetary benefits to the plot-holders. This is common in other sectors in South Africa now, where many private companies invest in the community through social responsibility initiatives. Strategic partners need to live up to their promises, as failing to do so will result in strained relations with the farmers and the community.

The issue of ownership of land versus economic benefit has many aspects. For some, land ownership is seen as empowerment in and of itself regardless of the economic benefits that accrue. For them, land represents a place to live, and a site of origins and traditions, and it can be passed on to one's descendants. On the other hand, others see land primarily as an income-raising asset category, while others would prefer to derive income from land-based production. In land restitution claims, for example, some beneficiaries prefer monetary compensation to taking back ownership of land (Makhathini 2010: 21).

2.8 CHAPTER SUMMARY

According to literature, irrigation will continue to be more instrumental in addressing



poverty in most communities although there are still challenges to be addressed such as economic and other issues. It would appear that most irrigation projects in Lesotho have been imposed on people, hence, the limited success. The chapter mainly highlighted the definition of irrigation agriculture paying special attention to the contribution of irrigation project on the livelihood of the community on a worldwide perspective. The chapter further deliberated on the scarcity of water and the livelihood of the community where the unavailability of water around the project affect the crops, which is relevant in the contemporary world. The chapter also looked at community participation and performance of irrigation project where enabling communities to manage their own irrigation facilities means that the promoting agencies should be facilitators rather than implementers. It has been observed that, the literature is strong on adequately unpacking the concept of low crop yields globally, regionally and locally. Theories on effectiveness of irrigation project on the livelihood of the community were also highlighted in the literature. This study is grounded on the sustainability theory which is supported by classical contingency theory. Above all, the main reason of reviewing related literature was to establish the intellectual value of the study.



CHAPTER 3

RESEARCH METHODOLOGY

3.0 Introduction

This chapter presents the procedures and techniques that were used in the collection, processing and analysis of data that was collected. Basically, the following subdivisions are included; research design, target population and sampling, data collection instruments, data collection procedures and lastly data analysis. The research applied purposive sampling, that is, critical case and expert sampling where subjects were selected from Butha-Buthe district, and those who were significant to the study. The study further emphasized that data was analysed manually using the Thematic approach, which exactly fits qualitative research because the analysis conveys out themes and a theory at the end. The chapter acknowledged the significance of ethical considerations to come up with accurate data.

3.1 Research Paradigm

McGlinchey, (2022) defines interpretivism paradigm is a research paradigm that is grounded on the assumption that social reality is not singular or objective, but is rather shaped by human experiences and social contexts (ontology), and is consequently best studied within its socio-historic context by reconciling the subjective interpretations of its several participants. This view is supported by Alharahsheh, & Pius, (2020) who writes that interpretivism is a trend of research approach, and it has a preference in using qualitative methods in data collection. Interpretivists tend to approve qualitative methods such as case studies and ethnography. As explained by Corrado (2022), qualitative approaches frequently give rich reports that are essential for interpretivists to fully understand context. Qualitative methods are typically reinforced by interpretivists, because the interpretive paradigm exposes a world in which reality is socially constructed, complex, and ever changing (Corrado, 2022). Interpretivists view the world through a “series of individual eyes and choose participants who have their own interpretations of reality to encompass the worldview (Erciyeh, 2020). Researchers who are using interpretivist paradigm and qualitative methods often seek experiences



and perceptions of individuals for their data rather than depend on numbers of statistics. Interpretivists also embrace a relativist ontology in which an event may have numerous clarifications rather than a fact that can be determined via a particular method to gain a deeper understanding of the event and ascertain the complex issues and the phenomenon in the detailed context the situation is entrenched in (Creswell & Creswell, 2021) so that researchers are able to see what has happened and how it has happened. On the grounds of ontological and epistemological viewpoints, the meaning of reality is socially constructed through the experiences of social narrators, which might decrease to resonate the occurrences that are situated socially (Omodan, 2022). Referring to this notion, as an interpretivist researcher, one ought to understand that there could be more than one interpretations of the findings derived from the data so it is the responsibility of the researchers to find ways to see and understand the diverse nature of experiencing the issues and the situation in several cultural settings.

A broader perspective has been adopted by Erciyas, (2020) who argues that one of the benefits of this paradigm is interpretivist scholars can use their varied viewpoints on phenomena to not just describe objects, people, or events, but also to deeply understand them in their socio-cultural contexts because they believe that they have shared belief systems in the society they are living in. Furthermore, the studies in interpretivist paradigm can take the approach of diverse methodologies- from narrative study, case study to ethnography because they provide the in-depth life experiences of the narrators (Omodan, 2022) who are the social actors who establish their culture. Moreover, researchers can probe an interviewee's thoughts, values, prejudices, perceptions, perspectives, emotions, and perspectives by utilizing the key approach of interactive interview, which permits researchers to analyse and set off matters that we cannot perceive (Corrado, 2022). Researchers can probe an interviewee's thoughts, values, prejudices, perceptions, perspectives, emotions, and perspectives (Pervin & Mokhtar, 2022). Consequently, gathered valuable data will provide academics with better insights for future action (Pervin & Mokhtar, 2022).

Interpretivists assume that access to reality happens through social constructions such as language, consciousness, shared meanings, and instruments (Omodan, 2022).



Interpretivism (sometimes called 'anti-positivism') takes things yet further by arguing that objectivity is impossible. As an approach, this leads researchers to emphasis on gaining subjective knowledge through approaches where individuals, or smaller groups, are analysed in depth through detailed observations and discussions (McGlinchey, 2022). This connects a broader framework of 'qualitative analysis' in which deeper sets of data are required from smaller numbers of participants – such as through detailed interviews.

Interpretivists can collect qualitative data using a diversity of techniques. The most common of these is interviews (Alharahsheh & Pius, 2020). These can manifest in various forms, such as face-to-face, over the telephone, or in focus groups (Omodan, 2022). Another technique for interpretivist data collection is observation (Corrado, 2022). Interpretivists can also use documentation as a data collecting technique, collecting external and internal documents, such as memos, emails, annual reports, financial statements, newspaper articles, websites, and policy documents to cast further vision into a phenomenon of interest or to verify other forms of evidence (Erciyas, 2020).

3.2 Research Methodology

Research Methodology is defined by Leedy et al, (2021), as systematic process of collecting, analysing and interpreting data in order to upsurge our understanding of a phenomenon about which we are interested or concerned. This study employed a qualitative approach method. Qualitative research is the study of nature, which comprises their quality, various manifestations, the context in which they appear, or the perspectives from which they can be perceived, but rejects their range, frequency, and place in an objectively determined chain of cause and effect (Chinyere & Val, 2023; Jilcha, 2023). Qualitative research is the process of collecting, analysing, and interpreting non-numerical data (Jilcha, 2023). These methods intended to address societies' scientific and practical dispute and involve naturalistic and interpretative approaches to various subject matters (Busetto, Wick & Gumbinger, 2020). This approach employs numerous empirical materials such as case studies, life experiences, and stories that show the routines and problems that individuals are



struggling with in their lives through focusing on their in-depth meaning and motivations which cannot be defined by numbers (Taherdoost, 2022). Qualitative Research refers to research which concentrates on collecting and analysing words and textual or visual data.

Qualitative research is based in the assumption that individuals construct social reality in the form of meanings and interpretations, and that these constructions tend to be transitory and situational. Qualitative research typically involves qualitative data, i.e., data attained through methods such as interviews, on-site observations, and focus groups that is in narrative rather than numerical form. Such data is analysed by looking for themes and patterns. It includes reading, re-reading, and exploring the data. How the data is collected will greatly affect the ease of analysis and utility of findings. When the purpose of the research topic is to analyse, explain, and characterize a phenomenon, qualitative approaches are used (Audu, 2022).

Rather than providing predictions and/or causal explanations, the qualitative method offers contextualization and interpretation of the data gathered. This research method is subjective and requires a smaller number of carefully chosen respondents (Ugwu & Eze, 2023). Therefore, qualitative research is defined as “the study of the nature of phenomena”, including “their quality, different manifestations, the context in which they appear or the perspectives from which they can be perceived”, but excluding “their range, frequency and place in an objectively determined chain of cause and effect (Busetto, Wick & Gumbinger, 2020).

3.3 Description of the Study Area

Nkhaketse Irrigation Project is situated on the Northern part of Lesotho and it is about 52km from Botha-Bothe town. The irrigation project is considered to be huge in the country since it is found at the Hololo River in Botha-Bothe. The project covers about 17 hectares of land which is used by communities nearby who grow vegetables (cabbage, carrots, beetroot and butternut) and maize for both subsistence and commercial purposes, (The Reporter Lesotho, 2023). The research area was selected because it represents the main cropping areas and displays the highest agricultural potential because of the relative abundance of arable land. However, there are a number of



challenges to be dealt with in that area. Shortage of capital, poor market outlets, and incompetent extension services, as reflected on the findings of the research needing attention.

