FARMERS' PERCEPTIONS ON THE CONTRIBUTION OF KITHIGIRI - KAMATUNGU IRRIGATION PROJECT TO FOOD SECURITY IN MARIMANTI LOCATION, THARAKA SOUTH SUB COUNTY

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DECLARATION

Student declaration

This research proposal is my original work and has not been presented for conferment of a degree or diploma in this or any other University.

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ABSTRACT

Food insecurity is the state of being without reliable access to a sufficient quantity of affordable, nutritious food. Several efforts have been made to alleviate food insecurity including irrigated agriculture. Despite the efforts, the situation continues to persist in the contemporary human society. Small scale farmers play a vital role in addressing food insecurity and are often beneficiaries of smallholder irrigation projects. However, the contribution of such irrigation projects towards attainment of household food security is not adequately known. The main aim of this study is to assess the farmers' perceptions on the contribution of Kithigiri-Kamatungu irrigation project towards food security in Marimanti location, Tharaka Nithi County, Kenya. The study will be guided by the following objectives; To assess the perceptions of farmers, who are spatially settled in kithigiri-kamatungu irrigation project, on its contribution towards food security; assess the contribution of smallholder irrigation projects towards reducing households' dependency on food aid in Marimanti Location and determine the factors affecting sustainability of small-scale irrigation to food security in Marimanti Location. The study will employ a case study research design where primary data will be collected using questionnaires administered to 202 out of 426 farmers that have benefited from the small holder irrigation project. The 202 farmers will be selected using simple random sampling. Other data collection methods to be used will be key informants' interviews and focused group discussions. Data will be SPSS Version 21 where Pearson's product moment likert 5-point scale will be used in the main objective. The findings of this study will contribute towards knowledge besides forming an important input in planning of food aid support programmes in the area. Furthermore, the research is also expected to help researchers and extension practitioners develop technical, social and economic interventions to better manage irrigation schemes to achieve food security, reduce poverty and create job opportunities for themselves and their families.

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ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
ASALs	Arid and Semi-Arid Lands
ERS	Economic Recovery Strategy
FAO	Food and Agricultural Organization
FEWS NET	Famine Early Warning Systems Network
GOK	Government of Kenya
HIV	Human Immunodeficiency Virus
IFAD	International Fund for Agricultural Development
LEDCs	less Economically Developed Countries
NACOSTI	National Commission for Science Technology and Innovation
NGOs	Non-Governmental Organizations
NIB	National Irrigation Board
SPSS	Statistical Package for the Social Sciences
SRA	Strategy for Revitalizing Agriculture
UN	United Nations
USAID	United States Agency for International Development
WFP	World Food Programme
WHO	World Health Organization

CHAPTER ONE: INTRODUCTION

1.1 Background to the study

Food security is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (World Health Organization, 2011). At the household level, food security implies physical and economic access to foods that are adequate in terms of quantity, nutritional quality, safety and cultural acceptability to meet each person's needs. Household food security depends on adequate income and assets including land and other productive resources owned (FAO, 2013). However, this has become more of a fantasy as food security has continued to present itself as an insurmountable challenge in many countries in the 21st century, especially in the Less Economically Developed Countries (LEDCs) (WHO, 2011). Food insecurity contributes to economic and political instability. Acute food insecurity is frequently the result of humanitarian disasters such as civil conflict. According to WHO, 462 million people are underweight or malnourished while 47 million children below the age of five years are wasted, 144 million are stunted and 14.3 million are severely wasted (2020). Furthermore, 45% of the deaths of five-year-old children or under are caused by malnutrition and they are mainly evident in low and middle-income nations (WHO, 2020).

Food insecurity is a developmental concern that requires collective action from development practitioners. It affects the most vulnerable in countries and it can incapacitate large numbers of people affecting economic development. Improving food security can reduce tensions and contribute to more stable environments. The complex challenge of improving food security involves an interdependent and interconnected set of issues, including agriculture, energy, the environment, government policy and trade (Brooks, 2016). In a country where agriculture is the dominant source of livelihood, responding to climate change should be a priority. There has been a myriad of solutions suggested by scientists and development practitioners which have not yielded much success. However, one way that can promote food security is small grain production. Small grain production has become widespread in dry areas with promise of enhancing food security if planted on a larger scale.

In Africa, approximately 3.1 billion people live directly from agricultural production systems, either as full or part-time farmers, or as members of farming households that support farming activities (FAO, 2017). Smallholders produce food and non-food products on a small scale with limited external inputs, cultivating field and tree crops as well as livestock, fish and other aquatic organisms. Smallholder farmers in Africa are characterized by marginalization in terms of accessibility, resources, information, technology, capital and assets, but there is great variation in the degree to which each of these applies (Murphy, 2010). With these qualifications, the Food and Agriculture Organization (FAO) of the United Nations (UN) adopted a 2-hectare (ha) threshold as a broad measure of a small farm (which is not inclusive of fishers and other small-scale food producers). The vast majority of smallholders live in rural areas, although urban and peri-urban smallholdings are an increasingly important source of food supply for developing urban areas (IFAD 2011a).

Africa has been greatly affected by food insecurity and it has not shown great improvements in tackling the crisis instead the problem has persisted. According to the study carried out by Akombi et al. (2017) the majority of malnourished people in Sub-Saharan Africa were in East and West Africa between 2006 and 2016. In February 2017, 153 million people, representing about 26 percent of the population above 15 years of age in sub-Saharan Africa, suffered from severe food insecurity in 2014-15, according to a new FAO report (FAO, 2017). In 2013, United States Agency for International Development (USAID) provided more than $75 million in humanitarian assistance to aid more than three million food-insecure people in Southern Africa (USAID, 2013).

In 2012, Angola experienced intermittent and below-normal rainfall which contributed to reduced agricultural production, increased food insecurity level and a rise in the prevalence of acute malnutrition, particularly in the southern provinces of Cunene, Huíla and Kuando (FAO, 2013). By late 2012, drought conditions had affected nearly 1.8 million people and placed more than 533,000 children under the age of 5 years at risk of acute malnutrition. This was also the case in Lesotho, whereby late rains and an early frost shortened the 2012 agricultural season, reducing cereal production to the lowest level in 10 years (USAID, 2013). The cereal shortfalls and consequent food price increases resulted in more than 725,000 people, approximately 40 percent of Lesotho's population, requiring humanitarian assistance by late August 2012 (FAO/WFP, 2010).

In Zimbabwe food insecurity has remained a problem affecting three quarters of the population (Makuwa, 2005). He argues that in 2002-03, Zimbabwe was the epicenter of the so-called Southern Africa 'food crisis', which the World Food Program (WFP) considered to be one of the most severe in decades, with more than 12 million people in six countries facing the threat of starvation.

The main causes of food insecurity in Africa have been contributed by climate change which has worsened agricultural production in these countries (Berman, 2009). The most affected people are those who depend on agriculture production. This is made worse because most of the livelihoods depend on rain-fed agriculture as they are too poor to install irrigation systems. It is therefore imperative to realize the importance of agriculture in enhancing food security as it is a sector that the rural poor are most dependent on as a means of survival. According to Tafirenyika (2014) leaders should treat agriculture not only as a solution to end poverty and hunger but also as a major contributor to economic development deserving of public investment.

In Kenya, where the main economic activity for many households is agriculture, smallholder farmers play a great role in controlling this sector (IFAD, 2011a). About 80% of the population of Kenya lives in the rural areas and derive their livelihood largely from agriculture. But more important is the fact that 56% of the Kenyan people live below the poverty line with over 80% of these in the rural areas (IFAD, 2011a). Kenya's agriculture is largely dependent on seasonal rainfall. In many instances, the quantity of rainfall has not been adequate to sustain crop production, leading to serious food insecurity in the country. The incidence and prevalence of food insecurity is more severe in the arid and semi-arid lands (ASALs). In this context, the Government of Kenya formulated the Strategy for Revitalizing Agriculture 2004–2014 (SRA) towards the implementation of the Economic Recovery Strategy (ERS). The strategy envisaged increased agricultural productivity, including diversification into water management systems through irrigation. The overall objective of the SRA was to minimize dependence on rain-fed agriculture by utilizing water resources for irrigation under sustainable environmental management, raise household incomes, create employment, ensure food and nutrition security by raising the productivity of the sector through efficient research and extension service support and adequate provision of support services; and increasing the area under irrigation. Such initiatives have seen small holder irrigation schemes being started in different parts of the country.

Like other parts of Kenya, agriculture is the main means of livelihood for the population in Tharaka, both in terms of crop production and livestock rearing. Farming is almost totally dependent on rain fed agriculture. Farmers produce crops biannually with the short rain of October-December and long rain of February-March. During normal rain years, majority of the farmers produces adequate amount to meet their food requirements. Unfortunately, agricultural production and productivity in Marimanti location has severely been affected by recurrent drought and depressed rainfall. Such unfavorable climatic conditions often resulted in acute decline in food production. Overgrazing and rapid depletion of the tree cover for fuel and housing have resulted in an alarming rate of soil erosion. Lack of adequate rainfall combined with variability in the onset and duration of rain remains a major threat to agricultural production in Marimanti location.

