

**CONTRIBUTION OF SMALL SCALE IRRIGATION SCHEMES
TO THE LIVELIHOOD OF RURAL HOUSEHOLDS: THE CASE
OF LUMUMA IRRIGATION SCHEME IN KILOSA DISTRICT;
MOROGORO REGION**

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LIVELIHOOD OF RURAL HOUSEHOLDS: THE CASE OF LUMUMA
IRRIGATION SCHEME IN KILOSA DISTRICT;
MOROGORO REGION**

By

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**A Dissertation submitted in Partial fulfilment of the Requirements for the
Degree of Master of Science in Economics (MSc Economics) of Mzumbe
University**

2013

CERTIFICATION

We, the undersigned, certify that we have read and hereby recommend for acceptance by the Mzumbe University, a dissertation entitled **Contribution of Small Scale Irrigation Schemes to the Livelihood of Rural Households: The Case of Lumuma Irrigation Scheme in Kilosa District; Morogoro Region**, in partial fulfilment of the requirements for award of the degree of Master of Social Science in Economics (MSc Economics) of Mzumbe University.

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I, **Willy Gerald Chiwaya**, declare that this dissertation is my own original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award.

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DEDICATION

My wife, Maria Daudi, children and my late mother, Rose.

LIST OF ABBREVIATIONS AND ACRONYMS

BTC	Belgian Technical Cooperation
CHAULU	Chama cha Umwagiliaji Lumuma
CPR	Common Pool Resources
DALDO	District Agriculture and Livestock Development Officer
DANIDA	Danish International Development Agency
DIDO	District Irrigation Development Officer
GM	Gross Margin
IWMI	International Water Management Institute
MoAFS	Ministry of Agriculture and Food Security
NBS	National Bureau of Statistics
PPP	Purchasing Power Parity
URT	United Republic of Tanzania
SPSS	Statistical Package for Social Sciences
SSA	Sub Sahara Africa
SSIS	Small Scale irrigation Scheme
REPOA	Research on Poverty Alleviation
TPHC	Tanzania Population and Housing Census
WUAs	Water Users' Association

ABSTRACT

Irrigation farming is one of the most important rural development investments that can have both direct and indirect impacts on poverty and food security. Small-scale irrigation is said to be the dominant contributor to the total irrigated areas. Despite the contribution of small scale irrigation systems in enhancing rural agricultural production and alleviating poverty being widely recognized, this contribution has not been evident for small scale holder farmers at Lumuma irrigation scheme. The general objective was to assess the contribution of small scale irrigation scheme at Lumuma in enhancing the livelihood of rural households.

Case study research design was used in the methodology. A sample size of 75 respondents (including small scale holder farmers and extension officers) was involved. Data collected were descriptively analysed using SPSS computer software.

The findings from the study showed that 70% of the respondents agreed that the availability and utilization of Lumuma irrigation scheme has reduced indebtedness caused by poverty which they faced before the commencement of the scheme. However, 78% of the respondents argued for the presence of poor infrastructure which does not enable farmers to attain the expected yields and 80% of the respondents reported the lack of reliable markets and information which necessitate farmers to sell their yields in a low price. Likewise, 78% of the respondents agreed on improving the physical infrastructure of Lumuma irrigation scheme in order to cater for a good number of small scale holder farmers and access to marketing the products as to enable farmers to freely sell their products at the reliable market for the purpose of attaining profits.

The utilization of Lumuma irrigation scheme has been a success to small scale holder farmers in Kilosa district. Policy makers have to see a need for promoting irrigation development so that farmers can irrigate more crops, fruits, vegetables and other fresh produce while encouraging group cohesion in scheme activities like marketing and maintenance of infrastructure.

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CHAPTER ONE

INTRODUCTION AND PROBLEM SETTING

1.0 Introduction

This chapter provided the assessment of the contribution of small scale holder irrigation schemes to the livelihood of rural households at Lumuma irrigation scheme in Kilosa district. In this chapter, the study describes the background to the problem; followed by statement of the problem; research objectives and questions; significance; limitations and organisation of the study.

1.1 Background to the Problem

In Africa, agriculture forms the backbone of most of the continent's economies, providing about 60% of all employment (Birendra *et al*, 2011). During the last decade, per capita agricultural production has not kept pace with population growth. Consequently, as per the Food and Agriculture Organization's (FAO's) assessments, at the end of the 1990s, 30 countries in Africa had over 20% of their population undernourished, rising to 35% in the 18 worse affected countries. In terms of absolute numbers, between 1997–99, 200 million people were malnourished, with 194 million of these people living in Sub-Saharan Africa (SSA). The food gap estimated at 17 million tons in 2000 was filled by imports (14.2 million tons) and food aid (2.8 million tons) at a cost of US\$18.7 billion. In 2001 close to 30 million people required food emergencies due to droughts, floods and civil strife (You *et al*, 2010). Agricultural growth offers possibilities for reducing risks of food shortages at all levels, increasing overall supply of food, creating economic opportunities for vulnerable people and improving dietary diversity and the quality of food consumed by farm households (Lyne *et al.*, 2009). Development of the agricultural sector in Africa is therefore seen as central to combating hunger, reducing poverty, and generating economic growth (through the reduction of food imports and the boosting of exports). However, progress in the sector can only be achieved if the main constraints are successfully addressed such as: variability in climate; limited access to technology; low levels of rural infrastructure; and poor institutional structures.

Other areas that need addressing are the poor political and economic governance, the need to introduce supportive policy and legislation, the need to develop rural entrepreneurship capacity, combat HIV/AIDS, mobilise savings for investment and improve the performance of cash crops (Ortman and King, 2010).

Small-scale irrigation is said to be the dominant contributor to the total irrigated area in many African countries (Mwakalila and Noe, 2004). Agricultural production is the mainstay of Tanzania economy. In 2009, agriculture accounted for 24.6 percent of the GDP and about 80 percent of the population was dependent on agriculture for their livelihood (Tanzania Economic Survey, 2009). The 1997 Tanzania irrigation policy shows that irrigation is a means of stabilizing agricultural production and livestock keeping, both being adversely affected by periodic droughts. The developed policy is to have an important aspect because its strategies are to improve food security, increase farm productivity and income generated is to enhance production of higher value crops (URT, 2009). The development of small-scale irrigation schemes practice by farmers is seen as a viable and practical alternative to rain-fed agriculture. Therefore, small-scale irrigation schemes is said to be adopted easily in order to suit local socio-economic and environmental conditions (Sokoni and Shechambo, 2005). By June 2008, Tanzania had 289,245 ha under improved irrigated agriculture, spread across more than 1,000 irrigation schemes, most of them smallholder-managed. Paddy is commonly grown on these schemes and yields can be as much as four times those of rain-fed areas, although the various types of irrigation schemes and management systems result in a range of 1-6 tons/ha (Kaswamila, 2004).

There seems to be a general consensus that improving agriculture and enhancing agricultural productivity through irrigation will remain a key strategy for rural poverty alleviation in most of the low income countries, where the majority of the rural poor depend directly or indirectly on agriculture (Hillel, 1997). A number of studies such as those conducted by You *et al* (2010) in different countries show that irrigation has served as the key driver behind growth in agricultural productivity and in increasing household income and alleviating rural poverty.

Lipton *et al* (2004) state that irrigation can reduce poverty through increasing production, income and reduction of food prices. This helps very poor households meet the basic needs associated with improvements in household overall economic welfare, protection against risks of crop loss due to erratic, unreliable or insufficient rainwater supplies, promotion of greater use of yield enhancing farm inputs and creation of additional employment, which together, enable people to move out of the poverty cycle. Frequent drought and adverse economic conditions are the major problems faced by the irrigation sector in semi-arid areas of sub-Saharan Africa. To reduce risks associated with rainfall variability and increase yields of food crops, more public investments in yield-enhancing technologies—such as small-scale irrigation and irrigation management systems—have been recommended as one important rural development and poverty reduction strategy (Sokoni and Shechambo, 2005).