3.4. Description of Research Design

A research design also called a research strategy, is a plan to respond to a set of questions (McCombes, 2019). It is a framework that involves the methods and procedures to collect, analyze, and interpret data (Pawar, 2020). In other words, the research design describes how the researcher will examine the central problem of the research. Pawar, (2020) asserts that the research design refers to the overall strategy that one select to integrate the various components of the study in a coherent and logical way, thereby, ensuring one will effectively address the research problem; it establishes the blueprint for the collection, measurement, and analysis of data. It appoints objectives, data accumulation and method of analysis, hours for work, price, duty, conclusion, and actions. The research design assist a researcher to pursue their journey into the unknown but with a systematic approach by their side. According to University of Southern California (2022), it is indeed the blueprint for the collection, measurement, and analysis of data.

The greatest common methods of explanatory research are Literature research, In-depth interview, Focus groups and Case studies (Pawar, 2020). The research design should be suitable to the type of research question being asked and the type of data being collected (The University of Southern California, 2022). That is, a typical research design is a detailed methodology or a roadmap for the effective completion of any research work.

3.5. Units of Analysis

According to Sekaran (2010), units of analysis is the total collection of elements about which the researcher wish to make implications. Units of analysis for this study comprised of 30 farmers from Nkhaketse Irrigation Project.



3.6. Sampling Techniques

Sampling is a thoughtful choice of number of people who are to provide the data from which a study would make conclusions about some larger group whom these people represent (Marshall et al. (2013). The sample of this study comprised of 30 participants, identified policy documents and related project research report documents. According to Patton cited in Marshall et al.(2013), none of the rules were there for sample sizes in practicality oriented studies as it depended on what the researcher wanted to know, the intention of the inquiry, what was useful, what was reliable and what could be done with available time and resources.

Purposive sampling was used in this study. The researcher deliberately selected items for the sample, thereby, making his choice concerning the items for this research supreme. Pandey and Pandey (2015) asserts that purposive sampling has several merits amongst them the use of the greatest available knowledge regarding the sample subjects, better control of important variables and sample group data could effortlessly be matched.

3.6 Purposive Sampling

The researcher elucidates the qualities of a population of interest. The researcher then tried to recognise the respondents who have those characteristics (Johnson & Christensen, 2008; Polit & Beck, 2012). The main purpose of purposive sampling in this study was to identify respondents that are saturated with information that is useful to the phenomenon of interest (Johnson & Christensen, 2008).

Purposive sampling in this particular study carried three dimensions which are, expert, typical and critical case sampling. Typical sampling defines typical attributes that are vital to the study. The sampling criteria visibly define the participants who should be comprised and not to be comprised. Inclusion criteria are those characteristics that make the respondents qualify to participate in the study while the exclusion standards make respondents not qualify to participate in this particular study (Grove et al., 2012). After the original transcripts and notes from the field were generated in this specific research study, the initial analysis was integrated back into the collected data in a



manner that, purposive sampling changed to theoretical sampling. The main purpose was to join any ends that are loose identified in the initial stages of the research study (Gilbert, 2008).

Charmaz (2014), points out that, as these categories surface, the researcher has to flash back and revisit the real world to attribute rich data that confirms the evolving themes and categories. However, the above sentiments by Charmaz, respondents who were not primarily sampled for this study were later combined because they wanted to shed more light on some relevant grey areas that were regarded as argumentative by other participants.

3.7. Data Collection Techniques

Primary data was attained using self-administered questionnaires. This is a research tool that collects data from a huge sample (Kombo 2006). The questionnaire was made up of open ended. The open ended questions were used so as to encourage the respondent to give an in depth and felt response without feeling held back in revealing of any information. According to Sanders (2011), the open ended or unstructured questions one can generally evaluate them easily. The questionnaires were used in an effort to save time and money as well as to simplify an easier analysis as they are in immediate usable form (Sanders 2011).

Data collection was done using questionnaires and these questionnaires were used to attain information about the population in area. Each questionnaire was subdivided into five sections. The first section covered personal information of respondents; the second section addressed the information on fields of the farmers at Nkhaketse Irrigation project. The third section addressed the information on cropping and the fourth section covered the information on project where respondents gave brief description of the project. The last section addressed information on sources of water for the irrigation in that project. The questionnaires revealed information on both dependent and independent variables which gave answers to research questions.

3.7.1 Data Collection Instruments

Instruments used to collect data from people or sources are referred to as data



collection instruments in the setting of investigation and data analysis. This indicates that it is a methodical procedure of acquiring measurements and observations (Bhandari, 2023). These tools are made to systematically gather data in order to tackle research goals and respond to certain research issues.

For the purpose of this study, data was collected through the semi-structured interviews, where the researcher interviewed farmers at Nkhaketse Irrigation project for their perceptions on how the project is effective to the livelihood of the community. As well, another data collection instrument employed in this study was the document analysis. Below is the discussion on the two data collection instruments to be used in this study.

3.7.2 Interviews

Busetto, Wick & Gumbinger, (2020) defines an interview as a qualitative research method that depend on asking questions in order to collect data. Interviews involve two or more people, one of them is the interviewer asking the questions. Interviews are used to gain visions into a person's subjective experiences, opinions and motivations – as opposed to facts or behaviours (Madill, 2023). Interviews can be differentiated by the degree to which they are structured (e.g. free conversations or autobiographical interviews) or semi-structured. Qualitative interviews have the advantage of being interactive and letting for unexpected topics to arise and to be taken up by the researcher. This can also assist overcome a provider or researcher-centred bias. Interviews can be audio- or video-taped; but sometimes it is only feasible or adequate for the interviewer to take written notes.

Interviews are appropriate data-collection methods for collecting detailed information, flexible and complex situations when questions have to be adapted to suit various people, exploring feelings, beliefs, emotions and experiences of people; and investigating sensitive social issues (Madill, 2023).

3.7.3 Semi- Structured Interviews

Busetto, Wick & Gumbinger, (2020) defines semi-structured interviews as characterised by open-ended questions and the use of an interview guide in which the broad areas of



interest, sometimes including sub-questions, are defined. The pre-defined topics in the interview guide can be resulting from the literature, previous research or initial method of data collection, for example, document study or observations. The topic list is normally adapted and improved at the start of the data collection process as the interviewer learns more about the field. Across interviews the focus on the different questions may vary and some questions may be skipped altogether.

For this study, actions performed on qualitative data collected by researchers are classifying, comparing, weighing and combining material from participants. The purpose of the actions is to extract meaning and patterns that may lead to “description of events into a coherent narrative

3.8. Data Analysis

Polit and Beck (2012) highlight that qualitative data analysis encompasses combining data together; making perceptible what is not understandable linking and attributing consequences to previous circumstances. This study used thematic analysis to analyse data and rigour together with transcription will be taken into account.

3.8.1 Qualitative Data Analysis

The systematic classification process of coding and the identification of themes or patterns used in qualitative data analysis allows for subjectively interpreting of the textual content of data (Mayring, 2022a). Working with data, organising it, breaking it down into manageable components, synthesising it, looking for patterns, determining what is significant and what needs to be learned, as well as determining what to share with others are all parts of qualitative data analysis.

One of the many research techniques used to assess text data is qualitative content analysis (Elik, Baykal, & Memur, 2020). Beyond counting words or extracting factual information from texts, qualitative content analysis looks at meanings, themes, and patterns that may be overt or covert in a given text (Mayring, 2022b). It enables students to grasp reality in society in a flexible and methodical way (Chintakrindi et al., 2022).

Abstracting commonalities and trends from written, visual, and aurally recorded data is



necessary for qualitative data analysis. It is uncommon to code qualitative data using numbers. In qualitative data, patterns and themes are frequently represented using words and phrases. In order to conduct a qualitative analysis of a data set for this study, the researcher followed the three steps. Data were analysed in the first step with the intention of learning more about the main study and its constituent parts. The nature, characteristics, and dimensions of each component were examined in the second stage. The third phase involved drawing conclusions or drawing assumptions about the research materials based on the information learned. Although there are a number of methods for identifying patterns in textual data, the word-based approach was the one used because it is the most dependable and often employed methodology worldwide. Notably, qualitative research uses a manual data analysis technique and was the case with this study. The researchers often read the information that was accessible and looked for words that were repetitive or frequently used.