In areas where rainfall is unreliable, irrigation development, provision of adequate and sustainable water for agricultural purposes is a viable option to secure food production. Addis (1991) argued that if assisted properly, smallholders can be the engine of growth that provides the surplus needed for economic development of the nation. Neglecting their welfare could actually jeopardize the success of economic policies that would otherwise have every chance of success. The increase of smallholders' agricultural production particularly of those in the drought prone areas of the country can be achieved through the development of small-scale irrigation systems if it is properly managed and well assisted (USAID, 2009). According to FAO (2000), smallholder irrigation development has shown throughout the developing world that it can be used as a key drought mitigation measure and as a vehicle for the long-term agricultural and macroeconomic development of a country. Successful smallholder irrigation schemes can result in increased productivity, improved income and nutrition, employment creation and food security.

This study will therefore assess farmers' perceptions on contribution of Kithigiri-Kamatungu irrigation project to food security, Marimanti location, Tharaka Nithi County, Kenya.

1.2 Statement of the problem

Community based irrigation projects in Kenya are meant to improve the farmer's harvests as well as increase productivity of their farms. This improves food security of the community by ensuring continuous availability of food.In Marimanti Location, since the inception of Kithigiri-Kamatungu Irrigation Scheme, farmers have embraced the concept of irrigated farming but incidences of food insecurity have persisted Most research on irrigated agriculture has focused on water use economies and irrigation projects maximization. However, this study takes a beneficiary's approach by focusing on farmers' perceptions about Kithigiri-Kamatungu irrigation scheme with regards to fiid security.

1.3 Purpose of the study

The main aim of this study is to assess farmers' perceptions on the contribution of Kithigiri-Kamatungu irrigation project to food security within Marimanti location, Tharaka Nithi County, Kenya

1.4 Objectives of the study

The study will be guided by the following objectives

i) To assess the perceptions on food security of farmers of kithigiri-kamatungu irrigation scheme
ii) To establish the contribution of smallholder irrigation projects on reducing households' dependency on food aid in Marimanti Location.
iii) To determine the factors affecting sustainability of food security in the kithigiri-kamatungu irrigation scheme.

1.5 Research questions

The study seeks to answer the following research questions

i) What are the perceptions of farmers on food security in kithigiri-kamatungu irrigation scheme?
ii) What is the contribution of smallholder irrigation projects on reducing households' dependency on food aid in Marimanti Location?
iii) What are the factors affecting sustainability of food security in the in kithigiri-kamatungu irrigation scheme?

1.6 Significance of the Study

The findings of the study are expected to have major implications for policy makers, researchers, extension practitioners, and smallholder irrigation farmers. At the policy level, it is expected that the research findings will assist the ministry of water sanitation and irrigation to provide relevant input in policy making in the area of household food security and small-scale irrigation farming practices and develop support systems that will improve the productivity, profitability, and sustainability of smallholder irrigated agriculture in Tharaka.

The findings will also provide relevant data to local NGOs in planning food aid support programmes. The research is also hoped to help researchers and extension practitioners to develop technical, social and economic interventions for building the capacity of smallholder irrigation farmers to better manage the irrigation schemes to achieve food security, reduce poverty and create job opportunities for themselves and their families.

Farmers in Marimanti location will have a better understanding of smallholder irrigated agriculture and be able to contribute to the development of relevant technologies. The findings will also contribute to the body of knowledge in the academia and may provide insights on food security gaps for further academic research.

1.7 Scope of the study

The study will be carried out in Marimanti Location, Tharaka-Nithi County and will involve farmers and key informants and focused group discussion.

The project borders River Thanantu to the East, to the south it extends to the tributary of River Kathita and River Tana, To the North it borders Nkondi-Gatunga road and western side it borders River Kathita.

The study will specifically assess the perceptions of farmers, spatially settled in Kithigiri-Kamatungu irrigation project, on its contribution towards food security, in Marimanti location, Tharaka Nithi County, Kenya. The study will be carried out for a period of three months. The study covers food security in three ways, farmers' perceptions, factors affecting sustainability and the food security criteria. In the farmers perceptions, the focus will be limited to availability water, crop yields, livelihoods, farm activities and self-employment with the factors affecting sustainability. The scope extends to policies, financial resources, trainings, technology and market of produce.

The criteria for identifying food security relates to examining availability, accessibility, usability and stability. The temporal scope of the study is between August and October 2020 which means that any factors characterizing this period are likely to affect the data collection for instance this is usually the hot and dry season in the area. Therefore, there are aspects of data collection that may be affected by the season.

1.8 Limitations of the study

According to Best and Khan (2008) limitations are conditions beyond the control of the researcher that may place limitations on the conclusion of the study and their application to other. Marimanti location predominantly has very poor road infrastructure which may limit the speed of collecting data.

Suspicion by the respondents especially those holding extreme views regarding to their irrigation project may lead them to give views that agree with their sentiments even when knowldge in their domaine suggest otherwise. The researcher will overcome this by building rapport within the respodents and explaining the usefulness of accuracy of information given as education is a crucial service to society. The worst of it all could be bad weather.

1.9 Assumptions of the Study

An assumption is any fact that a researcher takes to be true without actually verifying it (Mugenda & Mugenda, 2003). First, the researcher makes the assumption that the respondents would cooperate and give honest information that would enable the researcher draw valid conclusions. Secondly, the researcher assumes that farmers under Kithigiri-Kamatungu irrigation project have enhanced household food security which has contributed to reduction of households' dependency on food aid.

1.10 Definition of Operational terms

The following terms are defined operationally in this study:

Food security: This is when all people, at all times, have physical and Economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.

Food insecurity: Lack of access at all times due to economic barriers to enough Food for an active and healthy life style.

Household: A domestic unit consisting of the members of a family who live together along with non-relatives.

Smallholder farmers: Are defined in this study as farmers who reside in the area served by Kithigiri-Kamatungu irrigation project.

Farmers

Perception Farmer's views

Contribution The effects

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of related literature under the following sub-headings: Food security, effects of irrigation project on food security, impact on farmer's dependency on food aid and factors influencing sustainability. The chapter ends with presentation of theories that are used in this study, as well as the conceptual framework for the study.

2.2 Food security

Food security is frequently defined as access by all people at all time to the food they need for an active and healthy life (World Bank, 1986). Household food security in turn means adequate access by the households to amount of food at the right quality to satisfy the dietary needs of all its members throughout the year. A number of interrelated factors determine food security situation, which are related to the process of food acquisition, household procurement strategies and socio-economic conditions of the society. The basic resources like land, asset owned (productive and disposable), market, income sources, labour and humanitarian assistance are key factors for either promoting food security or increasing vulnerability to food insecurity. Therefore, the access of households to food is indicated by the amount of its production, type and volume of assets it owns, the amount of farm and off-farm income it has been able to earn and its access to community support mechanism.

A household is said to be food secure when it has food available and when it can access it. The families that spend a higher percentage of their income on food end up relying on market purchase as a source of food and cash income (Smith, 2002). 'Food security exists when all people at all times, have physical and economic access to sufficient, safe and nutritious food to achieve a balanced diet and food preferences for an active and healthy life (Fantaw, 2007). The definition combines stability, access to food, accessibility of nutritionally adequate food and the biological utilization of food. In this study food security refers to the availability of food and individual access to it. Food availability- is when a household have a sufficient quantity of food on a consistent basis. Food access is when a household have resources to obtain appropriate food for nutritious diet

Assessment of food security is a difficult issue, mainly because of the availability of a wide range of alternative indicators of the level of food security at the household and community level. Thus, what is needed now is a refinement of the methodology for selecting and weighing of indicators of household and regional distress and customizing the available indicators for use in a location-and context-specific manner (Webb and Von Braun, 1994). However, Gitu (2004) says that agricultural growth can improve global food security and promote prosperity. Most of the world's poor live in rural areas and struggle to survive on subsistence-based agriculture, producing low-value food crops on very small plots of land. Affordable access to water enables these poor farmers to increase agricultural production and invest in higher-value crops. Unleashing the potential of smallholder farmers to produce and sell food not only increases the well-being of the farmers' households but creates a more resilient and abundant global food supply as well (Sikwela, 2008). Community irrigation project must also be directed to grow food crops that are can contribute significantly in poverty alleviation and improve food security. Terry and Ryder (2007) observed that farmer associations who opted to keep some of their land as irrigated home gardens rather than converting all land to sugar cane improved food security at a time of low sugar prices.

2.3 Effects of Irrigation Project on Food Security

The need for irrigation development in drought prone regions is also promoted by many international development organizations. For instance, a study by Tillie, Elouhichi And Gomez Y Paloma (2020) indicated that small scale irrigation schemes would stabilize agricultural production system and assure food supply even in years with inadequate rainfall and increase the overall level of crop production in years with normal rainfall. The major features of food insecurity in Kenya are a persistent deficit in aggregate food supply, due to a steadily declining cereal production on a per capita basis.