Smallholder irrigation development has shown throughout the developing world that it can be used as a key drought mitigation measure and as a vehicle for the long-term agricultural and macro-economic development of a country (Sokoni and Shechambo, 2005). Successful smallholder irrigation schemes can result in increased productivity, improved incomes and nutrition, employment creation, food security and drought relief savings for the government. However, socio-economic evaluations of smallholder irrigation schemes are needed at regular intervals in order to be able to derive lessons from past experiences and also help policy makers in formulating sound policies for future development. Yet, government-managed (large-and small-scale) schemes have generally performed far below expectations and most of the time, initial capital costs have not been recouped and the financial returns have not been able to cover operation and maintenance (O&M) costs. Meanwhile, privately developed and managed (small-scale) irrigation schemes in most of the SSA countries show that there is business potential for private entrepreneur involvement in irrigation. Groups of farmers or water users' associations (WUAs) running parts of irrigation schemes for which responsibility was transferred to them by government, can also be considered as operating private irrigation schemes (Hussain and Hanjra, 2004).

Irrigation is important in terms of food supply and economic growth in Tanzania like elsewhere (URT, 2005; Bos *et al.*, 2005). In Tanzania, the commitment to investment in irrigated agriculture and the impetus to construct new irrigation projects has not matched with performance improvement efforts through application of management tools (Sokoni and Shechambo, 2005). This study is an attempt to look at how the irrigation scheme contributes to improve small scale farmers' livelihood at Lumuma irrigation scheme.

1.2 Statement of the Problem

Rural livelihoods in many parts of sub-Saharan Africa are under considerable stress (Denison and Manona, 2007). Economies and the political environment are experiencing a period of significant transformation and poverty remains endemic. Agriculture remains at the core of rural livelihoods and has a major influence on livelihood outcomes (Sokoni and Shechambo, 2005). In many countries, a substantial proportion of the rural population lives below the poverty line, per capita incomes are stagnant and life expectancy is often static at best. Irrigation is a crucial input in the agricultural production process and movement towards market-oriented production is often requiring a greater application of irrigation techniques (World Bank, 2008). It has been argued by Bos *et al* (2005) that most of the poor are concentrated in rural areas and depend heavily on agriculture. Therefore rural infrastructure development and irrigation development, in particular, is believed to increase returns from agriculture, thereby reducing poverty (Mwakalila and Noe, 2004). Irrigation has the potential to stabilize agricultural production and mitigate the negative impacts of variable or insufficient rainfall. Irrigation development also can help offset some of the negative effects of rapid population growth 2.9% per year in Tanzania (TPHC, 2002).

Kilosa district is endowed with 37 rivers with the identified potential area for-improved situation. Lumuma irrigation scheme is located in Kilosa district and this scheme is mostly used for agricultural irrigation activities in three villages which are Msowero, Lumuma and Mkungh'ulu.

The construction of scheme infrastructure started in 2002 and the operations commenced on 2003. However, the study by Bos *et al* (2005) showed a growing appreciation of the contribution of small-scale farmers' irrigation for rural development, Lumuma irrigation scheme being among them. Despite the success of irrigation in supporting the green revolution, irrigation schemes at Lumuma have often under-performed in economic terms (Kaswamila, 2008) and field research has highlighted substantial shortcomings in management (operation and maintenance), equity, cost-recovery and agricultural production (Bos *et al.*, 2005). Yet, apparent decline in performance of the past irrigation projects unfolds the urgent need for improvements (Ministry of Agriculture and Food Security (MAFS) 2004. This has led to changes to new ways of accommodating agricultural production among small scale farmers at Lumuma irrigation scheme (Kaswamila, 2008). It is from that background that a study was done for the purpose of unveiling the progress attained for the betterment of these small scale farmers.

1.3 Research objectives

The objectives of this study were divided into two main types, that is; general objective and specific objectives as itemized hereunder

1.3.1 General objective

The general objective of the study was to assess the contribution of small scale irrigation scheme at Lumuma in Kilosa District, in enhancing the livelihood of rural households in Kilosa district.

1.3.2 Specific objectives

- i) To identify the socio-economic impact accrued from Lumuma irrigation scheme for small scale farmers in Kilosa district
- ii) To identify factors influencing the performance of small scale farmers at Lumuma irrigation scheme
- iii) To determine the strategies that can promote small scale farmers in improving production through Lumuma irrigation scheme

1.4 Research questions

- i) What is the socio-economic impact accrued from Lumuma irrigation scheme for small scale farmers in Kilosa district?
- ii) What are the factors influencing the performance of small scale farmers at Lumuma irrigation scheme?
- iii) What are the strategies that can promote small scale farmers in improving production through Lumuma irrigation scheme?

1.5 Significance of the study

This study is very important as it will enable small scale farmers to use this theoretical knowledge and become a reference material for academic endeavours.

The findings from this study will be used by small scale farmers to improve their yields and alert others to emulate the same.

This study is important for the researcher for the fulfilment of Master degree in Economics as the requirement of Mzumbe University.

1.6 Organisation of the Study

The study consisted of five chapters. The first chapter was an Introduction and problem setting. The second chapter presented the Literature Review, the third chapter discussed the Research Methodology, the fourth chapter dealt with Presentation of Results and Discussion of Research findings and the fifth chapter presented the Summary, Conclusion and Recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviewed the literatures from different studies in order to capture ideas and arguments which guided the development of the study. It is based on theoretical literature review, literature review from earlier studies and conceptual framework.

2.1 Meaning of concepts

A small scale farmer is the one who depends on his efficiency in the utilization of basic production resources available to him or her. He/she makes a significant and important contribution to the national product (i. e. 99 percent of total crops output). The small scale farmer is the main producer of 98 per cent of the food consumed in Tanzania (Mwakalila and Noe, 2004). Experience has shown that small farms out yield large farms on calorie output per hectare and are therefore more efficient. Even though small scale farmers' accessibility to agricultural innovations is often limited by unfavorable economic, socio-cultural and institutional conditions, they have achieved some level of efficiency through deployment of their indigenous knowledge. If provided with the right inputs, feasible technology and relevant information, they are capable of transforming traditional agriculture (Sokoni and Shechambo, 2005).

A livelihood is a means of making a living. It encompasses people's capabilities, assets, income and activities required to secure the necessities of life. However, a livelihood is sustainable when it enables people to cope with and recover from shocks and stresses (such as natural disasters and economic or social upheavals) and enhance their well-being and that of future generations without undermining the natural environment or resource base (Mwakalila and Noe, 2004). The relationship between the livelihood assets that farm households own or have access is categorized as natural, human, social, financial and physical assets.

Each component of livelihood assets is expected to be measured using indicators such as: a) Human assets: age and education of household head, labour availability in man-equivalent unit and health threats of households, b) Natural assets: agricultural area, irrigated area, fallow areas and number of livestock, c) Physical assets: value of shelter and building, sufficiency of household water supply and sanitary, type and number of motorcycle, type and value of farm equipment, d) Financial assets: access to credit, pension and remittance, value of household assets, e) Social assets: membership of water user group, leadership of existing groups, kinship network and community network. The households by utilising the assets (the resources that people own or can obtain access) in their productive activities may create income and satisfy their consumption needs, also maintain their asset levels and invest in their future activities (SIWI, 2005).

Irrigation scheme is the artificial application of water to the land or soil. It is used to assist in the growing of agricultural crops, maintenance of landscapes, and revegetation of disturbed soils in dry areas and during periods of inadequate rainfall Bos *et al* (2005). Additionally, irrigation scheme also has a few other uses in crop production, which include protecting plants against frost, suppressing weed growing in grain fields and helping in preventing soil consolidation. In contrast, agriculture that relies only on direct rainfall is referred to as rain-fed or dry land farming (Kaswamila, 2004).