3.8.2 Thematic Analysis

Thematic analysis is a method of analysing qualitative data (Mihas, 2023). It is usually applied to a set of texts, such as an interview or transcripts (Lefere et al., 2023). Thematic analysis is a data analysis procedure that centres on identification, description, explanation, substantiation and linkages of themes (Constantinou, Polvara, & Makridis, 2023). It is premised on the view that all information is conveyed with meaning and this meaning can be deduced from identifying a central idea or a cluster of ideas that gives it a comprehensive meaning (Byrne, 2022). The researcher closely examines the data to identify common themes – topics, ideas and patterns of meaning that come up repeatedly (Mihas, 2023). Thematic analysis is a good approach to research where you're trying to find out something about people's views, opinions, knowledge, experiences or values from a set of qualitative data – for example, interview transcripts, social media profiles, or survey responses.

Thematic analysis method is an iterative process consisting of six steps: (1) becoming familiar with the data, (2) generating codes, (3) generating themes, (4) reviewing themes, (5) defining and naming themes, and (6) locating exemplars. Becoming familiar with data refers to data immersion and iterative cycles of reading, with each cycle



generating further insight (Mihas, 2023). Generating codes means coding for as many topics as possible and applying the code to a contextual segment, not just a phrase (Kiger & Varpio, 2022). Generating themes means sorting the codes into higher-level topics. Researchers might use tables, mind maps, or theme piles to cluster topics into these broader groupings (Braun & Clarke, 2021ab). This phase ends with “candidate themes” and subthemes (Braun & Clarke, 2022).

Reviewing the themes means interrogating the candidate themes by revisiting the data coded to the component codes. We may determine that the data do not sufficiently support the theme or that there is too much variation across text segments to justify the theme (Delve, Ho., & Limpaecher, 2023c). This may mean renaming the theme or making it a sub-theme of a broader construct. The next phase entails refining the names of themes and ensuring that they occupy the same semantic plane, i.e., that they are conceptually parallel. If the language of most of the themes is broad and abstract (e.g., collectivity and the communal self) but other ideas are more surface-level (e.g., keeping busy, reading a book, playing a game), this may require creating a higher-level construct to elevate the superficial topics to more abstract ones (e.g., suppression and distraction) (Constantinou, Polvara & Makridis, 2023). Producing the report means telling the complex story of the themes, first describing the meaning within each theme, with illustrative examples, and then perhaps looking across themes to discern connective takeaways or meta-themes (Braun & Clarke, 2021b).

The data for thematic analysis is often directly collected by the researcher, such as through semi-structured interviews. That being said, a researcher may still apply thematic analysis to newspaper articles, and content analysis to semi-structured interviews (Kiger & Varpio, 2020).

3.8.3 Rigour in Research

A systematic manner of handling the research process is referred to as rigour (Bowling 2016). It encompasses the thorough and careful collection, interpretation and analysis of the data in such a manner that a sovereign researcher ought to be able to re-analyse the collected data using the similar processes and generate the same findings (Bowling 2016). Rigour is achieved through trustworthiness of the qualitative collected data,



validity and reliability of the quantitative data (Lincoln & Guba, 1985).

3.8.4. Transcription

In this study at hand, a word for word transcription preceded the analysis of data and the researcher attempted to ascertain that the transcriptions were an exact indication of what had emerged during data collection. This was carried out by thoroughly listening to the audio-tape joined with on-going feedback from other students and the research supervisor (Polit & Beck, 2012: 534). The coding was done manually in this study. This simplified manage and possession of the data. Being close with the data through coding manually allowed mini-analysis in that, the information could be seen, and codes could be allocated at the same time (Bazeley 2007: 92; Saldana, 2009: 22).

3.9. Research Ethics

Studies must be directed or guided by clear set standards with the view to protect the rights of the respondents in the study. Safe guarding against immoral research activities and conducting a proper scientific investigation, are prerequisites in carrying out an objective and rational research (Grove, Burns & Gray 2012). Some ethical principles that are used to reflect validity and reliability of the research outcome are: voluntary participation, anonymity, confidentiality, honesty and continuity. This study is grounded in the mentioned ethical principles.

In this regard, the study initially prepared informant's consent forms in the local language that fully brief the participants about the purpose so as to avoid erroneous discernment of the work. The procedure and the total duration of the interview were also clearly explained. It also informed participants of the freedom to withdraw at any time when felt inconvenienced. The consent encouraged respondents to positively cooperate and give honest and unbiased answers. Their answers were kept in strict confidence. Therefore, the study believes that the information gathered was correct and relevant. No participant was remunerated for partaking in this study, and in no way was any participant or respondent solicited to be part of the research.

Ethical considerations, that is, value for people, the steps followed to get informed consent, justice, beneficence and confidentiality, were dealt with in each and every



phase of the research (Grove, Burns & Gray 2012). Adhering to the ethical requirements for research presented no major challenges as the provincial task force was aware of the research intentions and proper channels were followed.

3.9.1. Informed Consent

According to Grove, Burns & Gray (2012), informed consent can be best defined as the participant's confirmation that they want to participate in the study and getting consent is mandatory in research. The consent was first explained to all the participants who participated in this study that it is what exactly the study is all about and their role in the participation. No participant was forced to partake in this research study as all agreed. The respondents were also informed that, they are free to withdraw at any stage when answering questions whenever they feel to do so. Every participant filled the consent form administered by the researcher before participating in the interviews. The researcher read loudly the consent form to every participant. Not even one participant was involved in this study without his or her own consent.

3.9.2. Protection of the Vulnerable Participants

If a respondent is unable to grasp and keep information pertaining the study, it means the participant cannot utilise that information to reach a decision regarding participation or cannot convey that decision. Such participants did not to have the ability to consent to participation and were not included in the study. Johnson & Christensen (2008) consider that written informed consent is vital; in the case of this research, it was obtained from each respondent before participation. Transparency was upheld since the objectives of the study, benefits of the study and the type of data to be collected was communicated well before to the respondents.

3.9.3. Beneficence

According to Polit and Beck (2012), beneficence is best described as the obligation not to cause damage to the respondent and maximise benefits to them. The main purpose of the researcher was to protect the respondents from harm and discomfort. The researcher realised that, there are various risks that are attributed to beneficence such as physical, emotional, social and financial. Building rapport with the respondents is



very crucial in research, hence the researcher tried to be open to divergent views from respondents and using interactive dialogue with participants. No participant was forced to contribute and those wanted to withdraw could do so without penalty.

3.9.4 Justice

Each person has the right to fair treatment. Justice also incorporates the right to privacy, which can be alternatively expressed as confidentiality expressed as confidentiality (Grove et al., 2012; Polit & Beck, 2012). Justice was observed throughout the study to ensure non-infringement of individual participant's rights. All research participants were treated as equal beings.

3.9.5 The Right to Fair Treatment

Sticking to rigorous procedures was a way of making sure that fair treatment was observed and guaranteed. The researcher made sure that, the respondents' contributions were handled with utmost professionalism and respect without any violation of human rights. The researcher had an opportunity to inform the respondents of the right to get professional assistance if need be, and to elucidate what the participants would not have understood.

3.9.6 The right to Privacy

Polit and Beck (2012) assert that a researcher must ensure that there is limited intrusion and the privacy of respondents throughout the study is maintained. With reference to this particular study, it showed that, the researcher related well with the participants with no disturbances and maintained privacy by keeping all details surrounding the interviews. The right to privacy in this study was observed by using codes instead of participant names. Privacy was again further demonstrated by having Key Informant Interviews where there was minimal intrusions or interruptions. Participants were made alert that all the information they gave was gathered, collected and stored within a system that would operate in the strictest of confidence.

3.9.7 Confidentiality

All the respondents participating in the study have the right to confidentiality. This is



supported by (Polit & Beck 2012), saying that, “the information shared by participants should be kept strictly confidential”. The participants were assured of confidentiality when the researcher agreed with them that the information shared is not going to be shared in any way to the public and even amongst the participants. The tape recorder and the notes collected from the field were kept under lock and key in the researcher’s office.

The personal computer of the researcher was used to keep identifiable information such as interviews transcripts. It is anticipated that, the data stored will be destroyed after five years after this study is published when it is no longer of functional value. It is the obligation of the researcher to destroy all the audio recordings produced during data collection phase. The research will further discard all the information in the hard drive using state of the art commercial software. The mass storage device will be then discarded as well. A detailed record indicating what, how, when and which information was destroyed by the researcher is going to be kept.