To increase food production, the strategy focuses on diffusion of improved agricultural technologies within smallholder agriculture in areas where there is inadequate rainfall. On the other hand, the strategy has envisaged implementation of cost-effective irrigation schemes in drought prone and densely populated areas in order to reduce the vulnerability of the sector to the vagaries of weather and to address food insecurity problem at the household level (FAO/WFP, 2010).

This study will therefore analyze farmers' perceptions on contribution of Kithigiri-Kamatungu irrigation project to food security, Marimanti location, Tharaka Nithi County, Kenya

Investing in smallholder irrigation is one of the most effective ways to develop smallholder agriculture and, thus, contribute to poverty alleviation. The contribution of irrigation to increased food security has been demonstrated in countries such as Bangladesh where growth in public sector funded canal irrigation and private sector funded tube-well irrigation have played a major role (Shah, 1993). Hussain and Hunjra (2004) noted that although irrigation water is only a single factor in meeting food demands, it plays a disproportionately powerful role. Sally *et al*. (2003) concluded that smallholder agriculture intensification by improving the management and productivity of land and water in a sustainable manner is a solution for both poverty reduction and agricultural growth in Sub-Saharan Africa.

Irrigation development benefits the rural poor in various ways including (a) reduced food prices resulting from increased production and (b) increased on-farm and off-farm employment leading to income generation for the poor (Stewart, 2010). Thus, irrigation contributes to food security. Smallholder irrigation schemes have not performed well in Africa. These schemes have performed poorly in terms of yields and economic returns (Underhill, 1990). The poor performance of smallholder irrigation schemes means that farmers have not been able to produce enough yields to match the demand for food. In order to match the demand for food, it will be necessary to increase productivity because the scope for increasing food production by increasing the area under cultivation is limited (WFP, 2009). The growing scarcity of rain water makes it extremely difficult to expand food production by increasing the area under cultivation in Tharaka.

The unreliability of water supplies has contributed significantly to the poor performance of smallholder irrigation schemes in terms of productivity and profitability. Therefore, this study will assess the farmers' perceptions on the contribution of Kithigiri-Kamatungu irrigation project to Food security in the wake of diminishing water resources. Household food security will be assessed on the basis of information supplied by farmers as requested in the questionnaires. Farmers will be requested to

indicate whether they sometimes experienced food shortages and how often this occurred.

They will also be asked to provide information on the contribution of the various sources of income (farm and non-farm) to total household income. The analysis will provide some indication of the role of smallholder agriculture in increasing food security by assessing the Farmer's perceptions on contribution of Kithigiri-Kamatungu irrigation project to food security in Marimanti location Tharaka South Sub County.

2.4. Contribution of Smallholder Irrigation Projects in Reducing Households' Dependency on Food Aid

Food aid, today, is considered as an essential instrument in addressing both transitory and chronic types of food insecurity in low-income country (FAO, 2010). The humanitarian agencies, or donors, implement food aid programs in these countries as an immediate response to the needy people, to increase their income sustainability, to improve agricultural production, and improve their health and nutrition status (FAO, 2010). Moreover, this improves food supplies at national or regional level, increase access to food at household level through higher home production of food crops, market purchase and other means of effective utilization of food at the individual level to meet human biological needs (Barret, 2006). However, there are disincentives of food-aid on domestic agricultural production that may result from farm level responses to price reduction caused by increased food supplies (Clark, 2001). The negative effects of food-aid can be realized when certain conditions prevail. This means that food-aid can have strong negative effects when distributed during harvest period. Large quantities of food-aid are released directly into countries with markets that operate with the same locally produced products, and when poor commodity targeting is implemented. The food-aid products given to households are likely to be exchanged in the market, particularly when that product has a local substitute and increased market supplies lower prices for the locally produced substitute (Donovan, McGlinchy, Staaz & Tschirley, 2006).

Mabuza (2008) undertook a study on the impact of food aid on smallholder agricultural development in Swaziland. The study focused on the relationship of food aid and agricultural production, distribution and effect receiving aid on production.

The results of the study indicated that receiving food aid in the previous year is not enough to influence the decision of household to cultivate.

In short, household members who rely on their locally produced food are negatively affected thus food aid has a role to play in filling this gap.

Mellor (2001) postulated that food-aid discourages growth of agricultural production in recipient nations and it encourages the growth of world population. Food-aid has been accused of depressing agricultural price in recipient nations (as a result of excess supplies) thereby reducing incentives for food production and ultimately inhibiting long term food security (Beddington, 2010). Sometimes governments focus their attention on other aspects of development at the expense of agricultural development as they hope in food aid is covering their food deficit (Republic of Kenya, 2007).

FAO (2011) points out that food aid is seen as a donor driven response that it serves the interests of donors rather than food security needs of the beneficiaries. It is also criticized of creating dependency among beneficiaries, disincentives for local agricultural development and distorting international trade. Jaka (2009) said that it has an effect on beneficiary households and communities. Barrett (2006) noted two ways in which food aid can impact communities, which is positive dependency and negative dependency. Harvey and Lind (2005) states that there are assumptions and meanings that support common usage of dependency in the context of humanitarian aid which are: dependency is perceived as something that is negative and as something that need to be avoided, associated with a provision of food relief and seem to discourage people's initiatives, a problem in areas where there is protracted relief assistance.

Gyamfi (2006) argues that when envisaged, irrigation projects have the potential to alleviate food insecurity. Sikwela (2008) also argues that food security interventions strategies such as irrigation could be the people's panacea for improving dependency on food aid. Food insecurity results from recurrent drought, soil and land degradation (Ellis & Freeman, 2004). Agriculture in Kenya is characterized by its subsistence nature and dependence on unreliable rainfall patterns. Irrigation projects in Kenya are limited with only about 2% of the country's arable land irrigated. This, calls for improvement of small holder irrigation projects to curb on food aid dependency (Kinyua, 2004).

Irrigation development is one of the strategies identified in the Economic Strategic Programme (ESP) for alleviating households' dependency on food aid. However, if irrigation is to benefit the poor, it is vital that farmers not only are able to access irrigated land but also have the resources to make effective use of it. Only 29% (436) of the 1500 farmers intended to benefit from Kithigiri-Kamatungu irrigation project have access to the irrigation water (Republic of Kenya, 2010). This raises the question as to whether the project has achieved its objective of alleviating household dependency on food aid. This study therefore aims at assessing the contribution of Kithigiri-Kamatungu irrigation project in reducing households' dependency on food aid. From the available literature, no in-depth studies have tended to focus on status of food production, status of household food insecurity and coping strategies against household food insecurity among small scale farmers. Due to this observation, the study on contribution of smallholder irrigation projects in reducing households' dependency on food aid among small scale farmers in Marimanti location of Tharaka South Sub-County, Kenya is timely. This is so, especially due to the fact that small scale farmers are important players in alleviating household dependency on food aid through their subsistence crop production.

2.5 Factors Affecting Sustainability of Small-Scale Irrigation to Food Security

According to Lipton (1996) a number of factors including lack of policy on agriculture and irrigation; financial resources; proper training, adequate market for produce, and lack of appropriate technology affect contribution of irrigation projects to food security.

2.5.1 Policy

Kenya needs to have an elaborate policy on irrigation projects. The 2015 Kenya national irrigation policy provides opportunities for growth through irrigation; drainage and agricultural water storage are immense in Kenya. The country has an irrigation potential of 1,341,900 ha based on available water resources and improvement in irrigation water use efficiency. Of which approximately 161,840 ha of irrigation have been developed (Water Master plan, 2012). The rate of irrigation development in the country has been low, with an increase of new irrigated area, which is equivalent to an annual growth rate of less than one per cent (Republic of Kenya, 2015).

Past irrigation development strategies and approaches have been articulated in the Sessional Paper No.4 of 1981 on National Food Policy, Sessional Paper No. 1 on

Economic Management for Renewed Growth, Sessional Paper No.2 of 1994 on National Food Policy, the Economic Recovery Strategy (2003 - 2007), Strategy for Revitalizing Agriculture (2004-2014), the Water Act (2002), the Agriculture Sector Development Strategy (ASDS 2010-2030) and Vision 2030. Past development approaches in irrigation scheme development aimed providing employment and settlement for the landless. In these schemes, the National Irrigation Board (NIB) played a central role in providing water conveyance, land preparation, inputs supply, produce marketing and processing. However, following liberalization of financial markets and removal of marketing restrictions, farmers 'participation in identification, development, operation and maintenance of the schemes through irrigation water users' associations (IWUAS) has increased. The development strategies of this Policy draw from both the successes and failures of the past while institutionalizing more participatory, stakeholder-led and business-oriented irrigation.

The Government of Kenya (2015) recognizes that there are many constraints and challenges facing the irrigation sector. One of them relates to un-coordinated policies, legal, institutional and regulatory frameworks. The second one is about under-exploited irrigation potential due to low levels of public participation and investments including inadequate budgetary allocation. The third relates to inadequate private sector participation and investments. The fourth entails inadequate infrastructure development for irrigation, drainage and water storage. The fifth is about poorly developed channels for participation by irrigators and weak governance of water users and farmers associations. The sixth relates to inadequate and un-coordinated information in irrigation research, science and technology. The seventh pertains to inadequate support services and the eighth is about insecure land tenure and unsustainable land use. The ninth entails inappropriate utilization of waste water while the tenth pertains to ineffective use of water resources in existing schemes. The eleventh is about inadequate access to credit and financial services while the twelfth pertains to input supplies and output markets. The thirteenth reveals limited incentives for investment in irrigation materials, technology, equipment and machinery and the fourteenth relates to challenges of climate change.