2.2 Theoretical review

Mutsvangwa and Doranalli (2006) defined irrigation as the ministering of land through the artificial application of water to ensure double cropping as well as steady supply of water in areas where rainfall is unreliable. Irrigation is assumed to be a major contributor to the increase in food production that changed countries like Bangladesh and India from famine-prone regions to food-surplus regions (Hussain, 2006). Apart from producing crops, irrigation systems in developing countries are vital to rural livelihoods, providing water for livestock and fish production, domestic use and many small enterprises. The primary reason for irrigation was to improve agricultural productivity in areas where surface soils are naturally drier.

Semi-arid regions often have higher agricultural productivity if irrigated (Mwakalila and Noe, 2004).

Figure 2.1: The constructed main canals at Lumuma irrigation scheme which convey the water to secondary canals



Source: Field survey, 2013

According to Burrow (1987), small holder irrigated horticulture had proven to be a viable and attractive option for poor farmers in developing countries. He further asserted 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 (1999) when he asserted 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. More so irrigation farming is the source of income for the disadvantaged rural people that are mostly women, widows, orphans and people living with HIV and AIDS.

According to Jackson *et al* (1997), a survey of horticultural production in Zimbabwe showed that irrigation farming enables the growing of green vegetables, wheat, tomatoes, cotton, maize and even sugar-cane among others.

According to the World Bank (2008) more than 70% of the poor people live in areas relying mostly on agricultural activities and sometimes mining and finishing for survival. Hillel (1997) goes on to argue that about half of the family heads in the informal sectors are employed as peasant farmers. As population is ever increasing thus land set aside for irrigation farming has been excessively subdivided rendering most units sub-economic in Gezira irrigation scheme. He 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.

2.2.1 Livestock and rural household

Within agriculture, water is said to be the essential resource for productive and livelihood activities. Water resource development is assumed to be promoted in many developing countries in order to improve farmers' livelihood (Hussain and Hanjra, 2004). Farm household with lack or a low level of access to reliable water for both household and productive purposes is seen to be the central feature of poverty in developing countries. It is argued that improving the access to water is an important way of helping to diversity livelihoods and reduces the vulnerability of poor farm households. The relationships between the livelihood assets that farm households own or have access is categorized as natural, human, social, financial and physical assets. Each component of livelihood assets is expecting to be measured using indicators as follows: 1) Human assets: age and education of household head, labour availability in man-equivalent unit and health threats of households; 2) Natural assets: agricultural area, irrigated area, fallow areas, number of livestock; 3) Physical assets: value of shelter and building, sufficiency of household water supply and sanitary, type and number of motorcycle, type and value of farm equipment; 4) Financial assets: access to credit, pension and remittance, value of household assets; 5) Social assets: membership of water user group, leadership of existing groups,

kinship network, and community network. The households by utilising the assets (the resources that people own or can obtain access) in their productive activities may create income and satisfy their consumption needs, also maintain their asset levels and invest in their future activities (Arcus, 2004).

According to Kaswamila (2004) the problems related to irrigation development and management can be categorised as follows: a) Environmental factors: - water scarcity and poor water quality especially as related to sediment concentration; - land degradation as a result of poor O&M activities – this is partly related to inefficient water management resulting in water wastage and water logging as well as land-use regulation; b) Capacity of the farmers: - lack of know-how in, and access to, the opportunities of irrigation technology; - weak economic base of most farmers and the relatively high development costs involved in developing irrigation schemes; and c) Government policy; institutional and legal support: - limited or no priority given to irrigation development during national and local planning and budgeting; - poor management structures in place to support farmers and promote irrigation development.

2.2.2 Socio-economic impact of irrigation schemes at Lumuma

More than 80% of Kilosa District population is employed in agriculture activities according to DALDO Kilosa report of 2009. However, according to 2002 population and housing census; 2.8% were employed in office work, 0.93% livestock keeping, 0.08% fishing, 7.45% elementary occupation, 0.49% Plant operations and 8.25% others. On the other hand, agriculture is the main economic activity and most of people in Kilosa district engage in farming of both subsistence and cash crops where the major food crops are paddy, maize, beans, cassava and bananas and major cash crops are sisal, sugar cane, cotton, onions, simsim and sunflower. However, crops like paddy, maize and beans can fall into both categories. Onion crop has emerged to be the great cash crop especially on the North side of the District (along Malolo, Kidete and Lumuma Wards). Recently there are about 1,850 hectares under onion cultivation where 1,370 hectares are under improved irrigation schemes and 70 hectares are traditional irrigation schemes (DALDO report, 2009).

Table 2.1: Onion cultivation under irrigation schemes in Kilosa

Irrigation scheme	Hectares	Scheme status	Yield per year (tons)
Lumuma	980	Improved	15
Malolo	390	Improved	15
Mwasa	50	Traditional	8 – 10
Mzaganza	30	Traditional	8 – 10
Chabi	400	Traditional	8 – 10

Source: DALDO Kilosa, 2009

The socio-economic impact of the irrigation schemes have been found to be in the following areas according to Ortman and King (2010).

a) Crop diversification

The farmers are able to grow high value crops both for the local and export markets, thus effectively participating in the main stream economy. While those who cultivate in the dry land could concentrate on grain maize and groundnuts which are both low value crops; others of large-scale production with high value horticultural crops could not be possible under dry land conditions due to climatic limitations.

b) High yields

Irrigated agriculture produces substantially higher yields than dry land agriculture. Based on the monitoring and evaluation data, the crop yields for maize which is grown under irrigation ranges from 6-9 tons/ha as compared to maize yields of 1-2 tons/ha under dry land. This shows that yields could go up manifold with the introduction of irrigation.

Figure 2.2: A picture of plots with onions at Lumuma valley



Source: Field survey, 2013

c) Human development

Irrigators can develop a commercial mentality which can be indicated by the use of high levels of inputs by irrigators in comparison with dry land farmers. For example, irrigated farms use 450 kg/ha per ha top dressing fertilizer for maize where as dry land farms use on average 100 kg/ha. This difference reflects that irrigators are operating on commercial lines while needing labour intensive. The hiring of labour is also a characteristic of business minded people. Each irrigator can open a bank account in which he or she deposits all proceeds from crop marketing; hence developing their way of life.

d) Employment creation

The irrigation schemes provide seasonal employment for people in the surrounding farms. Hired labour is paid in cash or in kind or both when performing works in irrigation schemes. The irrigation scheme also acts as an employer to the irrigators.

The fact that only one male household heads out of twenty male household heads works in town is an indication that the scheme provides gainful employment. From a broader perspective the irrigation scheme is vital in curbing the rural to urban drift.

Figure 2.3: Lumuma Irrigation Scheme



Source: Field survey, 2013

e) Food security

The irrigation scheme acts as a source of food security during times of drought. In times of drought, non-irrigators come to buy grain maize from the scheme. The irrigators do not experience any grain shortage like the dry land counterparts.

f) Drought relief savings

The irrigation scheme farmers are food self-sufficient always. While farmers living in dry land often rely on food handouts from government, this is not the case with the irrigators on the scheme. By not providing drought relief to the irrigators and their families the government is making a huge financial saving. The government saving only captures the cost of purchasing maize or other crops without even taking into account transportation costs, manpower costs and other logistical support required in the distribution of this relief packages.

In addition a complete drought relief package could include other commodities like beans which, if included, would double the drought relief requirement.

g) Assets

Irrigators manage to acquire assets using incomes from the scheme. For example, farmers on the irrigation scheme can buy trucks, cultivators, ploughs, harrows and own small cars which are bought from scheme generated incomes. The cars help in the ferrying of produce to the market. Farmers could also buy animals from the scheme incomes if they wish.

h) Entrepreneurial skills

Irrigators can develop entrepreneurial skills over the years. The skills might help them to budget for their cropping activities, can manage their own affairs and can borrow and repay debts by participating in the irrigation scheme.

i) Support to other industries

The irrigation scheme enhances business activities for the local dealer who supplies the scheme with inputs. The high value crops grown in different irrigation schemes require high levels of fertilizer and chemicals and these are mainly purchased from the local dealers. Transporters could also benefit from the farmers who hire trucks to carry produce to the markets.