3. 9.8 Chapter Summary

The chapter discussed the research design that this study employed to come up with credible results. The research is buttressed by research instrument namely, Key Informants Interviews. The chapter cited and justified why the mentioned research instruments were adopted by citing their strengths. The chosen methods when used holistically are a pillar to rely on, since the weakness of one method is tackled by another meaning that they complement each other. The chapter highlighted units of analysis and justified why purposive sampling that is critical case and expert sampling were employed. The methodology was largely or thoroughly inclined to a qualitative one, therefore data presentation and analysis was done using the thematic way since the research was contextual in nature. The chapter also acknowledged the professional guidelines used by the researcher during the research and outlined their significance in the study.



CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION OF FINDINGS

4.0 Introduction

This chapter presents the findings and analysis of data. The qualitative method used to collect data will direct the analysis of the data. The interviews and transcriptions were done and quotations were used to convey clear meaning of data (Rule and Vaughan, 2011). The interview itself was grounded on the questions in the interview guide, even though the order of these questions varied from time to time. Throughout the interviews, the researcher also used a combination of probes and pauses in order to gather as much information as possible. A probe is a comment that the interviewer can use to attain more detailed information, for example, by asking the interviewee to say more about a particular topic, while pauses require the interviewer to be silent for longer than the interviewee in order to encourage them to keep talking (Ary, Jacobs, Sorensen and Razavieh 2010).

The interview guide encompassed 33 questions assembled thematically into five sections. The researcher typically commenced the interviews with questions one to three, related to the farmers and their biographical background. The researcher then moved to the topic of literature in question four and enquire the farmers regarding the economic contribution of Irrigation Project on livelihoods of the communities around the project. After that, the researcher asked them about the scarcity of water at the irrigation project, sustainability and profitability of the irrigation project and the reasons it produces low crop yields.



4.1 Description of Nkhaketse Irrigation Project

Nkhaketse Irrigation Project is located in the lowlands of Lesotho in Botha-Bothe district and it was established in 1989 (The Reporter Lesotho). It is surrounded by rural villages namely, ha Marakabei, Ha Rasekila, Ha Ijo, Liphakoeng, Mankising, and Ha 'Maseretse. The total population of these villages is that are around the project is 1399 and most of the farmers come from these villages (Census 2016). Farmers indicated that Nkhaketse Irrigation Project was made as a plan to eliminate hunger in Botha-Bothe district especially communities that are around the irrigation project. Farmers were consistently growing vegetables (cabbage, carrots, beetroot butternut and maize) in their fields. They further indicated that Nkhaketse Irrigation Project is one of only two irrigation projects that use high- pressure irrigation systems. Farmers further stipulated that Lets'eng Diamond Mine assisted them to commence farming projects through the distribution of seeds, fertilizers and also ploughing machines.

4.2 Demographic characteristics of respondents

The researcher interviewed 30 farmers at Nkhaketse Irrigation Project. 23 farmers aged between 24 and 48, the sample consists of more females than males and among them were high school drop outs. They are producing cabbage and carrots. Farmers selected 7 of 30 members of the irrigation project to represent them as members of the committee. Members of the committee were regarded as the key informants in this study. Of the 7 members of the committee interviewed, 4 were males and 3 were females. 7 members of the committee whose experience in running of the irrigation project varied between 5 and 10 years. Since the interviewees were conducted anonymously, the informants have been allocated the following labels: P1, P2, P3, P4, P5, P6, and P7. The interviews with these seven informants were conducted in person at their respective irrigation project. The table below illustrates the information of the committee in Nkhaketse Irrigation Project.

Table 4.1 Agricultural related site specific of the study



Participants	Age	Sex	Marital status	Level of education	Production
P1	30	Female	Married	High school	Cabbage and carrots
P2	32	Female	Divorced	Primary	Cabbage
P3	37	Male	Married	Illiterate	Cabbage, carrots and beetroot
P4	40	Female	Single	Tertiary	Cabbage
P5	45	Male	Single	High school	Cabbage and beetroot
P6	45	Male	Married	Primary	Cabbage
P7	56	Male	Married	Illiterate	Cabbage and butternut

4.3 Production of crops before irrigation project

Data was collected on the crops that the farmers cultivated prior to the introduction of the irrigation project. The chairperson in Nkhaketse Irrigation project elaborated that before the introduction of Nkhaketse irrigation project, there was a shortage of irrigation equipment such as sprinklers and pipelines. They used small sources for irrigation in their agricultural fields. Furthermore, subsistence farming was the dominant economic activity of that area. Before the establishment of Nkhaketse Irrigation Project, maize and some vegetables such as cabbage and carrots were the main production in that area. Almost every farmer produced cabbage and carrots in their fields. At that time, irrigation was available only in rainy season by pipes and stream which start from outlet region. Farmers indicated that this area is fertile and little bit plain region but due to lack of proper irrigation equipment, agriculture could not give sufficient production. The productivity of crops was less and subsistence survival farming was prevailing in that



area before the construction of irrigation project.

4.3.1 Production of Crops after Irrigation Project

Changes in cultivated area after irrigation facility, the crop production area has also increased in that area. Farmers indicated that they are now able to produce bulky quantity of produce compared to the production before irrigation project. It means that irrigation brought a significant change in the production of agricultural products in the cultivated area. The construction of irrigation project has brought a significant changes in the cultivated land. The dry lands are converted into irrigated land. There is facility of water supply now even though it is not effective. Some of the fallow and dry lands have been converted into cultivated land after the irrigation project.

Most of the farmers in Nkhaketse Irrigation Project produce cabbage for the market because it is easy to grow even in winter and it is less expensive to cultivate and maintain. Farmers tend to overlook vital factors that could enable them do well with other crops as opposed to depending on the production of cabbage. The essential weakness here is that, the over production of one crop tend to flood the market, hence generates a powerful competition among the farmers. The effects of this are economically disturbing the failure of agricultural projects due to sustainability issues. Therefore, farmers are certainly abandoned thereafter. These farmers could, still, do themselves a great favour if they were to consider different methods for cultivating a diversity of crops in order to entice different customers at all times. This could definitely lead to the sustenance of other farms, in the process of making sure of their prosperity and their well-being.





4.4 Themes and Categories

The presentation of data is made through the thematic approach, data was gathered into themes, which were derived from research participants in the study. The findings and analysis cover current trends and realities on irrigation at Nkhaketse Irrigation Project in Botha-Bothe district, sustainability and profitability of the irrigation project, economic contribution, low crop yields and the scarcity of water for irrigation. The thematic areas are presented in Table 4.2 below.



Table 4.2 Themes and Categories

Economic contribution	Sustainability and profitability of the project	Low crop yields	Scarcity of water
Market failure	Share cropping	Restricted fields	Leaking of pipes
Unskilled labour	Conflicts among farmers	Fallow fields	River overflow
Sharing of energy		Theft	Outflow
Source of equipment and machines		Animal damage	

4.4.1 Market Failure

Farmers underlined the potentials and crucial factors for a successful implementation of irrigation projects despite the past failure and actual inactivity of irrigation projects. The main constraint for farmers in Nkhaketse Irrigation Project was represented by low market power and limited access to credits represented. The interviewed farmers specified the foremost potentials of irrigation project that lie in improved commercialisation, common purchases of means of production, improved access to credits, sharing farm equipment and purchase of high quality seeds.

All farmers interviewed in the study region mentioned the commercialisation as the main constraint for farmers' income generation. Farmers in Nkhaketse Irrigation Project produce cabbage, carrots, beetroot as well as maize in small quantities due to lack of market. Most products are sold to the trader directly from the field because farmers do not own any means of transportation for their products and, therefore, lack alternatives to sell their products. Findings indicate that because of lack of market, the trader



dominate the market equivalent to monopolies, dictate producer prices, and even bring manipulated scales when collecting yields from the farmers.

“The transport costs of agricultural produce are more expensive compared to the cost of selling to the local market”. Participant 1 elaborated.

Traders also decide the scale conditions and frequently change them after, usually verbal contract conclusion. The wholesaler even often organise harvest, which diminishes the farmers’ added value and provides the wholesaler extra opportunities to manipulate the yields. Promised payments after resale can be decreased and parts of the harvest denied and left on the field. Farmers typically sell their products to neighboring schools when schools are opened but when the schools are closed their market become low. Regardless of its locality to irrigated fields, farmers cannot sell directly to the factory because they lack means of transportation. Participant 2 (P2) stipulated that they are capable of producing crops in large quantity but they experience market failure.

“We can produce quality crops for commercial purposes from our irrigation project but there is no market. Some of our products become wasted because there are no people in demand of such a product. Besides, we sell some crops such as cabbage in nearby schools because they need it in large quantity but when the schools have closed we encounter a problem. We can supply some cooperatives but we do not have transportation to deliver our products” P2.

