

**FACTORS THAT INFLUENCE SMALL -SCALE IRRIGATION FARMING  
ALONG TANA RIVER IN CENTRAL DIVISION OF GARISSA DISTRICT,  
KENYA**

By  
UNIVERSITY OF NAIROBI  
ISAAC KIPKOGEL SARGOI  
2012  
NAIROBI

**A RESEARCH PROJECT REPORT SUBMITTED IN PARTIAL  
FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF  
MASTER OF ARTS IN PROJECT PLANNING AND MANAGEMENT OF  
UNIVERSITY OF NAIROBI**

2012

## DECLARATION

I, the undersigned declare that this is my original work and has never been submitted to any university other than the University of Nairobi for the award of a degree:

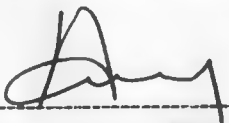
Signed: \_\_\_\_\_  


Date: 31/07/12

**Isaac Kipkogei Sargoi**

**Reg. No. I.50/60733/2011**

This project report has been presented for examination with my approval as the university supervisor:

Signed: \_\_\_\_\_  


Date: 31/07/2012

**Dr. Anne Aseey**

**Lecturer, University of Nairobi**

## DEDICATION

I dedicate this work to my mother Esther Jemalit Korir (God rest her soul) who taught me the virtue of humility and hard work, my immediate family and to those interested in addressing the problem of food shortage in Kenya through irrigation farming.

## ACKNOWLEDGEMENT

This project report is a product of the enormous and valuable support received from a number of individuals and organizations. First and foremost, I would like to thank my loving wife Naomi Maru and my children; Elsie, Ivy and Ian and my immediate family members for their kind support during my studies bearing in mind that I had to spend many hours away from them. The government of Kenya for sponsoring me to pursue this M.A course through the Ministry of National Heritage and Culture, without which meeting my expenditure would not have been possible.

I appreciate the constant encouragement I received from my many friends and colleagues, particularly Mr. Stephen Muteti who gave me valuable moral support. To him, I say thank you and God Bless you.

My University supervisor Dr. Anne Aseej offered the necessary guidance, scholarly advice and positive criticism throughout the period of the project process and to her I say a big thank you.

I also extend my thanks to my Research Assistant, Mr. Patrick Okello from Provincial Planning Office –NEP for his support during my field work; and all those who were involved in one way or another in this work, since their critical roles contributed in making this project a reality. Without their support, the report preparation would have been extremely difficult to accomplish.

## TABLE OF CONTENTS

	Page
DECLARATION .....	ii
DEDICATION .....	iii
ACKNOWLEDGEMENT .....	iv
List of figures .....	viii
List of tables .....	ix
Abbreviations and Acronyms .....	ix
ABSTRACT .....	xi
CHAPTER ONE .....	1
INTRODUCTION .....	1
1.1 Background of the Study .....	1
1.2 Statement of the Problem .....	4
1.3 Purpose of the study .....	5
1.4 Objectives of the Study .....	6
1.5 Research Questions .....	6
1.6 Justification of the Study .....	7
1.7 Scope of the Study .....	7
1.8 Limitations of the Study .....	8
1.9. Assumptions of the study .....	8
1.10 Definition of significant Terms .....	9
1.11. Chapter Summary .....	10
CHAPTER TWO .....	11
LITERATURE REVIEW .....	11
2.1 Introduction .....	11
2.2 Effects of Small- Scale Irrigation Farming .....	11
2.3 The Social –psychological Factors Influencing Small -Scale Irrigation Farming .....	14
2.4 Economic factors Influencing Small- Scale Irrigation Farming .....	17
2.5 Technical factors influencing small-scale irrigation farming.....	21
2.6 Physical environmental factors influencing small-scale irrigation farming .....	23
2.7 Constraints facing Small- Scale Irrigation Farming .....	24