2.2.3 Costs and benefits associated with the irrigated crops in the scheme

a) The use and availability of Inputs

Crops production may involve the use of a number of inputs including seeds, equipments, labour, fertilizers and pesticides, to mention but a few. In Lumuma scheme, the major crop is onion which uses almost the mentioned inputs. But for other crops like beans, maize, sunflower paddy and simsim very few inputs are used, apart from labour and fertilizer.

Some farmers use improved seed varieties, but these are relatively expensive and new seeds need to be purchased at the beginning of each season, when farmers usually have little capital remaining. Therefore most farmers keep a small amount of each year's harvest for next years' seed, so that new seeds do not need to be purchased at the beginning of every season. The use of fertilisers and pesticides is mostly for onion and very little for other crops such as beans and maize (DALDO Report, 2009). Farmers who have enough capital are hiring labour for cultivation, transplanting and harvesting. Farmers who do not have the money use their own labour and family labour to cultivate their fields by hand and sometimes work to others' farms in order to get money for purchase of inputs.

Table 2.2: Gross Margin Analysis for Onion farmers at Lumuma

Item	Amount (in Tsh)
Labour cost for production of onions	39,628,300
Local seeds cost for production of onions	18,770,000
Pesticide cost for production of onions	7,364,500
Fertilizer cost for production of onions	24,574,000
Costs associated with storage	4,055,000
Total cost	94,391,800
Gross income/Total revenue	206,132,000
Gross margin	111,740,200

Source: DALDO, 2009

b) Labour input

Labour is one of the major inputs used in small-scale irrigation schemes. Trained and experienced labours are essential production factors. Family labour is the major source of labour for both irrigation schemes as well as for non-irrigation areas (DALDO Report, 2009). And in most cases demand for labour is higher during peak production period, i.e. transplanting, weeding and harvesting when farmers hire additional labour. Both male and female labourers are involved in the production activities. Male labours are involved in all production activities whereas females are mostly involved in planting, weeding, and harvesting.

Table 2.3: Distribution of crops irrigated at Lumuma

Item	Area (hectares)	Percentage (%)
Number of plots cultivated for onion in irrigation scheme	10,174	48.6
Number of plots cultivated for beans in irrigation scheme	4,066	19.4
Number of plots cultivated for maize in irrigation scheme	3,795	18.0
Number of plots cultivated for ground nuts in irrigation scheme	2,290	11.0
Number of plots cultivated for paddy in irrigation scheme	590	3.0
Total plots cultivated	20,915	100.0

Source: DALDO, 2009

2.3 Empirical Literature Review

Hillel (1997) stated that Africa has promoted small-scale irrigated agriculture as a means of ensuring food security as well as improving the standard of living of the rural people for many years. Various studies such as those conducted by You *et al* (2010) show that small-scale irrigation improves food security and livelihoods of rural farmers in Africa. However, according to Lyne *et al* (2009) despite their important role in improving livelihoods of rural communities, small-scale irrigation schemes have had limited performances of operating irrigation systems; generally, this has averaged less than 50% efficiency due to poor infrastructure, limited knowledge of crop production among smallholders, limited farmer participation in the management of water, ineffective extension and mechanisation services and lack of reliable markets, effective credit services and predominance of subsistence-oriented farming. Moreover, these could not identify socio-economic impact accrued from irrigation schemes.

Ortman and King (2010) argued that small-scale irrigation is an important aspect of irrigation development in many countries. Taking this into consideration empirical studies in various part where small irrigation schemes operates are necessary to contribute to existing literatures and to assist policy makers to come up with more effective institutional arrangement to facilitate irrigation schemes.

However, according to Birendra *et al* (2011) the economic and social output from irrigation projects has been often lower than estimated at the planning stage. In a recent report which evaluated more than 200 irrigation projects subsidized by the World Bank, for example, 23% were rated unsatisfactory. Arcus (2004) argued that many accounts of irrigation projects report failed to meet estimated agricultural production targets due to poor maintenance, and disappointing economic returns on investments. On the other hand Smith and Maheshwari (2002) argued that the future alternative water supplies for irrigation will have to be carefully developed and managed. Another related issue is that the way farmers manage water affects the long-term sustainability of their farms. There is now greater demand to share water resources with the environment. As a result landholders need to consider the options available to them to meet their irrigation water needs.

You *et al* (2010) stated that the irrigation schemes helped in reducing the rural to urban migration by offering the rural population an alternative source of employment and income. Hellin *et al* (2011) further reported that irrigators' wealth was chiefly held in farm implements and in better houses. In a comparative analysis between irrigators at Nyanyadzi irrigation scheme in Zimbabwe and their dry land counterparts, irrigators' investment was estimated to be between Z\$ 150 and Z\$ 200 while dry land farmers' investment was estimated to be lower at Z\$ 100. This indicated that irrigators were in a better position to invest in capital items than non-irrigators because of their higher incomes. However, FAO (1997) in a brief general overview of the smallholder irrigation sub-sector in Tanzania concluded that smallholder irrigation has brought many successes to farmers. The following observations were made: a) Smallholder farmers are now able to grow high value crops both for the local and export markets, thus effectively participating in the mainstream economy; b) In areas of very low rainfall, farmers enjoy the human dignity of producing their own food instead of depending on food handouts from the department of social welfare; c) Irrigation development has made it possible for other rural infrastructure to be developed in areas which could otherwise have remained without roads, telephones, schools and clinics; d) Smallholder irrigators have developed a commercial mentality; and e) Crop yields and farmer incomes have gone

up manifold. The report, however, identified a number of constraints, which are hampering smallholder irrigation development. Some of them are: a) The high cost of capital investment in irrigation works when one considers that communal farmers are resource poor; b) Rural infrastructure to facilitate input procurement and produce marketing is weakly developed in some areas, for example roads, telecommunications and electricity; c) Lack of reasonably priced appropriate irrigation technology for the smallholders; d) Shortage of human resources at both technician and farmer levels; e) Poor catchment management, which results in siltation of some water bodies; and f) Lack of decentralized irrigation service companies to give back-up service in rural areas. However, their studies and reports could not identify factors influencing the performance of small scale holder farmers.

Mutsvangwa and Doranalli (2006) in their study questioned the economic viability of smallholder irrigation schemes in Zimbabwe. The author pointed out that certain smallholder schemes have failed and are under-utilized. They attributed this to poor management, lack of inputs and irrigation experience by farmers. In the same study they advocated for the reduction of subsidies on smallholder irrigation and indicated that irrigation development has become expensive. They suggested that some form of cost recovery should be employed in these schemes. On the other hand Sokoni and Shechambo (2005) argued that modern technology can result in less water wastage because water is conveyed in pipes and irrigators can control the amount of water applied and its timing more easily which can increase productivity per unit of water. They suggest that traditional methods have limited productivity and are dependent on a farmer's willingness to invest in land preparation and coaxing water to spread evenly over the land. Buying modern irrigation equipment is trading money for labour and skill. Sokoni and Shechambo (2005) stress the opportunity cost of money for smallholders for it is very high whilst those of labour and traditional skills are low. Farmers will make the investment in modern equipment only when the financial return is clear and relatively assured. For many poor farmers, the idea of a cash investment is inconceivable without credit and institutional support that ensures success.