Of the 30 participants, 20 farmers sell their agricultural products independently and 10 supply the local market. Earlier, they used to deliver their products in many districts within the country, in addition to doing business with imperative enterprises that used to buy cabbage, carrots, beetroot and maize from them. Since the project is no longer doing well, few farmers sell their products to the local market. This has negatively impacted production because of reduced profits, a culmination of retailing as opposed to wholesaling and these include, carrots, beetroot, cabbage and maize. The farmers indicated that they chose such crops because they need little water, and their seeds are locally found. This has led into higher production of these crops. The majority of farmers (26) in the project produce the same types of crops. This has resulted in a tight



competition, and it is also the reason why the profits are low.

4.4.2 Water Suppliers, Energy, Irrigation Method and Equipment

The issues presented above try to achieve the second objective of the study, which is to assess how scarcity of water affect the livelihood of communities around Nkhaketse Irrigation Project. The findings revealed that water had to be pumped from the source using mainly electricity as a source of energy for irrigation at Nkhaketse. Farmers have to purchase electricity that is going to be used to pump water from the river. If the farmer fails to contribute the agreed amount of money, it is obvious that the fields of that particular farmer will not be irrigated. Farmers used fixed sprinkler system for irrigation. This technology is costly and often ineffective because of under designed pipeline, lack of knowledge by farmers, leaks in the irrigation pipelines, incorrect nozzles and low pump proficiency. P4 elaborated that:

“Our equipment such as metal water pipes are not in good condition. The pipes are leaking because the metal has rusted. They have holes that are not plugged and the joints of the pipes have become leaky. At least if they are buildup of plastic they can take longer time without being destroyed. Water is wasted even before it can irrigate the crops because of leaking pipelines. This problem has been there for so many years and we tried to repair them but they only take a short period of time hence plastic pipelines are essential for this project” P4 complained.

According to the chairperson of Nkhaketse Irrigation Project Committee, source of water for irrigation is Hololo River and water from the river is stored in the dam, from the dam to the storage tank until irrigation takes place. Water is reliable in that project, they get water throughout the year for irrigation and they use reticulation system for pumping water to their crops using electricity. Farmers use sprinklers as a method of irrigation even though they are not of good quality. The pipelines are leaking and when there is a heavy rainfall water run on their fields and equipment gets destroyed.

Results further revealed that lack of fencing at Nkhaketse Irrigation Project resulted in loss by animals and theft of crops and deprived maintenance of infrastructure and



equipment such as sprinklers and pipelines were cited as major problems. Chazovachii (2012), supported this idea and reported that irrigation projects are targeted by thieves who do not just steal crops or parts of the fence but occasionally raid the place for the crops and this tends to draw back irrigation farming. Farmers claimed that they are already harvesting few crops but thieves on the other hand stole their crops since their project was neither fenced nor having a security guard for their crops. They indicated that if their project was fenced they can be motivated to grow quality crops in large quantity and supply their communities and other industries. They further claimed that if they were being helped by either ministry of agriculture or an independent sponsor to buy them fence since it is too expensive. P1 suggested that:

“Penalties should be given to those who leave their cattle to stray into the irrigation scheme perimeter, this will help to deter people from being reckless with their livestock”
P1.

4.4.3 Small Fields and Low Crop Yield

Participants in Nkhaketse Irrigation Project emphasized that they own small fields and that does not allow them to produce more crops for the livelihood of their community. Most of them (25 participants) own a 1 hectare field and few (5 participants) owned satisfying fields and that made them produce crops in small quantity. They indicated that they are unable to grow variety of crop on the same season. Those fields allow them to just grow one type of a crop at the season because they are small in size. Inadequate cultural practices such as poor weed control, low plant populations and insufficient pest control contributed to low yields. There was a strong link between production standards and the level of training provided. They continued to say that those fields are not theirs, some of them hired them while others are from one their family members. They used to harvest twice a year in winter and in summer and they used to grow maize and vegetables for the market. Maepa et al. (2014) indicates that farmers who own small fields that are sectioned and sometimes are fragmented and will lead to low quantity produced by farmers. The evidence is again supported by Devereux, (2013), poor smallholder farmers with only a small land and battling to afford seeds and fertilizers face persistently low yields and chronic hunger. Participant 6



explained that:

"We would produce crops in large quantity but the fact that we are hindered by small fields, we are unable to produce variety of crops. Some of us rent those fields so it would be difficult to rent more than a single field since the market is not good on our side" P6.

4.4.4 Unskilled Labour

Manona (2017) suggests that crop production approaches comprising farmer training in irrigation be considered alongside all other issues during implementation of irrigation projects to improve the livelihood of the communities. Furthermore, shortage of properly qualified project management and farmers is the main drawback to the effectiveness of Nkhaketse Irrigation Project. Training programmes at all levels are of high importance. Findings indicated that it is not easy for unskilled labours to use center pivots and sprinklers at Nkhaketse irrigation project since they have not been trained to use them effectively. Since center pivots and sprinklers are expensive, it will be hard for the farmers to replace them when they have been destroyed by unskilled labours.

According to farmers in Nkhaketse Irrigation Project, they depend mostly on labour (household and hired) for their agricultural activities, given the high cost of mechanisation. None of the farmers interviewed owns a tractor and tractors are hired for cultivating and disking ridging operations. Farm labour is hired either on a part time or full-time basis. Labour hired on a casual and basis serves to help farmers during the critical, labour-intensive stages of the farming cycle such as land clearance, irrigation, weeding, and pest and disease control. Participant 4 complained that they struggle to use some of the equipment such as sprinklers effectively since they are not trained before they can grow crops.

"Training of farmers is vital because some of us struggle to fix some equipment such as sprinklers when they are destroyed or broken" P4.

4.4.5 Financial Support and Distance from Home to the Irrigation Project

Farmers at Nkhaketse Irrigation Project points out that they did not obtain any financial support more especially from the government. The only support they got was from the



Lets'eng Diamond mine whereby they were assisted with tractors for cultivation, fertilizers, and seeds. They did that in order to empower them as farmers. The chairperson of that Irrigation project explained;

"Since I became part of irrigation project the only support we had was from Lets'eng Diamond mine. We need support from government through the ministry of Agriculture. We need them to assist us with at least new plastic pipelines for irrigation since we are using old leaking pipelines. We need them to help us with quality seeds and seedlings for us to produce quality crops for the market" Chairperson lamented.

Farmers are not satisfied with the distance between their residences and the irrigation project. Some farmers highlighted that they have to cross the river in order to reach the project because of access to road. Others indicated that they do not have enough cash for everyday transport. They become demotivated when they think of going to the irrigation project since they do not have enough market to make transport money.

4.4.6 Capital

Participants indicated that they struggled to raise the capital since shortage of capital hampers agricultural production in the irrigation project. Farmers who are not employed and old aged do not have enough start-up capital for commercial agricultural practice. They lamented that they should buy quality machines for them to cultivate up until harvesting. Those machines are expensive and some of them do not afford them since they do not work. The above information is supported by the evidence that the shortage of adequate start-up finance is one of the greatest significant impediments to people seeking to create their own businesses in rural areas (Robinson et al., 2004; Sarasvathy, 2004; Ulrich, 2006). Rural farmers face strict credit scoring methodologies and regulations, complex documentation procedures and long waiting periods when they apply for funding (Robinson et al., 2004).

4. 5. The Livelihood of the Community

Findings revealed that prevent Nkhaketse Irrigation Project has not improved their livelihoods. They complained that the shortage of capital such as finance and machinery (tractors) prevent them from carrying out food production in large quantity.



The shortage of finance made it hard for them to hire labour to increase production. Also, the high cost of inputs and levy paid for tractors used in cultivating their fields constituted another factor deducting farmer's livelihoods. It is imperative to note that farmers depend on social grants such as old aged pension, disability grant, and child support. According to, participants, state grants provide them with stable income which allows them to improve their livelihoods.

This is supported by the evidence that farmers lack education, awareness and understanding of startup financing possibilities, personal savings, and credibility and collateral securities for debt financing, business experience and skills. This explains the common trend in rural areas where the market for products is too low to encourage expansion of entrepreneurial activities. For the market that exists, products are sold at a very low price to benefit the majority of the poor who live in rural areas. This limits entrepreneurs from exploiting some opportunities in rural areas (Ngorora and Mago, 2013).