The implementation of the 2015 Kenya national irrigation policy will therefore facilitate coordinated development of the sub-sector. This will enable and encourage accelerated development of irrigation infrastructure, increased productivity per unit

volume of water, increased water harvesting and storage, improved scheme management, enhanced stakeholder participation and improved business orientation in the sector. The policy would together with other statutory instruments and sectoral policies guide the development of commercial agricultural activities. It should also be geared at stimulating investment in smallholder irrigation initiatives, as well as regulating the irrigation sub-sector activities while creating the conditions to attract public and private sector investment. With the promulgation of the Water Act of 2003, the needed policy would guide future irrigation development and the allocation of water for irrigation purposes within the framework of the Act.

2.5.2 Financial resources

Irrigation development is an expensive undertaking and a number of farmers are finding problems in securing adequate finance (Njagi, 2009). Credit institutions require collateral security before granting credits, and the majority of the farmers will not have such. Farmers are expected to group themselves into cooperatives before they can be considered for credit in most cases, and that comes with its own problems as the farmers have limited knowledge on the operation of cooperatives. The financial institutions are reluctant to provide credit to many other irrigation enterprises except for sugar cane, citing difficulties in recovering loans from other agricultural enterprises. There is need for government to facilitate access to adequate and flexible credit services for small scale irrigation farmers.

2.5.3 Training

The majority of farmers in small scale farmers have limited training in planning, implementation, operation and maintenance of irrigation schemes. This contributes to failures of irrigation schemes, including those initiated and funded by NGOs and donor agents (Ngigi, 1999). In as study of IFAD funded smallholder irrigation projects it was found that the NGOs and Ministry of Agriculture and Cooperatives (agents responsible for implementing projects) had low capacity for small scale irrigation construction (Manyatsi, 2004). It was found that there was shortage of personnel trained at technician level in the maintenance of irrigation infrastructure and equipment (Manyatsi, 2004). This was so mainly due to the fact that irrigation design and maintenance was not adequately taught at the training institutes in the country (including the University of Swaziland).

2.5.4 Irrigation Technology

The available irrigation technology in Kenya is targeted mainly to commercial and large-scale irrigation farmers. There is hardly any irrigation technology developed and targeted to small scale irrigation farmers (Moris, 1987). This can be attributed to the fact that there is no technology developed within the country. The methods used by small scale irrigation farmers include furrow, sprinklers and buckets. Some of the methods have very low efficiency and the poor performance of operations and management results in low water productivity. The rate of water application is not always appropriate for the crop grown and the soil type.

2.5.5 Market of produce

Market access is one of the driving forces of agricultural commercialization. In their study, Muhammad et al. (2004) included the following factors as having potential to influence level of success: size and type of farm operation, sources of information, importance of farm labor and off-farm income, use of information technology, marketing practices and research, extension and education needs. In addition, they also examined the plans for the future of the respondents. Their results showed that more successful farmers use production systems that are diverse, adopt measures to control costs and use marketing strategies that seek the highest level of profit.

In their study Hau and von Oppen (2002) present an analysis of the impact of market access on agricultural productivity. Results provided evidence for the importance of investments in physical and institutional infrastructure of agricultural markets. They assert that an improvement in market access can help stimulate market driving forces and in turn maximize the potential benefits of agricultural commercialization by increasing incomes and improving living standards in the rural areas of many developing countries. There seems to be a general view therefore that market access is one of the critical factors that determine success of smallholder farming projects. This is an acceptable view even among professional working in developing countries.

For example, presenting results of an expert survey, Gabre-Madhin and Haggblade (2001) found that the main views on determinants of success in African agriculture include technology, collaboration, markets and a favorable policy environment and

management. In this stud y, social scientists chose markets and favorable policy environment as the most prominent determinates of success.

Market institutions and services are not adequate and lack capacity to absorb irrigation products at all times. This is so because small scale irrigation farmers lack production planning and are poor market oriented. This results in over production of some crop by the farmers at some time, leading to oversupply of the market (Manyatsi, 2004). There is need for a mechanism to improve the market and to put up processing institutions to respond to the output of irrigated agriculture. The farmers should be taught aspects of production scheduling in order to attract the best prices for their products.

2.5.6 Other factors

One of the factors affecting the effective contribution of small-scale irrigated agriculture to food security is the tendency of relegating crop and vegetable production in irrigation schemes to be 'part time' occupation and putting less time in it. More time is often spent in production of main crops such as maize, and looking after livestock, as well as leisure (Manyatsi, 2004). There is often lack of commitment and ownership by members of communal irrigation schemes. When water has to be pumped for irrigation there is lack of commitment in paying for farm costs, and as such there are some irrigation schemes known to have failed because of failure to pay for pumping costs. Theft of irrigation pumps and irrigation facilities in communal schemes have been reported.

In many drought prone countries, including Kenya, there has been an optimistic view regarding irrigation development as a strategy to sustain agricultural production and ensure food security. In such countries, the key constraint on further increase in agricultural production is the scarcity of water. Therefore, national planners are strongly attracted to irrigation as a means of supporting future food strategies. In this regard, Elahi (1988) pointed out that for countries with arid and semi-arid climates, the luck of uncertainty about rainfall along with rising demographic pressure on rain fed land, would strongly be pointed to irrigation as a prime candidate to support future food strategies in the medium and long term. Dessalegn (1999) stated that, where rainfall is insufficient and unreliable, rain fed agriculture cannot fully support food production, investment on water management schemes will help stabilize agricultural production and promote food security.

Farmers face a series of unprecedented, intersecting challenges, often originating at global levels: increasing competition for land and water, increased influence of and changing markets, rising fuel and fertilizer prices, and climate change. This changing context poses difficult challenges for smallholders, who are more directly dependent on ecosystem services and have less capacity to adapt to changing contexts, compared with larger, more resource-endowed farmers. Until recently, international investments in agricultural development and policy had been lagging behind other sectors (Bioversity et al., 2012). Smallholders irrigation farmers have often been neglected in debates on the future of agriculture and left out of policymaking at numerous levels (Wiggins 2011).

Rukuni et al (2006) state that a number of problems have befallen irrigation schemes that are managed by central government departments, such as poor marketing arrangements, limited access to water, inability to meet operational costs due to poor fee structures and the lack of a sense of ownership, financial viability and poor governance. Some of these problems have necessitated government transferring responsibility to farmers, who have continued to mismanage these systems, hence their dilapidation. Poor maintenance and lack of effective control over irrigation practices have resulted in the collapse of many irrigation systems.

The FAO (1997) report identified a number of constraints, which hampered smallholder irrigation development in Zimbabwe. Some these include high cost of capital investment in irrigation works considering that communal farmers are resource poor, lack of reasonably priced appropriate irrigation technology for the smallholders, shortage of human resources at both technician and farmer levels, lack of decentralized irrigation service companies to give back-up service in rural areas, poor resource base of farmers, fragmented and small size of land holdings, unsecured or lack of land titles and high interest rates.

Further to the above constraints, Gyasi et al. (2006) state that in many countries, institutional weaknesses and performance inefficiencies of public irrigation agencies have led to high costs of development and operation of irrigation schemes. Poor maintenance and lack of effective control over irrigation practices have resulted in the collapse of many irrigation systems. The study by Gyasi et al. (2006) concluded that collective action for the maintenance of community irrigation schemes is more likely

to be problematic when the user group size is large and ethnically heterogeneous, and where the scheme is shared by several communities. Use of labour intensive techniques in the rehabilitation of irrigation schemes promotes a sense of ownership and moral responsibility that help ensure sustainability. A high quality of rehabilitation works and regular training activities also contribute to successful irrigation management by communities.

Mwaniki (2008) assessed on the challenges and issues of achieving food security in Sub Saharan Africa. The researcher provides that many countries failed to achieve food security due to unstable economic, social and political environments. These include: macro-economic imbalance in trade, natural disasters, natural resource constraint and agricultural dependency on climate and environment. In order to achieve food security, good governance, capacity building, and provision of markets were proposed as basic strategies to alleviate food insecurity. The available literature on this section were focusing on the causes of food insecurity and farmers decision on agricultural production, but this study focuses on the contribution of food-aid to smallholder farmers household food security.