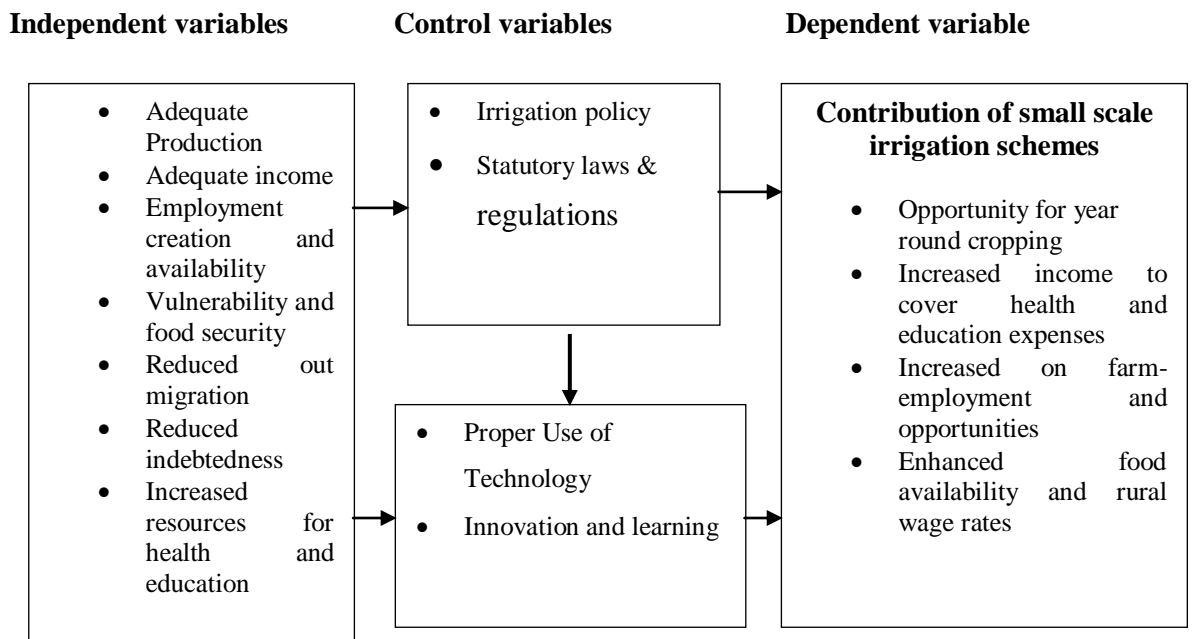
Very few farmers in Europe and the USA survive without subsidies and financial support from governments yet poor farmers in Africa are expected to stand on their own feet with little or no support. Hussain and Hanjra (2004) in their study showed that for almost all crops, except cotton in marginal areas, irrigation is only profitable when it is subsidized by government. However their study left out the analysis of high value horticultural crops as well as the strategies that can promote small scale holder farmers in improving production.

2.4 Conceptual Framework

Figure 2.1 provides the conceptual framework. This is defined as an abstract idea or a theory used to develop new concepts or to reinterpret existing ones (Kothari, 2004). It gives the relationship between the dependent and independent variables.

From the figure the dependent variable is the contribution of small scale irrigation schemes while the independent variables include; adequate production, adequate income/consumption, employment availability, vulnerability and food security, reduced out migration, reduced indebtedness, increased resources for health and education.

Figure 2.4: Conceptual framework model



Source: Researcher's modelling, 2013

The variables are defined as follows;

- Adequate production means finest product with the largest potential for consumption while satisfying dietary needs along with excess for selling in the market.
- Adequate income means earning that is able to sustain ones life
- Employment creation means innovation undertakings that assist unemployed members of the population in securing employment. This can be done by enhancing agricultural activities in rural areas
- Vulnerability and food security means availability of food and one's access to it or having available sufficient quantities of food on a consistent basis
- Reduced out migration means a state whereby people are unable to move away from their places searching for green pastures as their places provide those opportunities.
- Reduced indebtedness means a state where people are able to incur their living costs without borrowing so much from lenderers

g) Increased resources for health and education means the availability of resources (e.g. money) to incur costs for both health and education in the society

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter provided a blue print to be adopted in the study under the following parts namely; study area; research design; population and sample size; sampling procedures; data collection methods and data analysis.

3.1 Study Area

The study was done at Lumuma irrigation scheme found in Kilosa District. The Lumuma scheme is located 56 km from Kilosa Town. Lumuma irrigation scheme was selected because there hasn't been promising irrigation production which has yielded good results hence, requiring a study. Agriculture is the main economic activity and most of the people engage in farming of both subsistence and cash crops where the major food crops are paddy, maize, beans, cassava and bananas; the major cash crops are sisal, sugar cane, cotton, onions, simsim and sunflower. More than 80% of the District population is employed in agriculture activities. According 2002 population and housing census 2.8% were employed in office work, livestock keeping 0.93%, fishing 0.08%, elementary occupation 7.45%, plant operations 0.49% and others 8.25% (URT, 2003)

Kilosa district is one of the six Districts in Morogoro Region. The District is located in East Central Tanzania at an average distance of 300km west of Dar es Salaam and it is bounded by latitude 5°55" and 7°53" south and Longitude 36°30" and 37°30" East. Kilosa district borders Mvomero district to the east, Kilombero and Kilolo districts to the south, Kiteto and Kilindi districts to the north and Mpwapwa district to the west (URT, 2008). The District topography ranges in the central and southern flood plains of the Wami, Mkata and Ruaha rivers which stand at 400m in elevation, while the cultivation steppe in the north around Gairo reaches 1100m.

The highest parts of the District are found in the Ukaguru, Rubeho and Vindunda mountains, which form an almost continuous north-south spine along the Western side of the district and reach an elevation of 2200m. The district is divided into three physio-geographic units, which also constitute different agro-ecological zones (URT, 2007). The climatic condition of the District varies depending on the agro-ecological zones. The District experiences annual rainfall between 100 mm – 1600mm per annum. The annual temperature is usually between 25°C-30°C.

3.2 Research Design

A case study research design was used in this study. The reason for utilizing this design is that it focuses on and gathers in depth information about a specific person, group, community or event. It is designed to bring out the details from the viewpoint of the participants by using multiple sources of data. However, it investigates the unit across a variety of characteristics and it is characterized by a thorough study of a unit over a range of variables but maintaining the unitary nature of the unit of inquiry (Ndunguru 2007). The most important with case studies according to Yin (2003) is to explain the causal links in real life intervention, describe the real life context in which an intervention has occurred and evaluate the intervention itself.

3.3 Population and Sample Size

The population for this study was made up of all (250) small scale farmers engaging in irrigation as well as extension officers assisting these farmers. The sample size of 75 respondents was selected from whom information required for the study was obtained.

Cooper and Schindler (2008) argue that, for any valid and reliable study to be carried, its sample size shouldn't be less than 30% of its population. As it stands, the sample size is 30% of the population; hence fulfilling their argumentations. Table 3.1 shows the distribution of respondents.

Table 3.1: Sample Size Distribution

S/N	Category of respondents	Population	Sample size	Method to be employed
1	Small scale holder farmers	235	70	Purposive and simple random sampling
2	Extension Officers	15	5	Simple random sampling
	Total	250	75	

Source: Research data, 2013

3.4 Sampling Procedures

A two stage sampling procedure was followed to first select small scale farmers and then sample households. In the first stage, 250 small scale farmers and extension officers were found and selected purposively (in which personal experience of the respondent was considered to be key derived from the position one held or the roles/he played in relation to a particular activity). Before selecting household heads to be included in the sample, the sampling frame was stratified into irrigation water user and non-user households. The stratum of irrigation user consists of households who own, rented/shared in/out or gifted in land for direct utilization. The second stratum referred to hereafter as non-users composed of households who neither owned irrigated land nor involved in irrigation farming. In the second stage, farm households consisting of 75 irrigation users were selected from the identified list using simple random sampling technique taking into account probability proportional to size of the identified households in each of the two selected groups. Extension officers were randomly selected (as each respondent had the same and independent chance of being selected) focusing those who worked along Lumuma irrigation scheme.

3.5 Data collection methods

Primary and secondary data collection methods were used to get information from respondents and other sources. A structured interview schedule supported by personal observations of physical features was used to collect primary data.