They further reported that winter prevents them from carrying out food production in large quantity. During winter only few crops such as cabbage and carrots are grown. They again reported that due to the cold weather, they are forced to abandon production because they tend to fall sick. As a result the average yield during winter is very low. Participant 4 explained;

*"During harvesting time, we have to wake up early before 8 O'clock a.m. so that buyers would find our produce readily available whenever they need them. We have to wash the products with cold water in the morning and it is not easy for us because we become sick, we suffer from common cold and end up leaving the project because of cold weather condition"*P4.

Participants explained that due to the above challenges their livelihoods are not improving since they do not make enough profits from the project. As a result they are getting poorer thus hindering development in areas surrounding the project. In addition, other problems, such as poor fencing, winter, absence of title deeds and ownerships of land by farmers, low level of education, levy paid on electricity and tractors, and lack of proper sanitation (Clean water and sewerage) to farm houses were reported during the



interview.

4.5.1 Conflicts among the Farmers

Farmers at Nkhaketse irrigation project revealed that the conflicts arise when they compete for customers. Most of the farmers sell the same types of crops in that irrigation project, so selling of one type of crops causes conflicts because if customers are limited especially local customers they fight for them. They also fight for irrigation schedules. They indicated that since they divided their project into two sections, they planned that the first section should irrigate and the second section will follow. So some of the farmers after irrigating their crops, they leave their pumps on from the pipelines so when it is the other section's turn their crop become irrigated too. That behavior of some other farmers caused conflicts among the farmers and leaders of the irrigation project.

Conflict between farmers has also been predominant as a result of their efforts to attain satisfactory water for irrigation. The farmers interviewed revealed that water conflicts are common. Water conflicts are usually resolved by irrigation project committee within the project. This is supported by Naika and Siddaramaiah (2016) that participation contains management of skills, mobilization of community members, conflict resolution and institution building amongst extension personnel. When farmers fail to resolve arguments at the lower level, this is intensified to the irrigation project at cooperative level. Without help from outside, farmers have taken temporary initiatives to make sure that water is able to reach their fields. Some farmers resort to patching the cracks on their pipelines using mud and sand bags. This is very basic and cannot address the root causes of insufficient water.

In addition, participant 10 who is renting a field for irrigation, made his own plan of making sure that water is available in his fields. When he was given the field that he is currently using, water could not reach his fields. He had to examine and determine the cause of water blockages, clear the pipelines, and construct other pipelines to channel water to his fields. Now water is able to reach his fields. One solution proposed by him is that the project should confront the government or a private stakeholder for a loan, and then hire a private contractor, preferably from outside of Botha-Bothe district, to



rehabilitate the irrigation project and the dam. He said they need someone out of the district because some of the contactors within the district disappoint them hoping to be called again and repair it.

4.5.2 Lack of Proper Monitoring and Evaluation

Findings revealed that shortage of monitoring and evaluation of farmers in Nkhaketse irrigation project is a serious challenge to improving the livelihood of the community. The leader of that project indicated that they have been taken into some other workshop in town held by the Ministry of Agriculture to guide them how to apply pesticides on the crops. There was no follow up to education they have been given to ensure continuity of the proper application of pesticides. Some interventions are abandoned because of shortage of strict and organised follow up. Some of the farmers did not follow that because they are used to primitive way of killing pests on the crops.

Thus for any irrigation to succeed and to produce better outcomes, there is need to institute proper monitoring and evaluation project measures to identify operational problems, which will need to be resolved along the way or during the production of crops until products are ready to be sold. Participant 9 revealed that some of them are not educated, they do not know how to read and write so they cannot be able to note down important notes while in the workshop. So they need to be monitored so that they can do the right thing until they produce satisfying crops for the market. One of the farmers claimed that:

"When we come from the workshop, we need them to come and follow up what they taught us so that we get to know if we are doing the right thing or not. We need to be motivated by them, they should come and correct us if we are not following what they taught us. We need to produce quality crops for the livelihoods of our community" P9.

4.6 Recognised Satisfaction with Land Size and Form of Ownership

Land ownership poses numerous problems in irrigation farming as farmers cannot sustain long term capital investment because of temporary rental agreements or the shortage of full ownership of land. Findings revealed some of the farmers do not own the fields, some of them rent them and others belongs to their relatives. It became



evitable during data collection that many farmers (17) at Nkhaketse irrigation project were not pleased with the present rental agreements due to the informal contracts that usually exist between stakeholders. This factor was identified as a substantial uncertain block in potential irrigation development in the area. Participant 7 indicated that:

"It is difficult for us to make profit because we are not the owners of the fields, we are renting them and they are expensive. Land owners do not understand that we make little amount of money since we do not have a stable market. It is our plea that the government or NGOs can assist us in paying of rents so that our livelihood can improve" P7.

4.7 Diseases and Weed Management

Farmers indicated that unsuitable weeding management can lead to heavy losses in crop production. The irrigation farmers in Nkhaketse Irrigation project use hoeing as the major method of controlling weeds, while few farmers apply chemical control. A possible reason for this allocation may be that farming in Lesotho is done mostly on a small scale and that household members can involve themselves in weed control exercises. The use of chemical weed control is normally taken as expensive. Participant 12 complained that:

"We are not encouraged to use chemicals in order to kill weeds. Ministry of Agriculture encouraged us to use traditional method which is hoeing since chemicals might affect the growth of our crops. Crops like cabbage need fresh air all the time in order to grow. We remove weeds every two weeks depending on the level of rainfall in that season. We do not remove weeds just once like other crops" P12.

4.8 Contribution of Benefits from the Project to People's Livelihoods.

Few respondents were fulfilled with the income they get from irrigation farming. Those satisfied could manage to meet some of the basic requirements like sending children to school, buying groceries for the family and income to cover some farm inputs. Other farmers indicated that they could afford to pay a visit to their distant relatives and also affording cellular phones. However the majority mentioned that the income they get



was not always enough during the time of the year when the market is flooded and the inputs are costly. This suggests that the success of the project is held in revealing.

On the other hand, the attainment of assets such as scotch carts, ploughs and livestock are a sign that irrigation is promoting economic empowerment. Scotch carts are used to carry products from the fields to their homes thus certifying that transportation of their produce can be easier to some of the farmers. Crops can be sold in greater quantity so that they get income to cover for their basic needs. Moreover, instead of depending on synthetic fertilizers, farmers use animal manure since artificial fertilizers are costly for them.

The various crops grown in the fields such as vegetables, tomatoes and beans increase their nutritional requirements. Mutsvangwa et al (2006) is of the view that vegetables, and other crops affect customer's diet and health not only to rural households but also to those who buy them through local markets. Therefore food crops have a special role in supplementing the diet of small children at weaning age and lowering the lack of protective foods. Dried vegetable would be found all year round.

Since the majority of the respondents were females, irrigation also empowered women and liberates them socially. Recently, women tend to play a leading role in farming and this ensures their contribution in development creativities and poverty mitigation in rural areas. This was supported by Munina et al (2000), Manzungu (2004) who argue that women in irrigation farming upsurge income which changes the balance of power within the household. This encourages women's' confidence in discussions for community decision making which affect their lifestyles.

The availability of water throughout the year confirms that cultivation is done all year round. Double cropping ensures that farmers get income from the crops they grow though limited. Therefore, irrigation farming is the source of income and dietary requirements for the disadvantaged rural people.



4.9 Discussion of Results

4.9.1 Market Failure

As it was indicated in chapter 4, according to the findings, marketing was a main challenge hampering production of crops in the irrigation project. Market failure refers to the inefficient distribution of goods and services in the free market (Bator and Francis 1958). It was also reported that lack of appropriate market information is another foremost issue bothering farmers in the project. Lack of market and information has hindered their livelihoods in the project since they are unable to exploit other options of markets. The above statement is confirmed in the subheading 4.5 where farmers testified that their livelihood has not been of better quality since using the project due to challenges such as marketing. The issue of marketing and information problem is a very serious threat to farmers in creating income from the Nkhaketse Irrigation Project. This is in line with studies conducted by Kundlande et al. (1994) which specify that in Mutare, Manicaland Province in Zimbabwe, only hotels and schools were targeted as markets for irrigation farmers. Woldeab (2003) also supports with the statement and designates that market information is limited to small scale farmers involved in irrigation systems in North of Ethiopia and this has hindered marketing of their agricultural products.