2.5 Theoretical framework

The study will be based on the livelihood approach as the theoretical framework. The theory is relevant to this study because it reviews the importance of the participation of people in community projects as it empowers the locals since the focus is on irrigation projects and food security. The theory shows that when people participate in community projects which come inform of irrigation projects to this context the locals are empowered through availability of food. Therefore, the theory helps the study to identify whether the locals have the same perception; whether the perceived food security is evident and the factors that may be affecting sustainability efforts as guided by the research questions. According to Chambers (1994), who is the propagator of this theory, the participation of people in community-based projects can lead to increased motivation, commitment, and empowerment of the locals. The livelihoods approach puts people at the center of development. People –rather than the resources they use or the governments that serve them – are the priority concern. The livelihood approach group individuals into different livelihoods according to their access to assets (including both (material and social resources) and their capabilities to combine them to livelihood strategies for a means of living. Initially it is stressed that subjective perceptions of own

abilities and inclusion of the locals in the entire development process should be emphasized. The model breaks access into the five 'capitals':

1. Human capital (e.g. education, health).
2. Natural capital (e.g. land);
3. Financial capital (e.g. access to credit);
4. Social capital (e.g. community networks); and
5. Physical capital (e.g. infrastructure like markets and roads).

The ability to combine these assets to livelihood strategies is influenced by the prevailing transforming structures and institutions and the vulnerability context. The transforming structures and processes are the institutions, organizations, policies and exchange between the different types of capital and the economic and other returns from livelihood strategies. The vulnerability context presents three main categories of vulnerability: trends, shocks and seasonality which affect assets and livelihood strategies and determine the level of (non) vulnerability. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base.

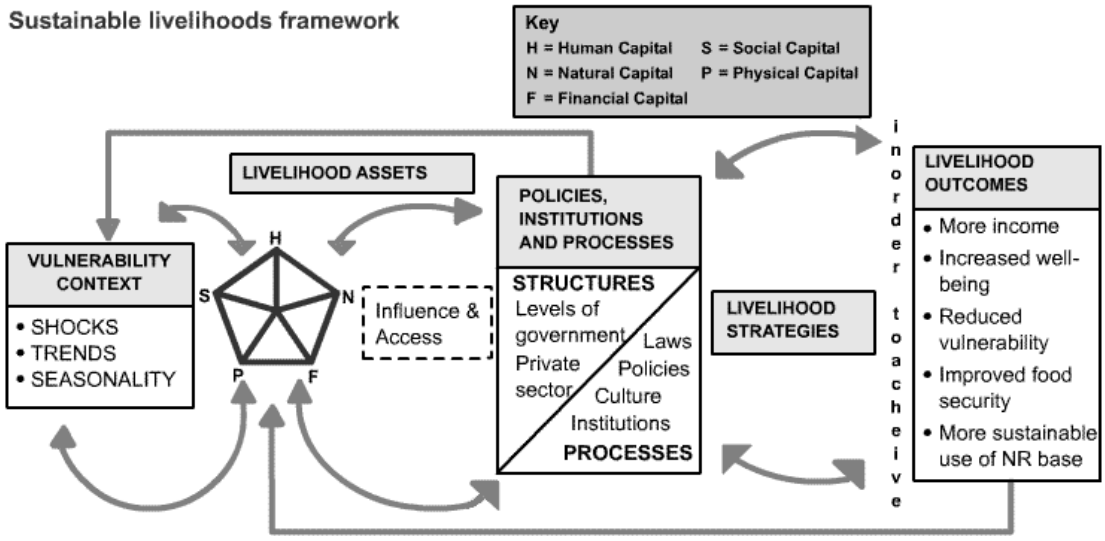

Figure 1: Livelihood Approach

(Source: Department for International Development, 1999)

The vulnerability context describes the external environment that the poor people live in. This includes critical tends, such as technological trends or population trends. It also

includes shocks such as natural disasters or economic inflation, and seasonality which refer to the way prices, employment opportunities and production might shift with the seasons. All of these factors will affect the assets that people have and thereby the sustainability of their livelihoods. The sustainable livelihoods framework is built on the belief that people need assets to achieve a positive livelihood outcome. People have different kind of assets that they combine, to help them achieve the livelihoods that they seek.

Human capital in this study refers to skills which include adaptability, time management and organization interpersonal and technological. Due to the changing seasons and weather patterns, adaptability has become crucial to avoid sticking to crops or foods that can no longer be sustained by these changes. Time management and organization is also a required skill because numerous agricultural activities depend on timing. Technological skills are needed to operate the various machinery or gadgets or facilitating the irrigation process as well as other technologies such as computers for the other aspects of operations. There is also need for knowledge, which is part of human capital. Knowledge is acquired by constantly learning about new methods of farming or other approaches of achieving efficiency and sustainability without compromising on effectiveness. It is relating to learning about new technologies, farming methods, people, crops and other factors that play a role in achieving food security. Ability to labour and have good health also of human capital. Even with the advancement in technologies, the input of humans is still crucial because these technologies are used by humans. People cannot be productive if they are weak, unhealthy, and sticky or facing other challenges that are inhibiting their productivity, thus human labour and health are essential in securing food in a community. Human capital is essential in order to use other kinds of capitals that exists noted that people is one of these assets, and refers to the skills, knowledge, ability to labour and good health that enable people to achieve their desired livelihoods. Human capital is essential in order to use the other kinds of capitals that exist.

Social capital refers to the social resources that people can get help from in order to achieve their livelihoods. This could be through networking, membership of formalized groups or mere trust between people that make them help each another. Natural capital is to be understood in a very broad manner, since it both covers tangible factors, like

natural resources such as trees, land etc., and more intangible products such as the atmosphere and biodiversity.

Physical capital describes the basic infrastructure and producer goods that are needed to support the livelihoods that people seek. Financial capital is the financial resources that people can use to achieve the livelihoods that they are striving for. Transforming structure and process includes the institutions, organizations and policies that frame the livelihoods of the poor, and they are found on all levels – from the household to the international level. These processes and structures determine the access that people have to different kinds of assets, and therefore the importance cannot be overemphasized. Examples of processes are international agreements, ownership rights and laws to secure the rights of the individuals, whereas structures might be the existence of ministries, banks that give credit to the farmers or self-help groups in the local community.

Livelihoods strategies are the way that people act in order to achieve their desired livelihood. The access that people have to different kinds of assets affect the strategies that they employ, and the structures and processes in a given society also creates possibilities and constraints on the strategies that people are able to use. Finally, Livelihood outcomes are the achievements of people's livelihood strategies. However, outcomes are to be described by the local people themselves, since these include much more than income. For outsiders it can be difficult to understand what people are seeking and why because this is often influenced by culture, local norms and values.

The livelihood framework is increasingly influencing the approach of projects ranging from emergency response, to disaster mitigation to longer term. The sustainable livelihood framework describes what development dedicated to poverty reduction should focus on to create sustainable livelihoods for the poor. The first basic principle is that development work has to focus on people; which means that we have to focus on what matters for the poor, how people and their cultures are different, and how this affects the way they understand and appreciate livelihoods. Another principle is that the poor themselves have to be key actors in identifying the important aspects of their own livelihoods. The poor know what matters to them, and outsiders have to listen to their priorities instead of assuming that their own values and ideas are as good as, or better. It is also a principle that the role of the donors is to be process facilitators that help the

poor to be aware of their priorities and analyze their own surroundings for resources. This means that participation and partnership become two very essential factors in development work, and by actively being part of the development work, the poor will be empowered instead of being dependent on outsiders to help them all the time.

The last basic principle is that development has to have a long-term focus. It is important that the way we develop an area now, will make it sustainable in the future as well. The sustainable livelihood approach is relevant to this study because it enables the researcher to contextualize that livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base.