In addition to primary data, secondary data were collected from the District Irrigation Development Officer (DIDO) and District Agricultural and Livestock Development Officer (DALDO).

3.5.1 Primary data collection tools

Primary data collection tools were used by the researcher to collect data from the field whereby interviews, questionnaires and observations were employed.

3.5.1.1 Interview

The researcher used interview to extension officers in order to solicit informations regarding the contribution of small scale farmers' irrigation schemes in enhancing rural livelihood (Appendix 2). According to Yin (2003) the interview tool is very important source of getting informations and it is helpful in handling case study related matters as the research design indicates.

3.5.1.2 Questionnaires

Questionnaires were used to obtain information focusing the objectives of the study from small scale farmers at Lumuma irrigation scheme (Appendix 1). These complemented and supplemented informations obtained under interview, observation and documentary review. Copies of questionnaires were prepared based on the essentials of a good questionnaire, i.e. short and simple, and organized in a logical sequence moving from relatively easy to more difficult issues. Technical terms, vague expressions and those affecting sentiments of the respondents were avoided. The reason was to obtain consistency of responses to the questions asked in repeated measurements (Carmines and Zeller, 1979).

3.5.1.3 Observation

The researcher used direct observation method {i.e. structured observation; where the researcher is an onlooker with a small number of specific behaviour patterns. Here the observer gets clues of the traits under observation}.

Structured observation complemented information which was obtained from the interview and questionnaires. It is stated that through structured observation, rich information and awareness about a phenomenon can be obtained. The eye witness in real situation assists the researcher to justify what to be revealed from the interview and questionnaires while observing the behaviours of respondents when performing their activities. The reason for using this method was its ability to obtain faithful answers from the respondents exactly when performing their jobs and making sure that what was observed is what is reported (Bryman, 2004).

3.5.2 Secondary data collection method

The researcher used different documents in order to access accurate and reliable data. Documents comprised of personal profiles (for small scale holder farmers), guidelines and directives (regarding irrigation techniques), policies and regulations (regarding irrigation agriculture), books and journals (used as literatures) and performance reports (quarterly and annual reports) obtained from the District Irrigation Development Officer (DIDO) and District Agricultural and Livestock Development Officer (DALDO).

3.6 Data Analysis

Data collected were analyzed both qualitatively (using content analysis) and quantitatively (descriptive statistics analysis). Frequency distribution and percentages were used to describe major variables. These data were summarized, coded and analyzed by Statistical Package for Social Science (SPSS).

The collected data were also analyzed through description, interpretation and explanation. Tabulation and classification were used as the major method during data analysis. The analysis was generally based on the descriptive framework.

CHAPTER FOUR

PRESENTATION OF RESULTS AND DISCUSSION OF THE RESEARCH FINDINGS

4.0 Introduction

This chapter presented and discussed findings regarding the assessment of the contribution of small scale holder farmers' irrigation schemes in enhancing the livelihood of rural households. It presents the respondents' response rate; respondents' characteristics; identifies the socio-economic impact accrued from Lumuma irrigation scheme; identifies the factors influencing the performance of small scale holder farmers at Lumuma irrigation scheme and determines the strategies that can promote small scale holder farmers in improving production through Lumuma irrigation scheme.

4.1 Respondents' Response Rate

Primary data were obtained by using interviews, questionnaires and observation tools while secondary data being obtained from published and unpublished reports as highlighted in chapter 3. In this study 70 questionnaires were spread among small scale holder farmers.

All questionnaires were successfully filled and the expected interviewees being reached something that allowed the researcher to code, summarize and analyse the data using SPSS computer software.

4.2 Respondents' Characteristics

The respondents' characteristics included Sex, Age and Level of education. Table 4.1 summarizes the results as follows;

Table 4.1: Respondents' characteristics

Information	Frequency	Percentage %
Sex		
Male	42	56.0
Female	33	44.0
Age (in years)		
18-24	20	26.6
25-34	18	24.0
35-44	15	20.0
45 and above	22	29.4
Level of education		
Primary	25	33.3
Secondary	32	42.6
Higher	18	24.1

Source: Research data, 2013

a) Sex

The findings in Table 4.1 show that out of 75 respondents, 56% were male and 44% were female. While women could identify socio-economic impact such employment creation and availability of adequate income; men identified socio-economic impact such as adequate production leading to increased crop yields and increased crop areas as accrued from Lumuma irrigation scheme.

b) Age

The age distribution of the respondents involved those who had 18 and 45 years and above as given in Table 4.1. Those who were between 18 and 24 years were 26.6%, between 25 and 34 years were 24%, between 35 and 44 years were 20% and those above 45 years were 29.4%. The respondents who were between 18 and 44 years identified socio-economic impact such as reduced out migration and reduced indebtedness; while those who were above 45 years identified socio-economic impact such as increased resources for health and education as well as increased overall resource base.

c) Level of education

The results in Table 4.1 show that 33.3% of the respondents had attained primary education, 42.6% secondary education and 24.1% higher education. Education of respondents played a vital role regarding the contribution of small scale holder farmers' irrigation schemes to the livelihood of rural households. While those who had primary education provided factors influencing the performance of small scale holder farmers such as poor farmer organisation, those with secondary education mentioned factors such as poor infrastructure and limited knowledge of crop production among small holders while those with higher education provided factors such as variability in climate, lack of reliable markets and poor institutional and technical arrangements.

4.3 Socio-economic impact accrued from Lumuma irrigation scheme

Socio-economic impact expected from Lumuma irrigation scheme reflected the level of development attained in terms of increase in income generation and the enhancement of quality of life when carrying out irrigation agriculture as to reduce poverty. The first objective of this study was to identify the socio-economic impact accrued from Lumuma irrigation scheme for small scale holder farmers in Kilosa district. To obtain informations regarding this objective, the researcher asked the respondents to tick and add various information which they thought for that choice. The summary of findings is given in Table 4.2

Table 4.2: Socio-economic impact accrued from Lumuma irrigation scheme

Impact	Percentage	
	Yes	No
Adequate production	78	22
Adequate income/consumption	80	20
Employment availability	75	25
Vulnerability and food security	75	25
Reduced out migration (rural-urban migration)	80	20
Increased resources for health and education	77	23
Increased per capita aggregate production	82	18
Increased overall resource base	85	15
Reduced indebtedness	70	30

Source: Research data, 2013

The results in Table 4.2 indicated that on average, the majority of respondents were in agreement with the socio-economic impact attained while the minority of respondents being in disagreement as indicated above. This suggests that respondents were generally aware of these socio-economic impact attained which paved their way to become profitable through better utilization of Lumuma irrigation scheme.

Specifically, the results in Table 4.2 indicate that 70% of the respondents agreed that the availability and utilization of Lumuma irrigation scheme has reduced indebtedness caused by poverty which they faced before the commencement of the scheme and 75% of the respondents supported that the scheme has enhanced employment availability as many people have engaged themselves in agriculture, reduced the vulnerability to hunger and promoted food security through enhancing food availability, increased opportunities to produce and retain food for home consumption as well as reducing the level of consumption shortfalls as supported by Ortman and King (2010). However, 77% of the respondents agreed that the scheme has increased resources for health and education through selling and accommodating the services for their families.

On the other hand, the results 78% of the respondents indicated the availability of adequate production which led to increased crop yields, crop areas, crop diversification and opportunity for year round cropping. Moreover, 80% of the respondents reported the presence of adequate income/consumption among farmers which resulted from increased income from crop production, family consumption of food, reduced food prices and enhancement of stabilization of farm family income while reducing out migration (rural-urban migration) as supported by Lyne *et al* (2009). Likewise, 82% of the respondents reported the increased per capita aggregate production whereas 85% of the respondents stated the increased overall resource base which has enable small scale holder farmer to diversify their business.