4.9.2 Lack of Capital

Findings revealed that farmers have a problem in obtaining capital such as finance to make production easy in the project. They were not able to receive any financial support from any institution. This is a serious tragedy to the small scale farmers in the project since finance is required to pay for electricity and also to buy farm inputs like chemicals, pesticides, tractors and fertilisers to make the production easy. This has bargained food security and livelihoods in the communities around the project. The above explains the reason to produce crops in small quantity in Nkhaketse Irrigation Project. The researcher shared the same sentiments shared by Machete et al. (2004). Machete et al. (2004), indicated that one of the most critical problems threatening the viability of smallholder irrigation is the absence of credit. Access to financial, physical and natural capital leads to sustainability of the irrigation project. Farmers need chemicals, seeds,



fertilizers and, in certain cases, irrigation pipes and sprinklers to facilitate production. Findings revealed that farmers do not have the funding to purchase agricultural implements because of the absence of credit from financial institutions and as a result of this, farmers are forced to do away with such important inputs which negatively affect the quality of their crops.

4.9.3 Scarcity of Water

Water is seen as an imperative factor in enabling farming in semi and arid region like the case of Nkhaketse Irrigation Project. Water permits crop production to be carried out throughout the year to escape food insecurity. Nevertheless, lack of water is seen as a challenge facing most irrigation farming in the world, Lesotho and Nkhaketse Irrigation Project in particular. As indicated in subheading 4.4.2, participant 4 elaborated that the high rate of water charged by the Lesotho Electricity Company (LEC) hindered food security and livelihoods in the area. As a result of the high water rate charged, farmers have accrued huge amount of debts in the project. This was supported by (Han & Zheng 2004). He argued that water pricing hike methods have intimidated the feasibility and sustainability of irrigation projects in China. This has made some irrigation projects in China to collapse thus causing food insecurity in the area. De Fraiture & Perry (2002) agrees and point out that incline in water prices for irrigation diminishes farmers' incomes, more especially those whose income basically comes from crops.

4.9.4 Theft of crops

Findings revealed that theft of farm crops had been a hazard to the existence of the project as this reduces productivity. Because of deprived fencing and the absence of an organised security system in the project, thieves are able to get their way to the irrigation project not just stealing crops but parts of the irrigation systems. This has led to continued poverty and food insecurity in households in that area. High rate of theft can lead to improper functioning or collapse of irrigation systems if not properly maintained. This view echoes that of Chazovachii (2012), that irrigation projects are targeted by thieves who do not just steal crops or parts of the fence but occasionally raid the place for the crops and this tends to draw back irrigation farming.



In addition, findings revealed that farmers lack the knowledge of irrigation development. Lack of title deeds and ownership of land by farmers was another reason plaguing farmers in the project. This has made the farmers to be scared to upsurge production because of doubt and suspicion. Another problem is the continuous change in the Ministry of Agriculture which affects the effectiveness of the Nkhaketse Irrigation Project. This is because legal policy that has been taken into consideration to improve the effectiveness of the project is often disturbed. The last main issue raised is the lack of proper fencing of the project, levy paid on electricity which is too high and the sprinkler irrigation system used on the irrigation project. Sprinkler irrigation system is hard to use and requires massive labour. Winter was quoted as another challenge plaguing the project.

4.9.5 Transportation

Findings revealed that shortage of transport facilities such as vehicles to take their products to the market were another challenge facing farmers on the project. In addition, farmers were accountable for taking their products to the buyer or market. This tends to disadvantage farmers to take produce of high quality to the market. Consequently, any profit made from the project is low thereby deducting farmer income and food security hence livelihoods. The researcher shares the sentiments expressed by Wodeab (2003). He indicates that at the local level in Ethiopia, for example, in the rural areas product flow is more problematic as roads linking remotely located irrigation farmers to various markets are often unpaved and transport services are rare. Rural areas usually have gravel roads which are long and winding, some poorly maintained and inaccessible to irrigation project and/or market.

The suggested possible solutions provided by the farmers at Nkhaketse Irrigation Project to address the problems facing the irrigation project comprise: Extension Officers should be part of the project as this will enable them to provide with a better knowledge on how best they can produce better quality of crops. In addition, the Ministry of Agriculture should uplift or keep up with the farmers on the project as this will decrease exploitation of farmers. The government and non-government organisations should assist farmers with fencing of the irrigation project and a well-



organised safety systems to avoid thieves and animals from attacking the project. Lesotho Agricultural College (LAC) must be involved to help extension officers with training and education in irrigation project development. To appoint the farmer who has the interest of the irrigation project at heart will lead to sustainability. More importantly, the Ministry of Agriculture should substitute the sprinkler irrigation system used on irrigation projects to some other better methods of irrigation.

4.9.6 Chapter Summary

The data discussed in this chapter show that there are many challenges facing farmers in Nkhaketse Irrigation project. The issue of government failure to assist farmers seemed to be the focal one. Lack of appropriate market information is another foremost issue bothering farmers in the project. Lack of market and information has hindered their livelihoods in the project since they are unable to exploit other options of markets. By virtue of being small scale farmers, these people do not have capacity to sustain their farming ventures without any government support. In addition, their lack of education seems to be problematic as well. Those who are educated are also old, exacerbating their farming dilemma.



CHAPTER 5

SUMMARY OF THE STUDY FINDINGS AND RECOMMENDATIONS

5.0 Introduction

This chapter presents a summary of the study and that of its findings as analyzed in the previous chapter. The chapter also provides a number of recommendations based on the objectives of the study. Thereafter, possible solutions are provided.

5.1 Summary of the research findings

This summary is based on the research objectives as obtained in chapter one. The study findings are discussed according to the following objectives, to determine the economic contribution of Nkhaketse Irrigation Project improve the livelihoods of the communities around the project, to assess how scarcity of water affect the livelihood of communities around Nkhaketse Irrigation Project, to determine how Nkhaketse Irrigation Project ought to be sustainable and profitable to the community and to assess the reason Nkhaketse Irrigation Project produce low crop yields for the livelihood of the communities around the project.

Objective one: to determine the economic contribution of Nkhaketse Irrigation Project on the livelihood of the communities around the project.

After the implementation of Nkhaketse Irrigation project, the livelihood of the villagers around the project slightly changed. According to the data collected, farmers are able to produce crops even though they are not quality crops for the market. They produce



small quantity of crops due to small fields and lack of resources such as tractors for cultivation, fertilizers and seeds. Furthermore, farmers indicated that they are able to supply neighboring communities with their produce since they are producing cabbage, beetroot, butternut and carrots for both market and consumption.

Objective two: to assess the effect of water scarcity on agricultural livelihood of the livelihood of communities around Nkhaketse Irrigation Project.

The findings revealed that each and every farmer has an access to water throughout the year unless if one of the farmers has not paid for the electricity to pump water from the source to their fields. The chairperson in Nkhaketse Irrigation claimed that some of the farmers are unable to afford the cost of electricity since the electricity is expensive. He concluded that if they have a sponsor to help them access water easily from the river to their field, their livelihood would improve and they would be motivated to produce crops even in large quantity.

Objective three: to determine how Nkhaketse irrigation project ought to be sustainable and profitable to the community.

Farmers indicated that if their irrigation project is fenced or being secured with a guard the project would be sustainable and profitable for the community. Since animals and thieves destroy their crops they are unable to make satisfying profit. That has led to continuing poverty in the villages surrounding the irrigation project because they do not get enough food for their families to survive. Not only lack of market hinders the sustainability and profitability of the irrigation project but also animals and theft play a huge role in causing food insecurity in communities around the project.

Objective four: to assess the reason Nkhaketse Irrigation Project produce low crop yields for the livelihood of the communities around the project.

Farmers indicated that lack of transportation to transport their produce to the market demotivate them to produce high crop yield. They are unable to carry their produce to other districts where they might have gotten the market because of lack of transport. They further claimed that if buyers do not come directly to their fields they are struggling to sell their produce and some of them get damaged such as cabbage and



butternut.

5.2 Conclusion

Nkhaketse Irrigation Project was implemented to advance the lives of the people in communities around the project through income, creation of job and most specifically to provide livelihoods of the community. Affected parties like Lets'eng Diamond Mine and a Chinese tender are all part of the project since they helped farmers to maintain and build a dam for them as well as to start them up by cultivating and planting their fields. According to Long (2001), farmers and other affected parties, all play an imperative role in the project that will enable the project to be maintainable using oriented actor approach as an imperative factor to ensure irrigation sustainability. The project enabled some farmers to produce more food which has helped in refining their livelihoods. The farmers are able to make profit even though it was not enough compared to how profitable quality crops are. Assets are acquired by some of the farmers such as livestock and farming tools with profit made from the project although limited. Nonetheless, the profit made by farmers has not been able to address food security and livelihoods amongst farmers in Nkhaketse Irrigation Project due to mentioned challenges. These challenges consist of; shortage of proper markets, institutional problems, lack of finance to purchase inputs, low level of education of farmers, high water rate charged, transport and theft of crops which hindered production to be done on a larger scale.