2.8 Theoretical Context of the Study .....	27
2.9 Conceptual Framework .....	30
2.10. Chapter Summary .....	33
CHAPTER THREE .....	34
RESEARCH METHODOLOGY .....	34
3.1 Introduction .....	34
3.2 Research Design .....	34
3.3 Target Population .....	35
3.4 Sample size and sampling procedure .....	35
3.5 Data Collection Methods .....	36
3.6 Research instruments.....	37
3.7 Validity of the instruments .....	38
3.8 Reliability of the instruments .....	38
3.9 Data Analysis Methods .....	39
3.10 Chapter Summary .....	39
CHAPTER FOUR .....	42
DATA ANALYSIS, PRESENTATION AND INTERPRETATION .....	42
4.1. Introduction .....	42
4.2 Bio-data .....	42
4.2.1 Sex .....	42
4.2.2 Age .....	43
4.2.3 Highest level of education .....	44
4.2.4 Household size .....	45
4.3 Economic factors influencing small-scale irrigation farming .....	45
4.3.1 Farmer's and spouse's occupation .....	46
4.3.2 Land ownership .....	47
4.3.3 Existence of agricultural development agencies .....	53
4.3.4 Marketing of produce .....	53
4.4 Socio-psychological factors .....	54
4.4.1 Influence of farming situation in early years to current owning .....	54
4.5 Technical factors influencing owning irrigation .....	56
4.5.1 Use of farm inputs .....	56
4.5.2 Membership to a farmers' organization .....	56
4.5.3 Access to agricultural training .....	56

4.5.4 Access to extension services .....	58
4.6 Physical environmental factors .....	58
4.6.1 Sources of water for irrigation .....	59
4.6.2 Existence of drought and floods .....	60
4.7. Constraints facing irrigation farmers .....	60
4.7.1a Constraints facing irrigation farmers along Tana river .....	60
4.7.1b Other related problems .....	61
4.7.2 Suggested solutions .....	63
CHAPTER FIVE .....	64
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS .....	64
5.1 Introduction .....	64
5.2 Summary and Discussion of findings. ....	64
5.2.1 Influence of socio-psychological factors .....	64
5.2.2 Influence of economic factors .....	65
5.2.3 Influence of Technical factors .....	67
5.2.4 Influence of physical environmental factors.....	67
5.3 Conclusions .....	68
5.4 Recommendations of the study .....	69
5.4.1 For local institutions and Policy makers .....	69
5.4.2 Recommendations for further Research .....	70
REFERENCES .....	71
APPENDIX 1 .....	79
INTRODUCTION LETTER .....	79
TO WHOM IT MAY CONCERN .....	79
APPENDIX 2 .....	80
APPENDIX 3 .....	81
QUESTIONNAIRE- FOR SMALL-SCALE IRRIGATION FARMERS .....	81
APPENDIX 4 .....	88
INTERVIEW GUIDE- FOR AGRICULTURAL OFFICERS.....	88
APPENDIX 5 .....	90
OBSERVATIONAL SCHEDULE TO GUIDE INTERVIEWERS .....	90

**LIST OF FIGURES**

**Figure 1: Conceptual Framework of the study .....32**



## LIST OF TABLES

Table 1 :Operationalization of variables .....	40
Table 2a: Sex of the respondents .....	43
Table 2b Status in the family .....	43
Table 3: Age of the respondents .....	44
Table 4: Highest level of education attained.....	45
Table 5: Year when land was acquired .....	47
Table 6: Sources of finance to own and to practice irrigation farming .....	48
Table 7: Decision on the need to acquire family land .....	49
Table 8: Factors influencing performance of small -scale irrigation farming in Garissa.	51
Table 9: Influencers to owning land or undertaking irrigation farming .....	52
Table 10: Influence of parents' farming situation in early years .....	55
Table 11: Sources of irrigation information .....	57
Table 12: Distance of farm from water source .....	59
Table 13: Constraints facing irrigation farmers along Tana River .....	61
Table 14 Challenges affecting to irrigation farming.....	62
Table 15: Suggestions towards solving existing problems .....	63

## **ABBREVIATIONS AND ACRONYMS**

<b>FTC</b>	<b>Farmer's Training College</b>
<b>KARI</b>	<b>Kenya Agricultural Research Institute</b>
<b>KEFRI</b>	<b>Kenya Forest research Institute</b>
<b>LSISs</b>	<b>Large-Scale Irrigation Schemes</b>
<b>SSISs</b>	<b>Small-Scale Irrigation Schemes</b>
<b>IIMI</b>	<b>International Irrigation Management Institute</b>