Figure 4.1: The picture showing the improved house of smallholder at Lumuma Village



Source: Field survey, 2013

It can be summarized that, the results in this part imply that 70% of the respondents agreed that the availability and utilization of Lumuma irrigation scheme has reduced indebtedness caused by poverty which they faced before the commencement of the scheme and 75% of the respondents supported that the scheme has enhanced employment availability as many people have engaged themselves in agriculture, reduced the vulnerability to hunger and promoted food security through enhancing food availability, increased opportunities to produce and retain food for home consumption as well as reducing the level of consumption shortfalls. However, 77% of the respondents agreed that the scheme has increased resources for health and education through selling and accommodating the services for their families. On the other hand, 78% of the respondents indicated the availability of adequate production which led to increased crop yields, crop areas, crop diversification and opportunity for year round cropping. Moreover, 80% of the respondents reported the presence of adequate income/consumption among farmers which resulted from increased income from crop production, family consumption of food, reduced food prices and enhancement of stabilization of farm family income while reducing out migration

(rural-urban migration). Likewise, 82% of the respondents reported the increased per capita aggregate production whereas 85% of the respondents stated the increased overall resource base which has enable small scale holder farmer to diversify their business.

4.4 Factors Influencing the Performance of Small Scale Holder Farmers at Lumuma Irrigation Scheme

The second objective of the study was to identify the factors that influence the performance of small scale holder farmers at Lumuma irrigation scheme. For this purpose, the researcher asked the respondents to identify those factors according to their perception. Hence, respondents after being interviewed by the researcher had the following views according to their preference. Table 4.3 summarises them as follows;

Table 4.3: Factors influencing the performance of small scale holder farmers

Factor	Percentage	
	Yes	No
Lack of research and development	84	16
Lack of reliable markets and information	80	20
Poor farmer organisation	75	25
Inflexible land tenure system	70	30
Poor institutional and technical arrangements	73	27
Poor infrastructure	78	22
Limited knowledge of crop production among small scale holder farmers	80	20
Limited farmer participation in the management of water	75	25
Variability in climate	85	15

Source: Research data, 2013

The results in Table 4.3 indicated that on average, the majority of respondents were in agreement with the factors that influence the performance of small scale holder farmers at Lumuma irrigation scheme while the minority of respondents being in disagreement as indicated above. This suggests that respondents were generally knowledgeable regarding those factors that influence performance.

Specifically, the results in Table 4.3 indicated that, 70% of the respondents reported the availability of inflexible land tenure system which is caused by lack of adequate land and low productivity due to land conflicts among farmers and 73% of respondents supported the presence of poor institutional and technical arrangements as among the factors which result into lack of stability, sustainability, equitability and autonomy among small scale holder farmers. However, 75% of the respondents reported the availability of poor farmer organisation which led to lack of marketing knowledge, poor marketing system and limited farmer participation in the management of water which lead to conflicts regarding water use as supported by Mwakalila and Noe (2004).

Moreover, the results in Table 4.3 indicated that 78% of the respondents argued for the presence of poor infrastructure which does not enable farmers to attain the expected yields and 80% of the respondents reported the lack of reliable markets and information which necessitate farmers to sell their yields in a low price while farmers having limited knowledge of crop production as among the factors influencing the performance of small scale holder farmers to poorly attain higher productivity. Furthermore, 84% of the respondents contended the lack of research and development from the fact of having poorly skilled farmers and extension officers. As the irrigation farming is extremely labour intensive, the presence of skilled farmers and extension officers is vital. However, 85% of the respondents reported the availability of the variability in climate due to the prevailing climate change. This has resulted into changes of seasons, reduction of rainfall; hence lowering water availability in many parts of Kilosa district as supported by Sokoni and Shechambo (2005).

It can be summarized that, the results in this part imply that 70% of the respondents reported the availability of inflexible land tenure system which is caused by lack of adequate land and low productivity due to land conflicts among farmers and 73% of respondents supported the presence of poor institutional and technical arrangements as among the factors which result into lack of stability, sustainability, equitability and autonomy among small scale holder farmers.

However, 75% of the respondents reported the availability of poor farmer organisation which led to lack of marketing knowledge, poor marketing system and limited farmer participation in the management of water which lead to conflicts regarding water use. Moreover, 78% of the respondents argued for the presence of poor infrastructure which does not enable farmers to attain the expected yields and 80% of the respondents reported the lack of reliable markets and information which necessitate farmers to sell their yields in a low price while farmers having limited knowledge of crop production as among the factors influencing the performance of small scale holder farmers to poorly attain higher productivity. Furthermore, 84% of the respondents contended the lack of research and development from the fact of having poorly skilled farmers and extension officers. As the irrigation farming is extremely labour intensive, the presence of skilled farmers and extension officers is vital. However, 85% of the respondents reported the variability in climate due to the prevailing climate change. This has resulted into changes of seasons and reduction of rainfall; hence lowering water availability in many parts of Kilosa district.

4.5 Strategies that can promote Small Scale Holder Farmers in improving production

The third and last objective of the study was to determine the strategies that can promote small scale holder farmers in improving production. To obtain the information the researcher asked the respondents to highlight some of the mentioned strategies which would promote irrigation activities. Table 4.4 summarises the strategies proposed by respondents as follows.

Table 4.4: Strategies that can promote small scale holder farmers

Strategy	Percentage	
	Yes	No
Promoting new technology acquisition in terms of production methods and inputs	87	13
Increasing access to credit through promotion of micro credit schemes	85	15
Improving the physical infrastructure and access to marketing the products	78	22
Improving training of farmers which would result into sustainable and improved performance	80	20
Increasing investment on non-agricultural activities and improving storage facilities	82	18

Source: Research data, 2013

The results in Table 4.4 showed that, on average, the majority of respondents were in agreement with the strategies that can promote small scale holder farmers towards higher production. This implies that respondents were generally aware that the strategies proposed would promote them and enhance productivity. On the other hand, the minority of respondents were in disagreement as indicated above.

Specifically, the results in Table 4.4 indicated that 78% of the respondents agreed on improving the physical infrastructure of Lumuma irrigation scheme in order to cater for a good number of small scale holder farmers and access to marketing the products as to enable farmers to freely sell their products at the reliable market for the purpose of attaining profits. However, 80% of the respondents suggested improving training of farmers which would result into sustainable and improved performance while 82% of the respondents argued for increasing investment on non-agricultural activities and improving storage facilities which would save farmers in times of little products as supported by You *et al* (2010).

On the other hand, the results in Table 4.4 indicated that 85% of the respondents argued for the increasing access to credit through promotion of micro credit schemes which would enable farmers invest more on agricultural activities by utilizing adequate tools and qualified personnel.

Likewise, 87% of the respondents reported promoting new technology acquisition in terms of production methods and inputs in order to enable them carry on their activities aiming at value addition and supply chain management enhancement as supported by Birendra *et al* (2011).

It can be summarized that, the results in this part imply that 78% of the respondents agreed on improving the physical infrastructure of Lumuma irrigation scheme in order to cater for a good number of small scale holder farmers and access to marketing the products as to enable farmers to freely sell their products at the reliable market for the purpose of attaining profits. However, 80% of the respondents suggested improving training of farmers which would result into sustainable and improved performance while 82% of the respondents argued for increasing investment on non-agricultural activities and improving storage facilities which would save farmers in times of little products. On the other hand, 85% of the respondents argued for the increasing access to credit through promotion of micro credit schemes which would enable farmers invest more on agricultural activities by utilizing adequate tools and qualified personnel. Likewise, 87% of the respondents reported promoting new technology acquisition in terms of production methods and inputs in order to enable them carry on their activities aiming at value addition and supply chain management enhancement.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This chapter provided the summary, conclusion and recommendations along with the policy implications and the need for further research. It commences with the summary, conclusion, recommendations and policy implications and finally provides the need for further research.