5.3 Recommendations

The following recommendations are grounded on the findings of this study. It is estimated that these recommendations may be used as strategies for the government (Ministry of Agriculture) and other affected parties involved in irrigation development to alleviate the encounters facing farmers in the Nkhaketse Irrigation project especially and Lesotho at large.

5.3.1 Market

From this study, it is evident that farmers in Nkhaketse Irrigation Project are facing a problem when it comes to market. Therefore, the study recommends that:



- ▶ The Ministry of Agriculture must support farmers in marketing their products. This can be perfectly done by holding market fairs and agricultural trade exhibitions.
- ▶ Also Ministry of Agriculture can help farmers through media platforms to promote their products.
- ▶ The one buyer system of marketing announced by the Ministry of Agriculture should be addressed so that farmers would be able to market their products with freedom.
- ▶ The Ministry of Agriculture, with access to market information, private and governmental organizations should continually supply market information to farmers.
- ▶ Also farmers must implement cooperatives as this will make them to gain power to influence the market.

5.3.2 Capital

The study confirms that capital was a thoughtful challenge confronting farmers in Nkhaketse Irrigation project. In this regard, it is recommended that:

- ▶ The ministry of Agriculture must introduce community based bank to meet the financial needs of the farmers in the project.
- ▶ Lesotho government through the bank should provide capital in the form of inputs such as fertilisers, seeds, chemicals and pesticides up to 60 percent then the community can provide the rest.
- ▶ The rate of percentage of loaning money should be underneath the cost of operation of the project.
- ▶ Cooperatives must be implemented by the farmers as this would make them obtain loans from banks involved in agricultural development since they would be able to pull their resources together.
- ▶ The Ministry of Agriculture should organise workshop to teach farmers on how



to gain loans from banks and the significance of repaying the loans.

- ▶ Lastly, the Ministry of Agriculture should encourage banks involved in agricultural development to help farmers in the irrigation project.

5.3.3 Transport

Farmers in Nkhaketse Irrigation project are facing a challenge of transport to deliver their products to the market. It is recommended in this study that:

- ▶ The government (Ministry of Agriculture) and other non-governmental organisations (NGOs) involved in Nkhaketse Irrigation project should help the farmers with less expensive transport.
- ▶ Also, the Ministry of Agriculture should inspire the commercial buyer to make transport accessible to farmers.
- ▶ Above all, Local Government should be part of the project and should help farmers with roads leading to the irrigation project since this is the responsibility of the Local Government.

5.3.4 Theft of crops

Theft of crops and parts of the project infrastructure is a challenge facing farmers in the project. The study therefore, recommends that:

- ▶ The government of Lesotho should help farmers with a fence for the security of the project or a well-fenced project should be introduced by those involved on the irrigation project.

5.4 Limitations of the study and recommendations for further studies

5.4.1 Limitations of the study

The limitations of this study is that the number of participants were few since there were only two interview sessions in irrigation project. There should be more irrigation projects, and more farmers interviewed in order to authenticate the findings. If there was a chance for a study to take a longer period of time and involving more participants would be favored for this particular method of research. Another issue with the study is



the geographical location. It focused on the irrigation project from one part of the country. If chance afforded, the study may have been extended to other districts of the country in order to cover a larger area and receive richer data from such places. The purposive sample does not permit for generalisations and these results need to be assessed in relation to their context and further research in this field must be conducted.

Another shortcoming with this study is the researcher used only one instrument which is semi-structured interviews, which may render the study biased. There is a call for more instruments in order to make the results more valid and tangible.

5.4.2 Recommendations for further studies

Unknown effects from interview translations into English might have impacted the consistency of the data badly. A need, therefore, exists for farming scales and terms to be officially translated and validated in Sesotho in order to minimise misrepresentation and improve data reliability and validity. The study relied on cross section data collected from one irrigation project. More research insights could have been gathered if the study had covered a number of irrigation projects across the country. Future studies could consider using panel data instead of cross-sectional data. Collecting data over a longer period of time could have enabled both spatial and temporal dimensions of the cause and effect relationships.

Future studies could compare water usage according to rankings of the farmers. Sampling biases included the fact that many of the participants interviewed were middle age or older. More research insights could have surfaced in researching whether or not young farmers faced unique challenges, constraints or opportunities relative to older farmers. A comparison of farm rankings and gross margins of young and older farmers in future research would also be insightful. This study could have benefited from a larger sample of non-irrigators, community gardener, and independent irrigators. It is suggested that an extensive study is conducted to determine the farming developmental paths of subsistent farming all the way to commercial farming. The detailed comparison of these paths between independent irrigators, scheme irrigators, a community gardener and non-irrigators would be insightful. Research on areas such as



evaluating the quality of training programs, comparing outcomes of trained versus non-trained farmers, and evaluating the contribution of farmers toward curbing unemployment at the macro level still needs to be conducted.



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APPENDICES

Appendix 1: A LETTER OF INTRODUCTION TO UNDERTAKE RESEARCH

THE NATIONAL UNIVERSITY OF LESOTHO

Telephone: +09 266 340601
Fax : +09 266 340000
<http://www.nul.ls>

P.O. ROMA 180,
LESOTHO.
SOUTHERN AFRICA.



E-mail: s.setsabi@gmail.com

22, May, 2023

Tel: 57435196



Dear Sir/Madam,

Re: Letter of Introduction Nkoebe David Malikhi (201701870)

Nkoebe David Malikhi, whose student number is 201701870, is a Student at the National University of Lesotho where she has enrolled in the Masters Programme in Development Studies. He is currently undertaking his research for her dissertation which is entitled "The effectiveness of Nkhaketse Irrigation Project on te livelihood of Communities in Botha-Bothe". The National University of Lesotho, through the Department of Development Studies, herein kindly requests that you assist him with information that he needs for the completion of his research dissertation.

Please do not hesitate to contact me as her research supervisor if any further clarification is required.

Yours Sincerely,

A handwritten signature in blue ink, appearing to read 'Setsabi Setsabi', enclosed in a blue oval scribble.

Setsabi Setsabi

(Senior Lecturer, Development Studies and Research Supervisor)



APPENDIX 2: INTERVIEW GUIDE

The research sought to investigate on farmers on the effectiveness of Nkhaketse Irrigation Project.

Section 1- introductory questions

Section 2- information on fields

Section 3- information on cropping

Section 4- the project

Section 5- source of water for the project

All different questions and answers will be highlighted.

The research questionnaire was administered to respondents.

Section 1.

INTRODUCTORY SECTION



- What is your name?
- Name of the village?
- Education?
- Sex?
- Principal occupation?

Section 2.

INFORMATION ON FIELDS

- Number of the fields?
- Ownership of the fields (own, share cropping, renting or leasing out)?
- Are all your fields under irrigation, if not why not?
- Size of the fields being irrigated?
- What crops were cultivated on the fields before irrigation?
- Were any of the fields left fallow for more than 2 years?

Section 3.

INFORMATION ON CROPPING

- What crops did you grow on your fields before you joined the irrigation project?
- How many harvests did you make each year from each field?
- Was your cultivation primarily for home consumption or for the market?
- How much harvest did you make each year from each field before you joined the irrigation project?
- Has the use of water for irrigation affected the availability of water from other sources e.g. natural springs? If yes, which sources have been affected and how?

Section 4.



THE PROJECT

- Give a brief description of the project.
- What are the major challenges in implementation of the project?
- For how many years have you been the part of the project?
- What are the factors that influenced you to join the project?
- What crops do you cultivate after having joined the project on the fields that are being irrigated?
- After joining the project what crops are you now cultivating in the irrigated fields?
- After joining the project what crops are you now cultivating in the fields that are not being irrigated?
- After you joined the project, are the crops produced primarily for home consumption or are they produced for the market?
- How many times a year do you harvest your produce from the fields that are now part of the project?
- Do you make more money or less money from the fields that are part of the project? (please explain your answer)
- Do you use more labour on your irrigated fields than before you joined the project? (Explain your answer)
- Do you use more machinery on your irrigated fields than before you joined the project? (Explain your answer).
- Are there any communal conflicts that have been brought about by the project? If yes, please describe those challenges.

Section 5.

SOURCE OF WATER FOR THE PROJECT



- What are the different water sources in this area?
- What is the primary source of water for the irrigation project?
- Is the supply of water for irrigation throughout the year adequate? If no please explain.
- Has the use of water for irrigation affected the availability of water from other sources e.g. natural springs? If yes, which sources have been affected and how?