## ABSTRACT

Climate change and the rapid increase of population have been thought to be responsible for the constant food shortage experienced worldwide and particularly in the developing nations. In fact, in the recent years, prices of foodstuff in the world market have skyrocketed. In Kenya, the problem of food shortage continues to manifest itself especially in the ASALs that account for more than 80 % of Kenya's landmass. In North, Eastern region, and Garissa particularly, the government and other stakeholders have been forced to continuously supply relief food to its population.

Irrigation has for long been deemed as one way of meeting food sufficiency as opposed to rain-fed agriculture. However, even though the Kenyan government has invested in public LSISs, the result has not been encouraging. Likewise, the irrigation potential is high, investment in this area is still wanting. Of late, the Kenyan government as a policy has been encouraging and supporting entrepreneurs to invest in commercial SSISs in the hope that they would contribute solutions towards food sufficiency because they enjoy communal support and ownership.

Irrigation farming can be seen as a business venture, but interestingly, entrepreneurs have not invested much in this area as expected. This study was undertaken in Central Division of Garissa District and sought to examine the factors that influence small-scale irrigation farming so as to understand what influences their initiation, operation and problems faced by small-scale irrigation farmers and their deemed solutions. The socio-psychological, economic, technical and environmental factors were investigated to see how they influence small-scale irrigation farming in Garissa District. The study was carried out among 120 farmers in central division of Garissa District using the non-probability sampling, particularly purposive sampling. The data was analysed using the SPSS. The data is presented in frequency and table forms.

The study findings indicate that sociological factors like gender, age and social status influence SSI farming in Garissa. Economic factors like availability of funds, access to credit facilities, infrastructure, and availability of land also affect SSI farming in Garissa. Results show that farmers lack relevant and timely agricultural information and training, thus negatively influencing SSI farming.

UNIVERSITY OF NAIROBI  
KIKUYU LIBRARY  
P. O. Box 20197  
NAIROBI

## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background of the Study

The outlook for food of many developing nations is a cause for serious concern. The problem of food insecurity is exacerbated by the rapid growth of population, hence demand for more food. Coupled with this is the problem of climate change that may increase the severity and variability of weather thus, disrupting established systems of production and causing outmigration into the fragile areas of the Arid and semi-Arid lands (ASALs). Such a change could require expensive investments in modifying existing systems of food production and establishing new ones (FAO, 1987).

In Kenya, food shortage has been greatly experienced in the ASALs, especially in Eastern and North Eastern Provinces. Apart from increasing population and generally poor climatic conditions prevalent in the ASALs, drought is seen as the main cause of food deficits in these areas (Shisanya, 1996). The most susceptible districts are Machakos, Makueni, Tana River, Kwale, Turkana, Lamu, Kilifi and all the districts in North Eastern Province (Kenya, 1994). Garissa District (the study area) provides a good example showing precarious food security situation in North Eastern Province and other ASALs. The District receives inadequate and unreliable rainfall most of the year during which it depends on relief food from the government (Kenya, 1994).

Universally, irrigation farming as an alternative to rain-fed agriculture is accepted to be a vital aspect of development in both economic and welfare terms. This is based on the realization that

agricultural food production through irrigation farming (as opposed to pure dependence on unreliable rainfall farming) is important in the attainment of an adequate quality of life. However, the current food production in Kenya has failed to keep pace with the rapidly increasing population which as at now stands at 37.7million, as per the adjusted figure of the 2009 population census (Kenya, 2007). As a consequence, studies (Finkel & Darkoh, 1991) have shown that there are trends of out migration of people from the high potential areas into the hitherto less densely populated and ecologically fragile ASALs (Finkel & Darkoh, 1991). As a result, there has been an increase in the use of the ASALs leading to detrimental environmental and social effects such as soil erosion, deforestation and acute food shortage (Darkoh, 1990).