2.6 Conceptual framework

A Conceptual Framework showing the relationship of the study variables

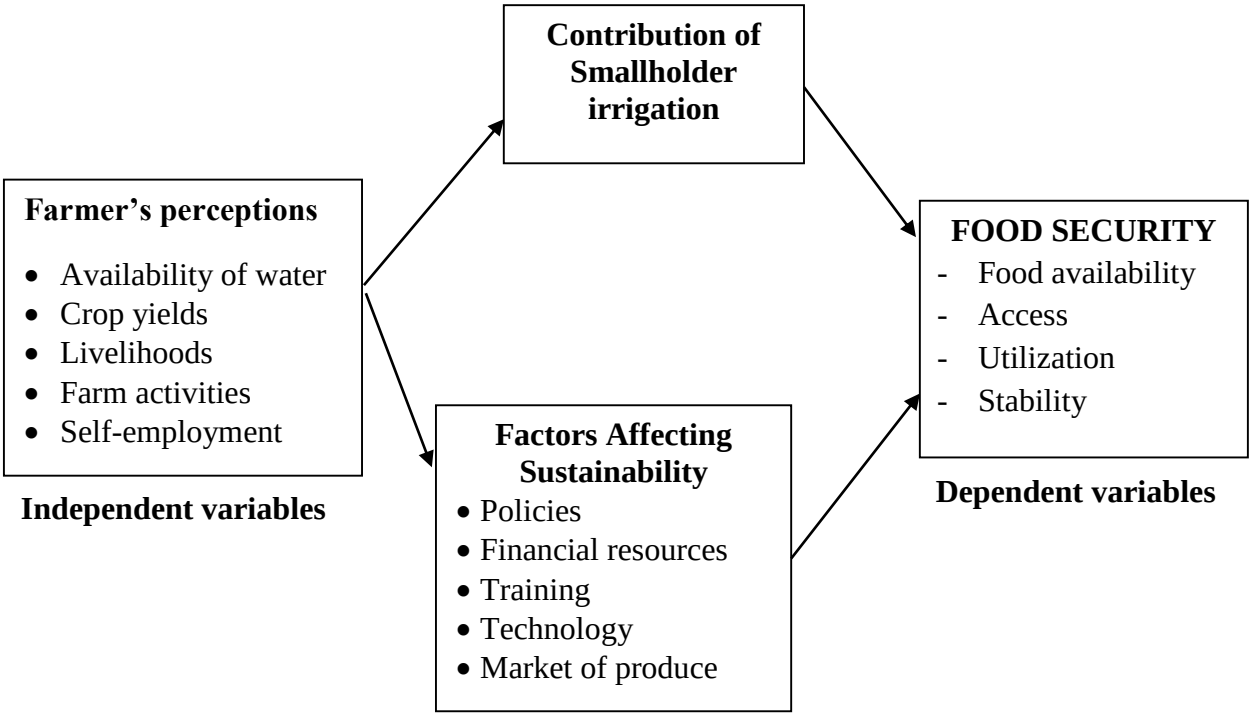

Figure 2: Relationship of the study variables

Source: Author

The framework shows that the independent variables are Farmer's perceptions (availability of water, crop yields, livelihoods, farm activities and self-employment), the Contribution of Smallholder irrigation, and factors affecting sustainability (policies, technology, market produce, training and financial resources). The dependent variable

is food security and it is characterized by food availability, accessibility, utilization and stability.

DIMENSIONS OF FOOD SECURITY

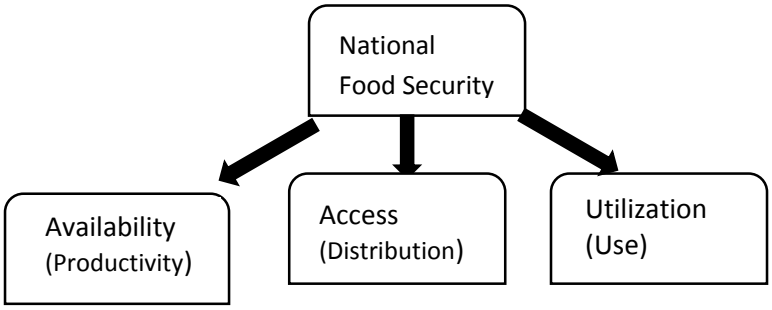

Figure 3: Dimensions of food Security

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter outlines the style that will be used to achieve the objectives of the study. It covers the research design, the target population, sampling procedures and sample size, research instruments, validity and reliability of the instruments, pilot study, data collection procedures, and data analysis.

3.2 Research design

The study will utilize a case study research design. A research design is a programme to guide the researcher in collecting, analyzing and interpreting observed facts Orodho, (2009). Adam, (2009) support this view by asserting that this type of research attempts to describe such things as possible behavior, attitudes and characteristics. According to Tashakkori and Teddlie (2010), a case study design describes the present status of a phenomenon, determining the nature of the prevailing conditions, practices, attitudes and seeking accurate descriptions. The design will be appropriate to gather information from households that have benefited from Kithigiri-Kamatungu irrigation project by describing the state of food security on engagement in the irrigation adventures.

3.3 Location of the study area

The study will be carried out in Marimanti location in Tharaka South Sub County in Tharaka-Nithi County. It is situated between Longitudes 37° 18’37” and 37° 28’33” East and Latitude 00° 07’23” and 00° 26’19” South. Marimanti location is situated in Tharaka South Sub County in the lowlands of Tharaka Nithi County. Marimanti lies in Latitude: 0° 7' (0.1167°) South, and Longitude: 37° 57' (37.95°) East.The area experiences bimodal rains and high temperatures. The soil types range from sandy loamy soils to stony sandy soils. Marimanti location in Tharaka Central Division is situated in the marginal mixed farming livelihood zone of the Sub County (GOK, 2008d). The short rain season occurs in December while long rains are received from March to May, where the annual rainfall ranges between 500mm and 1000mm. Generally, rains in Tharaka South are erratic. Temperatures range between 29°C - 36°C, though at certain periods they can rise to as high as 40^{o}C.Unreliable weather coupled with poor markets infrastructure hinders redistribution of food to the markets in the low potential areas of the district. Transportation is costly and constrained by poor transport and communication systems. This often results in high food prices and ultimate

household food insecurity due to poorly integrated markets. Prolonged drought due to erratic rain in the region has brought about unsteady and low crop production.

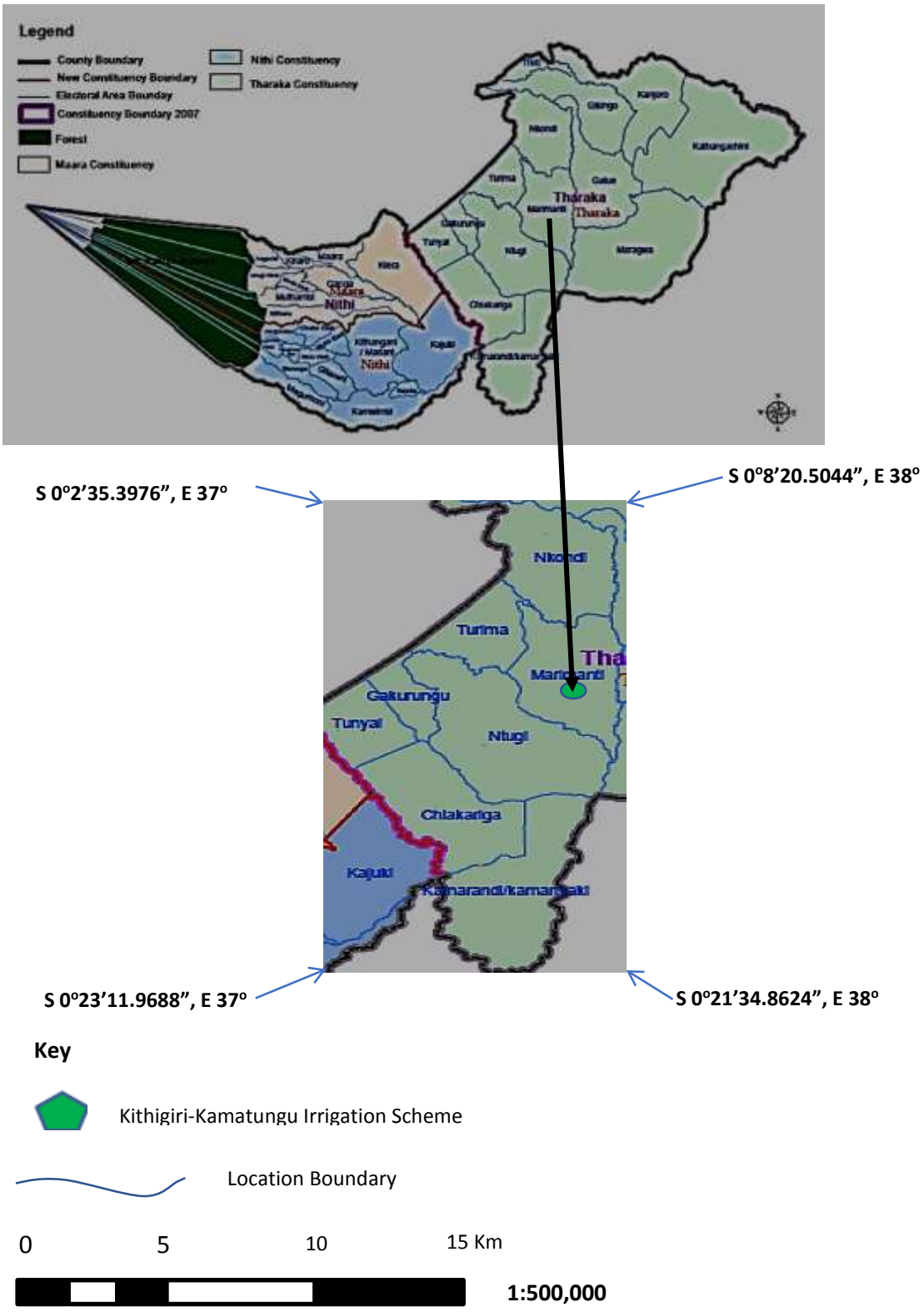

Figure 4: Map of the study area

Source: IEBC 2010

Singleton and Straits (2010) emphasizes that an ideal reason for choosing a study site should be the existence of a problem that the researcher hopes to generate solutions for. Marimanti location was chosen because of two reasons; first, it was one of the beneficiaries of the Government of Kenya irrigation scheme under economic stimulus programme and historically people in this area have not been known to engage in irrigation farming until the introduction of the small holder irrigation project. Secondly, the area has salient characteristics of ASAL areas. Food insecurity is one of challenges of concern in such areas.

3.4 Population of the study

According to Ministry of Agriculture and Livestock Development (2018), 426 farmers have benefited from the small holder irrigation programme in Marimanti Location. The farmers will be focused on because they will be able to reflect the situation of food production and household food insecurity in the study area. Respondents of the study will be members of the project. Household heads will be considered as the main respondents because of their knowledge about food security and land use. In cases where the household head is absent any other adult present can represent the family.