5.1 Summary of findings

There is a general consensus that improving agriculture and enhancing agricultural productivity through small-scale irrigation is one of the key strategies for alleviating poverty and improving livelihoods of rural communities where the majority of the rural poor depend directly or indirectly on agriculture. The study in hand assessed the contribution of small scale holder farmers' irrigation scheme in enhancing the livelihood of rural households in Kilosa district.

The findings from the study indicated that 70% of the respondents agreed that the availability and utilization of Lumuma irrigation scheme has reduced indebtedness caused by poverty which they faced before the commencement of the scheme and 75% of the respondents supported that the scheme has enhanced employment availability as many people have engaged themselves in agriculture, reduced the vulnerability to hunger and promoted food security through enhancing food availability, increased opportunities to produce and retain food for home consumption as well as reducing the level of consumption shortfalls. However, 77% of the respondents agreed that the scheme has increased resources for health and education through selling and accommodating the services for their families. On the other hand, 78% of the respondents indicated the availability of adequate production which led to increased crop yields, crop areas, crop diversification and opportunity for year round cropping.

Moreover, 80% of the respondents reported the presence of adequate income/consumption among farmers which resulted from increased income from crop production, family consumption of food, reduced food prices and enhancement of stabilization of farm family income while reducing out migration (rural-urban migration). Likewise, 82% of the respondents reported the increased per capita aggregate production whereas 85% of the respondents stated the increased overall resource base which has enabled small scale holder farmers to diversify their business.

Secondly, 70% of the respondents reported the availability of inflexible land tenure system which is caused by lack of adequate land and low productivity due to land conflicts among farmers and 73% of respondents supported the presence of poor institutional and technical arrangements as among the factors which result into lack of stability, sustainability, equitability and autonomy among small scale holder farmers. However, 75% of the respondents reported the availability of poor farmer organisation which led to lack of marketing knowledge, poor marketing system and limited farmer participation in the management of water which lead to conflicts regarding water use. Moreover, 78% of the respondents argued for the presence of poor infrastructure which does not enable farmers to attain the expected yields and 80% of the respondents reported the lack of reliable markets and information which necessitate farmers to sell their yields in a low price while farmers having limited knowledge of crop production as among the factors influencing the performance of small scale holder farmers to poorly attain higher productivity. Furthermore, 84% of the respondents contended the lack of research and development from the fact of having poorly skilled farmers and extension officers. As the irrigation farming is extremely labour intensive, the presence of skilled farmers and extension officers is vital. However, 85% of the respondents reported the variability in climate due to the prevailing climate change. This has resulted into changes of seasons and reduction of rainfall; hence lowering water availability in many parts of Kilosa district.

Finally, 78% of the respondents agreed on improving the physical infrastructure of Lumuma irrigation scheme in order to cater for a good number of small scale holder farmers and access to marketing the products as to enable farmers to freely sell their products at the reliable market for the purpose of attaining profits. However, 80% of the respondents suggested improving training of farmers which would result into sustainable and improved performance while 82% of the respondents argued for increasing investment on non-agricultural activities and improving storage facilities which would save farmers in times of little products. On the other hand, 85% of the respondents argued for the increasing access to credit through promotion of micro credit schemes which would enable farmers invest more on agricultural activities by utilizing adequate tools and qualified personnel. Likewise, 87% of the respondents reported promoting new technology acquisition in terms of production methods and inputs in order to enable them carry on their activities aiming at value addition and supply chain management enhancement.

5.2 Conclusion

Based on the empirical findings, some major conclusions are drawn after being achieved with regards to the contribution of small scale farmers to the livelihood of rural households.

The utilization of Lumuma irrigation scheme has been a success to small scale farmers in Kilosa district. This is a clear testimony that small scale irrigation schemes can be successfully operated and managed by the farmers themselves. In view of that Lumuma irrigation scheme has enhanced the employment availability as many people have engaged themselves in agricultural activities something that has reduced the possibility of falling into hunger as well as avoiding rural urban migration among the youths. However, inflexible land tenure system available has necessitated the land shortage leading to farmers' unnecessary conflicts. Although, there has been a need for carrying research and development in order to improve the irrigation scheme, the un-availability of skilled extension officers and farmers still pose a challenge for the government and other stakeholders to solve.

5.3 Recommendation and Policy implication

5.3.1 Recommendations

In light of the above findings and conclusion, the researcher has proposed the following recommendations;

- a) Lumuma irrigation scheme improvement attained by small scale holder farmers need to be maintained; hence attainment of higher production
- b) When land conflicts emerge, the resolution need to be passed wisely in order to avoid continuous conflicts among farmers for the smooth running of the irrigation scheme
- c) Efficient and effective training to farmers and extension officers should be enhanced for the performance of agriculture in the district.

5.3.2 Policy Implications

Policy makers have to see a need for promoting irrigation, enhancing marketing system and promoting new technology acquisition in terms of production methods and inputs in order to enable small scale farmers carry on their activities aiming at value addition.

5.4 Need for Further Research

The findings assessed the contribution of small scale farmers in enhancing the livelihood of rural households. It is advised that further studies could be done on the following issues;

- a) To what extent have small scale farmers been able to utilize fully the irrigation schemes found in their areas?
- a) What are the challenges small scale farmers face when carrying out their jobs?

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APPENDICES

Appendix 1: Questionnaires for small holder farmers

PART A: Socio-economic impact of small holder farmers for Lumuma Irrigation Scheme

1. Please indicate your agreement or disagreement regarding the socio-economic impact of small holder farmers as follows; 1) SA=Strongly Agree 2) A=Agree 3) U=Uncertain 4) D=Disagree 5) SD=Strongly Disagree.

Impact	Choice				
	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
1. Adequate production					
2. Adequate income/consumption					
3. Employment creation and availability					
4. Vulnerability and food security					
5. Reduced out migration (rural-urban migration)					
6. Increased resources for health and education					
7. Increased per capita aggregate production					
8. Increased overall resource base					
9. Reduced indebtedness					

PART B: Factors influencing the performance of small scale holder farmers at Lumuma Irrigation scheme

2. Please indicate your agreement or disagreement regarding the factors influencing the performance at Lumuma irrigation scheme as follows; 1) SA=Strongly Agree 2) A=Agree 3) U=Uncertain 4) D=Disagree 5) SD=Strongly Disagree.

Factor	Choice				
	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
1.Lack of research and development					
2.Lack of reliable markets and information					
3.Poor farmer organization					
4.Inflexible land tenure system					
5. Poor institutional and technical arrangements					
6. Poor infrastructure					
7. Limited knowledge of crop production among small scale holder farmers					
8. Limited farmer participation in the management of water					
9. Variability in climate					

PART C: Strategies that can promote small scale holder farmers in improving production through Lumuma irrigation schemes

3. Do you think that the following strategies can promote small scale holder farmers' production?

Strategy	Yes	No
Promoting new technology acquisition in terms of production methods and inputs		
Increasing access to credit through promotion of micro credit schemes		
Improving the physical infrastructure and access to marketing the products		
Improving training of farmers which would result into sustainable and improved performance		
Increasing investment on non-agricultural activities and improving storage facilities		

4. Would you provide other strategies you know? (specify)

i).....ii).....
 iii).....iv).....

PART D: Characteristics of respondents

5. Sex: (a) Male ()
 (b) Female ()

6. Age in years (*tick where appropriate*)
 (a) 18 – 24 ()
 (b) 25 – 34 ()
 (c) 35 – 44 ()
 (d) 45+ ()

7. What is your level of education?
 a) Primary () b) Secondary () c) Higher ()

Appendix 2: Interview guide Questions

- i) What is the socio-economic impact accrued from Lumuma irrigation scheme for small scale holder farmers in Kilosa district?
- ii) What are the factors influencing the performance of small scale holder farmers at Lumuma irrigation scheme?
- iii) What are the strategies that can promote small scale holder farmers in improving production through Lumuma irrigation schemes?

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