In view of the above conditions, the Kenyan government, in her development policy captured in her development plans including the Kenya Vision 2030 is turning to the option of irrigation farming (Kenya, 2007, 1989) which is seen as a long term solution to the problem of food shortages. However, these efforts have remained theoretical to some extent. For example, in North Eastern province, where food shortages are serious, there are large ASALs which have not been developed, whereas if developed, the region could support traditional food crops such as cassava, sweet potatoes, millet and sorghum.

In an attempt to address food insecurity, several public irrigation schemes have been established, expanded or reconstructed by the government and operate under the umbrella of the National Irrigation Board (NIB). These include Ahero, Perkerra and Bura among others. However, these schemes have not been very successful because they have failed to deliver the intended

objectives (Arnon, 1992; Ruigu et al, 1984) and are not cost effective (Muturi (1986; Migot-Adhola & Ruigu, 1989).

Drawing from lessons learnt from Large -Scale Irrigation Systems (LSISs), the Kenyan Government is now shifting policy focus to commercial small-scale projects so as to exploit the country's irrigation potential (Kenya, 2007: Kenya, 1994). There is a general consensus that the Small- Scale Irrigation Systems (SSISs) have greater chances of success (Arnon, 1992; Adams, 1992; Ruigu, 1987) because their inception is people driven, managed by farmers and thus enjoy greater communal participation due to their easy integration into the social systems. The SSISs are found throughout the country and can be described as age-old indigenous irrigation schemes. In most of these schemes, farmers still use traditional technologies of crop husbandry. Orodho (1998) sees these to be general characteristics of small-scale irrigation farming.

The success of small-scale Irrigation farming is affected by a number of constraints/problems, for example, inappropriate technology, inadequate access to markets and markets' information, exploitative prices for farm produce, unpredictable weather patterns, inadequate infrastructural facilities, inadequate agricultural extension services, inadequate or inaccessibility to credit by farmers, exploitation by middlemen, inappropriate laws, lack of secure land rights, access to labour, floods, reduced water levels and retrogressive socio-cultural practices and beliefs including conflicts between communities groups (Brown & Nooter, 1992).

Small- scale irrigation farming is a business venture (and by extension, a social venture) which is influenced by numerous socio-psychological and task environmental factors. However, it is

worth noting that some individuals and households have been able to undertake successful small-scale irrigation farming venture while others have not been able. Different psychological, sociological and task environment factors appear to come into play in the venture with some factors acting as enablers while others being disenablers (Bateman & Zeithaml; 1996). Therefore, this forms the basis of the proposed study. The aim is to examine the factors that influence small scale irrigation farming along Tana River in Central Division of Garissa District.

## 1.2 Statement of the Problem

Kenya has more than 140,000 hectares of the ASALs which have the potential to be put under extensive cultivation through irrigation farming. However, only 105,800 hectares (about 20% of irrigable land) have been exploited (Kenya, 2007; Ruigu, 1987; Migot-Adhola and Ruigu, 1989; Thompson, 1991). Garissa District, the study area has an irrigation potential of 22,060 ha. but currently only 2010 ha is under irrigation (Kenya, 2009). Food shortage continues to bite in most ASALs and particularly in Garissa District, and this has forced the government and its development partners to commit more resources in the acquisition of relief food supplies to save its citizens from starving. These are resources which would have been utilized in undertaking other key development activities. The blame has always been put on the government as the principal agent for the production and maintenance of key agricultural growth and development projects. However, a true advocate of irrigation farming would take a holistic approach and would be tempted to examine the factors influencing small- scale irrigation farming and the challenges/constraints facing the sub-sector in Kenya and how these challenges can be addressed to remedy the unsatisfactory performance. One therefore wonders what factors influence both the

establishment and expansion of small- scale irrigation farms especially along the Tana River in Garissa District.