3.5 Sampling procedure and sample size

Orodho (2014) defines a sample as a part of large population, which is thought to be representative of the larger population. Sampling is a process of selecting a number of individuals or objects from a population such that the selected group contains elements representatives of characteristics found in the entire group (Orodho, 2014). Sampling entities represents the actual target population and comprises all the units that are potential members of a sample (Kothari, 2019; Mugenda, 2008). In this study, the focus will be on stratifying on the location on the different sections of the scheme then sample from each proportionally. From the targeted population of 426 farmers the researcher will employ the Kothari (2019) formula to obtain the sample size.

$$n = \frac{Z^2 pqN}{e^2(N-1) + Z^2 pq}$$

Where; N = Total population

n = Sample size

Z = Standard variant at a given confidence level (Z variant at 95% confidence level obtained from the table = 1.96)

e = Acceptable margin of error = 0.05

P = Sample proportion (in this case = 0.5)

Q = 1-P

$$n = \frac{1.96^2 \times 0.5 \times 0.5 \times 426}{0.05^2 \times (426 - 1) + 1.96^2 \times 0.5 \times 0.5}$$

n=409 ÷1.5525

= 263.446=263

Thus, the sample size is 202

To obtain the sample of farmers to participate in the study, a total of 202 out of 426 farmers in this project that benefited from the irrigation programme will be selected randomly to form the sample.

3.6 Research instruments

The data for this study will be collected using questionnaires for farmers and focused group discussion and key informants.

3.6.1 Questionnaire for farmers

The questionnaire on farmers perceptions will be used for data collection because as Kothari (2019) observe, questionnaires offer considerable advantage in administration; presents an even stimulus potentiality to large numbers of people simultaneously and provides the investigation with an easy accumulation of data. Hair et al. (2010) maintain that questionnaires give respondents freedom to express their views or opinion and also to make suggestions. Such questionnaires are usually completed on an anonymous basis, thus further increasing the freedom of the respondents to be honest and frank in their replies.

The questionnaire for farmers (Appendix A) will contain both open and closed ended items. The questionnaire will contain items that seek to gather information to assess

farmer's perceptions on the contribution of Kithigiri-Kamatungu irrigation project to Food security.

3.6.2 Key informants interview

these interviews will be done with farmer group leaders, water supply managers, and agricultural and irrigation officers in the location/subcounty.

3.6.3 Focused group discussions (FGDs)

The researcher will have in-depth deliberations with farmers on irrigation and the effects of the scheme on livelihoods. He will also focus on their views on sustainability of the scheme

3.7 Validity

Validity is the degree to which a test actually measures variables it claims to measure (Kothari, 2019). Mugenda and Mugenda (2003) support this view when they argue that validity is the degree to which results obtained from the analysis of the data actually represent the phenomenon under study. Content, face and construct validity will be established by seeking the expertise of the supervisors of this study. The supervisors will ensure that correct variables relevant to the study are included in the questionnaire. The questionnaire will be constructed and revised according to the instructions of the experts. This is in accordance with Mugenda and Mugenda (2003), who says that content validity judgment is made better by a team of experts in the field of the research.

3.8 Reliability

Reliability is the measure of the degree to which the research instrument yields consistent results or data after repeated trials (Mugenda and Mugenda, 2003). A pilot study will be conducted to estimate the reliability of the instruments. According to Galloway (1997), it is difficult to give the exact number for the pilot group, but as a rule of thumb, it is recommended that researchers pilot 5-10% of the final sample. The research questionnaires will be piloted in the same study area.The pilot sample will constitute 5% of the target population. Test-retest method will be used to determine the reliability of the questionnaire. The reliability coefficient of the instruments will be calculated using Cronbach's Coefficient Alpha formula.

3.9 Data collection procedures

Application and permission for authority to conduct the research will be sought from NACOSTI. A copy of the permit will be submitted to Tharaka South Sub County Commissioner. The researcher will visit the farmers to introduce and explain the purpose of the study.

The researcher will book appointments with the participants and organize to administer the questionnaires. Key informants will fill in the questionnaires by their own. The last day focused group discussion will be carried out.

3.10 Ethical considerations

Ethical issues in educational research ensure that the rights and welfare of persons and communities that are subjects of the study are protected and guarded (Machmias, 1987). The respondents' voluntary and informed consent of participation in the study will be sought before data collection, informing and clarifying to them that the study is for academic purpose only. The respondents will also be assured of the confidentiality of the information they give. This will be done during the visit to their homes for the study. The researcher will book appointments with key informants prior to conducting interviews with them and they will also be informed that the purpose of the study is academic.

3.11 Data analysis

This research will yield data that will require both qualitative and quantitative analysis. Kothari (2019) defines data analysis as categorizing, manipulating and summarizing of data in order to obtain answers to research questions. This study will employ both descriptive and inferential statistics to analyze the data quantitative data. The data collected will be coded and entered in the computer for analysis using the Statistical Package for the Social Sciences (SPSS) version 21 for windows. Mugenda and Mugenda (2003) contends that SPSS is able to handle large amount of data. It is also quite efficient. Qualitative data on the other hand will be transcribe from the recordings and fields notes and organized into themes and reported thematically in line with the objectives of the study. The arising findings will be triangulated with quantitative data to build the study discussion. The results of data analysis will be presented in frequency tables and percentages as shown in Table 1.

Table 1: Summary of data analysis methods

Research questions	Data to be collected	Data analysis	Presentation
i) What are the perceptions of farmers on food security in kithigiri-kamatungu irrigation scheme?	Focused group Discussions Questionnaire (Likert Scale - 5 points)	Frequencies Percentages	Graphs Tables Chi Square
ii)What is the contribution of smallholder irrigation projects on reducing households' dependency on food aid in Marimanti Location?	Questionnaires	Frequencies Percentages	Graphs Tables Chi Square
iii)What are the factors affecting sustainability of food security in the in kithigiri-kamatungu irrigation scheme?	Questionnaires	Frequencies Percentages	Graphs Tables Chi Square

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WORKPLAN

ACTIVITY SCHEDULE	Jan Feb March 2020	April May June 2020	July Aug Sep 2020	Oct Nov Dec 2020	Jan Feb March 2021	April May June 2021	July Aug Sep 2021	Oct Nov Dec 2021
Literature review and proposal development								
Proposal submission Defense at department and correction								
Proposal submission for defense faculty and corrections								
Proposal correction after ethics department comments								
Data collection and analyses								
Thesis writing report presentation								
Final submission of thesis after correction								

BUDGET

ACTIVITY	ITEMS	UNIT COST	TOTAL
Personal development	Travelling expenses to Chuka university to submit document	24 trips @ 1500	36,000.00
Subtotal			**36,000.00**
	Bundles for internet search	720 days @ 50	36,000.00
Subtotal			**36,000.00**
Proposal writing Proposal copies for defense	Printing 2052 pages 16 .copies for defense	2052 pages @10 per page 912pages@10	20,520.00 9,120.00
Subtotal			**29,640.00**
Proposal writing	Printing services 864 pages Binding 24 copies	36pages x 24=864@10 24 copies @50	8,640.00 1,200.00
Subtotal			**9,640.00**
Pilot survey and finalizing of research instruments	Travelling costs 3 questionnaires of 60pages	1 trip @1000 60pages @10	1,000.00 600.00
Subtotal			**1,600.00**
Data collection and analyses	24 trips	24@1000	24,000.00
Subtotal			**24,000.00**
Report writing	Travelling to Chuka university 3 trips	3trips @2000	6,000.00
subtotal			**6000**
Contingencies (10%)			**14,288.00**
Grand Total			**157,168.00**

Source of Funds: **Self**

QUESTIONNAIRE FOR FARMERS

To be filled by farmers who use irrigation agriculture.

INTRODUCTION

The objective of this farmer's questionnaire is to assess the Farmers perceptions on contribution of Kithigiri-Kamatungu irrigation project to food security in Marimanti Location, Tharaka South Sub County, Kenya. Therefore, your active participation and genuine responses is important in meeting the intended objectives of the study. I kindly request for your co-operation in responding to the questionnaires. The study is fully for academic purpose and any information you provide will be kept confidential.

Section A: Demographic information

1. Gender of the respondents

   Male ☐

   Female ☐

2. Age group

   18-25 ☐

   26-30 ☐

   31-40 ☐

   41-45 ☐

   46-50 ☐

   51-55 ☐

   56-60 ☐

   61-65 ☐

   66-70 ☐

   71 and above ☐

3. Marital status

   Married ☐

   Single ☐

4. Duration of residence ☐

5. Primary source of income

☐ Peasant ☐ government employee ☐ business

☐ Private sector ☐ other sources of income

6. Level of education

Non-formal level	☐
Primary school level	☐
Secondary school level	☐
College level	☐
University level	☐

7. No of house hold size

8. Who owns the land that you farm?

Private	☐
Public	☐
Communal	☐

9. How many acres of land do you have?

10. What is the size of the arable land under irrigation from the one you have?

Less than a quarter	☐
Quarter	☐
A half	☐
1-2 acres	☐
3-4 acres	☐
5-6 acres	☐
7-8 acres	☐
9-10 acres	☐
More than 10 acres	☐

Section B: Farmer's Perceptions on the Contribution of Kithigiri-Kamatungu Irrigation Project on Food Security

11. Please react to the statements about the farmers perceptions on the benefits of Kithigiri-Kamatungu irrigation project and its contribution to Food security by indicating whether you strongly agree (SA) Agree (A) Neither agree nor

disagree(NA/D), Disagree (D) or strongly disagree (SD). Please tick (√) against each statement of your best opinion.