Research findings by Makanda (1987), Khayesi (1997) and Ruigu (1987) indicate that the SSISs have a great potential of improving the living standards of the people in the ASALs. However, more recent assessments of the irrigation sub-sector have all come to the conclusion that the success of small-scale irrigation farming has been limited. The current situation of small-scale irrigation farming ventures remains grossly unsatisfactory. Small- scale irrigation farming involves investment, thus it can be seen as a form of a new venture formation and there are many factors behind any new venture formation. Huuskonen (1993) and Bateman and Zeithaml (1996) argue that the factors that encourage new venture formation are strategic planning and decision-making factors, psychological, sociological and environmental factors. This leads one to question whether these categories of factors influence small- scale irrigation farming in general and in Central Division of Garissa District in particular.

Therefore, in order to understand the small- scale irrigation farming situation, this study examines the factors influencing small- scale irrigation farming in Garissa District. Such a study appears not to have been undertaken in the Central Division of Garissa District.

### **1.3 Purpose of the study**

The current study examines the factors influencing small-scale irrigation farming in Central Division of Garissa District so as to inform formulation of relevant irrigation policies.



## **1.4 Objectives of the Study**

- 1) To investigate whether socio-psychological factors influence small- scale irrigation farming in the Central Division of Garissa District.
- 2) To examine whether economic factors influence small- scale irrigation farming in the Central Division of Garissa District.
- 3) To investigate whether technical factors influence small-scale irrigation farming along Central Division of Garissa District.
- 4) To examine the extent to which physical environmental factors influence small-scale irrigation farming in Central Division of Garissa District.

## **1.5 Research Questions**

The study is guided by the following questions:

1. To what extent do social-psychological factors influence small- scale irrigation farming in Central Division Garissa District?
2. To what extent do economic factors influence small-scale irrigation farming in Central Division of Garissa District?
3. To what extent do technical factors influence small-scale irrigation farming in Central Division of Garissa District?
4. Do physical environmental factors influence small-scale irrigation farming in Central Division of Garissa District?

## **1.6 Justification of the Study**

This study will provide data on the socio-psychological, economic, technical and environmental factors at play in the small-scale irrigation farming in the Central Division of Garissa District. Therefore, the results would help both practicing and potential irrigation farmers and policy makers, planners and implementers in formulating appropriate policies and programmes, based on empirical evidence to improve on the small- scale irrigation farming situation in ASALs in Kenya in general and Central Division of Garissa District in particular.

This study would also provide useful data on the correct status of the factors influencing small-scale irrigation farming in Kenya's ASALs. The information obtained will therefore help to justify the support needed to improve the formal housing development sector in Kenya.

There appears to be limited information and knowledge about factors that influence small- scale irrigation farming in the Central Division of Garissa District among interested parties because of limited studies in this area. This study therefore contributes to the existing knowledge, information and literature about Kenya's irrigation farming development.

## **1.7 Scope of the Study**

The focus of the study is on the factors that influence small- scale irrigation farming in the Central Division of Garissa District using socio-psychological, economic, technical and physical environmental factors as the independent variables. It deals with both the positive and negative factors. This study was conducted between April and June 2012 among 120 farmers practicing irrigation farming along Tana River in the Central Division of Garissa District.

## **1.8 Limitations of the Study**

The study was limited by the time available for it given that the researcher, by the time of this study, was also in full time. The research was undertaken during the long rainy season, therefore accessing some of the farms along the Tana River may pose a challenge. However, efforts will be made to schedule interviews with farmers at convenient locations when and as need arises.

Some respondents were not forthright in their responses especially regarding income and property. Some respondents considered the research team as government agents and expected some monetary gain from the research team. Efforts were made to explain the purpose of the research as purely academic and that all the information could be held in confidence.

Finally, most of the small-scale farmers do not keep records. As such, even though they were willing to release the information asked for, recalling exact figures and dates was cumbersome. This limitation was overcome by use of case studies and focused group discussions.

## **1.9. Assumptions of the study**

- i) That the sampled population represents the general population of small-scale farmers in Central Division of Garissa District
- ii) That the respondents were truthful to themselves and gave the correct and relevant information.

## **1.10 Definition of significant Terms**

**Socio-psychological factors** Psychological and sociological factors that influence small-scale irrigation farming (Bateman & Zeithaml (1996).

**Physical environmental factors** Refers to the external atmospheric factors that may affect irrigation farming.

### **Constraints facing small- scale irrigation farming**

Issues or things that negatively affect the smooth development of small- scale irrigation farming.

### **Irrigation Farming**

Irrigation farming is cultivation of crops involving the artificial watering of land to sustain plant growth.

### **Small-scale Irrigation farming**

Is an irrigation development initiative which is undertaken by small farmers who “own and manage an individual plot or are part of a community managed irrigation scheme”

### **Infrastructure**

Social amenities like the availability of roads, transport facilities and crop storage facilities (such as cold rooms) among other factors that influence the development of small- scale irrigation farming.

## 1.11. Chapter Summary

This chapter presented the background of the study. It discussed the statement of the problem, the purpose and objectives of the study. The chapter also discussed the research questions, significance and limitations of the study. The chapter also provided the delimitations of the study before finally defining key terms used in the study.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This Chapter reviews relevant literature on small-irrigation farming, and specifically factors that influence small-scale irrigation farming. The review is done based on the thematic areas of the study such as socio-psychological, economic, technical and physical environmental factors. The chapter finally provides the theoretical framework and conceptual understanding of factors influencing small-scale irrigation by presenting a conceptual framework.

#### **2.2 Effects of Small- Scale Irrigation Farming**

Any development project involving irrigation can bring about positive or negative effects to the concerned community (Khayesi, 1997). The effects could be direct or indirect. Direct effects include improvement of farm incomes, creation of on-farm and off-farm employment opportunities, food security and improved investment. On the other hand, indirect effects include epidemics of water borne diseases, salinization and water-logging (IIMI, 1989). Otherwise, the over-riding primary benefit of irrigation farming has been thought to be the increase in agricultural production (Yusuf, 1982; Ruigu, 1987).

FAO (1984) associated irrigation projects in Yogyakarta and Bali in Indonesia with increase in area under crop production and cropping intensity. The projects had also helped in bringing farmers together and creating good understanding among farmers through farming groups/associations. Cases from South Asia and Philippines indicate that farming groups provide effective

mechanism or channels for airing grievances thus helping in resolving conflicts and improving water distribution system management.

Dixon et al. (1989) evaluated the effects caused by construction of the Tarbela Dam project in Pakistan. Among the effects they cited were, water impounding inundation of upstream areas and downstream effects of water flows. Their main concern was the physical effects of dams and reservoirs and had nothing to do with the socio-economic effects accompanying irrigation dams or irrigation schemes. They did not identify the magnitude of the effects that were noted. Further, all the effects examined by them seem to be negative. The current study attempts to fill this gap by including the positive effects of irrigation farming. Other researchers who have studied the physical effects of small scale irrigation projects include Umali (1993); World Bank (1989). They addressed such effects as salinity, water-logging and soil erosion, which in the current study are presented as problems and / or negative effects. The current study goes beyond the physical effects to include the social and economic effects not covered by the aforementioned studies.

World Bank (1990) examined the performance of the Gezira irrigation scheme in Sudan. The main benefit of the scheme is that it has led to crop diversification and intensification from the original mono-crop cotton production. However, there were negative effects that could be associated with the scheme. For instance, despite the satisfactory water distribution, agricultural production in the Gezira was rather disappointing. The average crop intensity of 60% was lower than the 75% intensity of the authorized four crop rotation. Moreover, yields of cotton and

wheat, two of the main crops were 2-3 times below the yields achieved in the research stations meaning the targeted harvest levels had not been achieved.

In Kenya, Thompson (1991), using Njoguini, Gitero and Kabati Self-Help Water Project as case studies, addressed the benefits accruing from the development of SSISs. The main thrust of his study was to use the case study analysis to illustrate some critical resources required for the sustenance of small-scale irrigation farming. Effects cited include introduction of a variety of crops (e.g. cabbages, kales, pawpaw, bananas, onions and tomatoes), and conflicts over water share by farmers. These problems (over-production of certain crops and conflicts over water) according to Goriz et al. (1995) could be solved through joint efforts by farmers and the government. The current study examines the problems facing the farmers along the Tana River and gives suggestions on the specific areas the government should address.