Farmers perceptions	**SA 5**	**A 4**	**N/AD 3**	**D 2**	**SD 1**
I. Kithigiri-Kamatungu irrigation project has enhanced the availability of water to the farmers who are members of the project in Marimanti location.					
II. Kithigiri-Kamatungu irrigation project has enhanced your Crop yields through irrigation					
III. Your livelihood has improved as a result of irrigation fed agriculture**.**					
IV. Kithigiri-Kamatungu project led to increased Farm activities by the members like planting, weeding, harvesting, etc.					
V. The Availability of water expanded my options of what I can cultivate, and when to cultivate.					
VI. Kithigiri-Kamatungu irrigation project has enhanced the livelihood of the beneficiaries					

12. Has the project enhanced food accessibility? Yes ☐ No☐

13. Has the project increased food production? Yes ☐ No☐

14. Has the project created more income? Yes ☐ No☐

15. Do the members have knowledge on food utilization now that the project is viable? Yes ☐ No☐

16. Has the project reduced dependency on food aid? Yes ☐ No☐

17. Are there factors that promote irrigated agriculture in this area? Yes ☐ No☐

If yes name them.

18. Are there factors that hinder irrigated agriculture in this area? Yes ☐ No☐

If yes name them?

19. Are there any recommendations you would give as a sustainable solution to household food security among the small-scale farmers in Marimanti location?

Yes ☐ No☐

If yes, name them

Section C: Food Security.

20. How is the produce from the irrigated farms utilized?

☐Home consumption only

☐Sold

☐Both

21. Have you had difficulties in meeting household food needs before the irrigation project was initiated? Yes ☐ No☐

22. What were the difficulties that you encountered based on. (Tick)

a) Availability
b) Accessibility
c) Utilization
d) All the above

23. How has the project helped you address those difficulties?

Section D: spatial settlements

24. Farmer's perceptions on how varied settlements in the project contribute to food security in Marimanti location

I. Are there varied types of settlements of members like linear, nucleated, cluster, isolated and dispersed? Yes ☐ No☐

II. Specifically, which type of settlement is in this project?

(a) Linear
(b) Nucleated
(c) Cluster
(d) Dispersed
(e) Isolated

III. Does the spatial settlement contribute to food (production) availability?

Yes ☐ No☐

IV. Does the varied settlement contribute to food (accessibility) distribution?

Yes ☐ No☐

V. Does the varied settlement contribute to utilization of food (cooking well diet, etc.?) Yes ☐ No☐

25. Does the varied settlement contribute to food security? Yes ☐ No☐

26. Does the varied type of settlement reduce dependency on food aid?

(i) If yes, how?

(ii) If no why?

Section E: Farmer's Suggestions on how the Project can be improved

27. Do you face challenges in the irrigation farming?

(a) Yes

(b) No

(c) If yes, tick the challenge or challenges that you face

(a) Outreach from field officers

(b) Funding

(c) Management

(d) Administration

(e) Any other

28. What are some of the recommendations that you would suggest in addressing challenges facing Kithigiri-Kamatungu irrigation project?

FOCUSED GROUP DISCUSSION

INTRODUCTION

The objective of this focused group discussion questionnaire is to assess the Farmer's perceptions on contribution of Kithigiri-Kamatungu irrigation project to food security in Marimanti Location, Tharaka South Sub County, Kenya. Therefore, your active participation and genuine responses is important in meeting the intended objectives of the study. I kindly request for your co-operation in responding to the questionnaires. The study is fully for academic purpose and any information you provide will be kept confidential.

Group discussion regarding the Contribution of Kithigiri-Kamatungu Irrigation Project to Food Security in Marimanti Location, Tharaka South Sub County, Kenya.

Division _____ Sub-location _____location _____

1. How was the project started and who?

   ……

   ……

2. How many members does the project have? …….
3. What is the Criteria for becoming a member of the project?

   ……

   ……

4. What are the main crops grown in the project?

   ……

   ……

5. What is your rate on amount of yields of crops before and after the inception of the project?

CROP	Before approx. kgs	After approx. kgs
Millet		
Cowpeas		
crop		
Maize		
Green grams		
Sorghum		
Cotton		
Sunflower		
Beans		
Any other		

6. What are some of the recommendations that you would suggest in addressing challenges facing Kithigiri-Kamatungu irrigation scheme?

   ……

   ……

7. What are your suggestions on the best ways to improve the irrigation project on the basis of?

   1 Outreach ☐ Weekly ☐ fortnightly ☐ monthly quarterly ☐ yearly ☐

   2 Funding

   County government to fund ☐

   Use of harambee to raise money ☐

   Table banking ☐

   Bank loans ☐

   Proposal writing to NGOs ☐

   3 Extension services weekly ☐ fortnightly ☐ monthly ☐ quarterly ☐ Yearly ☐

8. Do you think food security situation has changed in this area after inception of the project?
9. To what extent do you think it has attributed to food security?

10. What mechanisms are there to ensure the produce in the area is made:
    Available
    Accessible
    And Utilized?

11. What challenges do farmers encounter?

    ……

12. Do you receive any extension services from the field officers from the ministry of agriculture?

    ……

13. How is the project managed?

    ……

14. In which ways has the project contributed to food security in the area?

    ……

15. Are there varied types of settlements of members like linear, nucleated, cluster, isolated and dispersed in project?

    ……

16. Does the spatial settlement contribute to food (production) availability?

    ……

17. If yes how

    ……

18. Does the types of settlement contribute to food (accessibility) distribution? If yes how

    ……

19. Does the type of settlement affect utilization of food (cooking well diet, etc?) if yes how

    ……

20. Does the settlement increase dependency on food aid?

    ……

21. Are there challenges the project experiences?

    ……

22. If yes, what challenges?

……

23. In your own view how can those challenges be addressed?

……

24. Size of farmland

……

INTERVIEW GUIDE FOR KEY INFORMANTS

To be filled by key informants.

INTRODUCTION s

Dear respondent,

The objective of this key informant's questionnaire is to assess the Farmer's perceptions, on contribution of Kithigiri-Kamatungu irrigation project to food security in Marimanti Location, Tharaka South Sub County, Kenya. Therefore, your active participation and genuine responses is important in meeting the intended objectives of the study. I kindly request for your co-operation in responding to the questionnaires. The study is fully for academic purpose and any information you provide will be kept confidential.

1. Give the History of the project before its inception

   ……

   ……

   ……..

2. Give the history of the project after the inception

   ……

   ……

   ……

3. Why was the project placed in this area and not another?

   ……

   ……

   ……

4. How many farmers benefits from this project?

   ……

   ……

   ……

5. Any user fees charged to members? Yes ☐ No ☐

6. Give the criteria used for one to become a member.

   ……

   ……

   ……

7. Do you think the project has enhanced food security in Marimanti and its environs?
   Yes ☐ No ☐

8. How did the project enhance food production?

   ……

   ……

9. How did it enhance food accessibility?

   ……

   ……

   ……

10. How did it enhance food utilization or any other?

    ……

    ……

    ……

11. Give the types of crops grown by farmers in the project.

    ……

    ……

    ……

12. Besides food production what are other benefits that farmers get from the project? E.g. job opportunities, expansion of infrastructure, road network, reduced incidences of crime because farmers are busy and food secure in farms etc.

    ……

    ……

    ……

13. Are there varied types of settlements of members like linear, nucleated, cluster, isolated and dispersed? Yes ☐ No ☐

14. Does the spatial settlement contribute to food (production) availability?

Yes ☐ No☐

15. Does the types of settlement contribute to food (accessibility) distribution?

Yes ☐ No☐

Does the type of settlement contribute to utilization of food (cooking well diet, etc)?

Yes ☐ No☐

If yes how?

……

16. Does the type of settlement reduce dependency on food aid?

Yes ☐ No☐

17. If yes, how?

……
……

18. If no how?

……
……

19. What organizations are involved in helping small scale farmers under the Kithigiri-Kamatungu irrigation project to achieve food security for their households?

……
……
……..

20. What services do they provide to farmers?

……
……
……

21. Has the implemented Kithigiri-Kamatungu irrigation scheme helped improve the food security in Marimanti location and its environs?

Yes ☐ No☐

22. What are the challenges facing this project?

……

……

……

23. What are the factors that hinder the project now that it's viable?

E.g. social capital, unity, labor policies any other

……

……

……

24. What should be done to address the challenges in order to make the project sustainable?

……

……

……