Ruigu et al (1984) surveyed the socio-economic effects of the Bura irrigation scheme. They established that at least 45% of the households did not have adequate incomes and were unable to meet their basic needs. This problem was attributed to middlemen who exploited the farmer and scooped a big share of the profits. Brokers' networks distort the market to benefit from rock bottom farm gate prices.

Farah *et al* (2001) carried out a socio-economic and ecological impact of SSISs on pastoralists and dry lands in Garissa, along Tana River. They found out that SSISs had diversified pastoral economy but had taken away child labour from pastoralists and at the same time reduced herding distance. They also found out that there were high drop out from irrigation farming. They were



interested on the effects of SSISs perse, but the current study examines the factors that influence SSI farming.

Makanda (1987) examined the Kibirigwi and Kangocho irrigation schemes and found that irrigation had led to increase in farm income, introduction of new crop varieties and employment opportunities. In Kangocho scheme, he noted that farmers had built 'tomato houses' from tomato sales and there was high farmer participation. A farmer could earn up to Kshs 90,000 from an acre of tomatoes (Makanda, 1987). His study was in the high potential area with good climatic conditions and soils favourable for increased agricultural production.

Khayesi (1995; 1997) used the Chemron-Marigat-Perkerra irrigation project as a case study to examine effects of small-scale projects on the household welfare. He observed that the small-scale projects in Baringo had led to the sedentarization of some pastoral communities, eventually leading to 'new' forms of employment, and diversified crop production hence increasing farm incomes. However, it should be noted that, sedentarization is not always positive because it leads to land degradation especially around watering points where animals are confined. He further noted that the Chemron irrigation project had settled 54 families while Losekan scheme had benefited 64 families. He concluded that there was a general improvement in crop production and welfare of household in terms of health, shelter, education and food.

### **2.3 The Social –psychological Factors Influencing Small -Scale Irrigation Farming**

According to Bateman and Zeithaml (1996) psychological and sociological factors operate either to encourage or discourage new venture formation. According to Yusuf (1995), Klein (2002) and

Olomi (1996), locus of control is one of the psychological factors for business formation and success. Entrepreneurs are persons who go out to change their status quo and are mainly concerned with doing business in order to better their lives or those of others. People with internal locus of control feel less able to determine their own fates. According to Bateman and Zeithaml (1996), people with an internal locus of control are more likely to become entrepreneurs. They will at all costs initiate ideas and efforts which they believe will eventually help them achieve their objectives of life. This may mean going out to look for funds in order to purchase a property such as an irrigation farming order to solve the problem of food shortage. However, those with external locus of control would resign to fate and wait for things to be done for them or opt to stay in their inadequate situations.

The need for achievement is a psychological factor important in venture formation. The concept of need achievement (N-Ach) was developed by David McClelland who argued that the high N-Ach person sets his or her own goals for example running a successful business and frequently seeks feedback about progress towards those goals (Armstrong, 2001). The high N-Ach person is more likely to become an entrepreneur than the low N-Ach person because starting a business can satisfy one's need to achieve. It is understandable that some people make efforts to own farms or engage in irrigation farming so that they can address the need for food while others own farms for cultivating crops so that they can generate income. Ominde (1988) argues that food is one of the most important basic needs which a man strives to satisfy.

Some people may also be influenced to engage in irrigation farming in order to realize self-actualization. The concept of self-actualization was developed by Abraham Maslow in his

hierarchy of needs expounded in his contact (Needs) theory. When applied to entrepreneurship, self-actualization implies that the entrepreneur is self-motivated when creating a new product (such as an irrigation farm) or organization. The act of creating is its own reward. The entrepreneur rejects many niceties (good things) of a more conventional life so that he/she can own the business. Rejecting conventional rewards may mean reducing expenditure on leisure in order to make enough savings for an irrigation farm (Armstrong, 2001; Bateman & Zeithaml, 1996; Armstrong, 2001).

Studies have shown that sociological factors influence the formation of businesses. Thompson (1981) argues that small-scale irrigation farming has substantial social benefits. It is therefore possible for the perceived benefits to influence one to own irrigation farms and/or engage in irrigation farming. Bateman and Zeithaml (1996) have indicated that social needs have precedence over economic needs and that they influence people in forming ventures. Significant evidence suggests that social status influences one to own property. As one rises in social status or social class from the low to the middle and upper levels, he/she may feel more contented in owning a farm than renting one. Similarly, higher socio-economic individuals may own irrigation farms as a way of liberating themselves from the “bondage” of hunger and dependence on relief food supplies (FAO, 1987; Odegi-Awoundo, 1990).

Family experience is another sociological factor which may encourage or discourage new venture formation such as engaging in small scale irrigation farming. If one’s size of household increases, he/she may require more food which may come by engaging in irrigation farming or purchasing a ready established irrigation farm. Some other people are engaging in small- scale

irrigation farming following the steps of their parents and/or siblings. It is argued that new entrepreneurs come from families of parents or relatives who are/were entrepreneurs and hence the rationale for family businesses. Other people may also try to own farms or engage in irrigation farming as a reaction to their families' unsatisfactory food situation during childhood and early adulthood period. Many a times we have heard people saying that they would not want their children or themselves to go through the problems they or their parents went through. In many cases, one would want to have a better food sufficiency and income situation than his/her parents (Bateman & Zeithaml, 1996).

Recently it has been argued that one's place in the family is a factor that may encourage new venture formation. For example, studies in America have indicated that sixty percent of entrepreneurs are first-born children, a higher percentage than chance alone would be expected to produce. In the African context, first-born children are normally bestowed with more responsibilities in their parents' families than other children. For example, they may be required to construct a house or acquire land for their aging parents and also educate the younger siblings.

#### **2.4 Economic factors Influencing Small- Scale Irrigation Farming**

Boserup (1965) argues that small- scale irrigation farming is a function of income. Increased income is associated with increased ability to acquire property such as a arable land or engage in farming. When more people in the general population experience increased incomes, it is more likely that they will seek for land property such as irrigation farms. The perceived permanence of the incomes resulting from profitable farming is also seen to result in more people expanding their farming activities. According to studies, individual households strive to improve their

farming as long as incomes are sustained. The reduction in the income level as a result of losses incurred in farming will have an influence in the reduction in the size of land being cultivated (Bergmann & Boussard, 1976).

Wealth is a key factor affecting small-scale irrigation farming. As more people become richer and richer, more of them will most likely invest in farm and land assets as forms of their wealth. They will hold their wealth in the form of agricultural land for hire or farms for their families' food production needs. The ownership of agricultural land properties is seen as socially desirable. The government has also gone out to promote irrigation farming through commissioning of irrigation and water projects and issuing of title deeds for land ownership (Jaetzold & Schmidt, 1983; Ruigu, 1987).

The price of land to set up an irrigation farm or existing irrigation farms is a factor which may encourage or discourage small scale irrigation farming. Higher prices beyond the means of prospective farmers or farm owners will discourage while lower prices will act to attract prospective farmers or farm owners to engage in farming. Therefore, the higher the price, the lower the demand and the lower the price, the higher the demand and the lower the price, the higher the demand but holding other factors constant.

Alila (1987) examined the economic status of Mwea irrigation scheme, which is thought to be the most efficient public scheme in Kenya. He noted that although the average income of tenants in the scheme was higher than those in the surrounding rain-fed areas, there were a substantial number of tenants within Mwea irrigation scheme whose income could not meet their basic

needs. He used income as the only variable in his examination. This is one of the many socio-economic variables that will be used in the current study.

Kiplagat (1990) undertook an economic evaluation of Perkerra irrigation scheme. He observed that the scheme had increased the farmer's income and also created employment opportunities especially during planting, weeding and harvesting. He concluded that farmers were an economic liability because they absented themselves from the scheme work. As they were busy in their own farms or other non-irrigation activities, hence reducing their participation. The situation could be different in irrigation farming along Tana River. He did not go further to consider the social variables (for instance, level of education, employment outside irrigation and gender/age) that could help explain the diverged interest outside the scheme.

A healthy economic climate that offers easy access to capital favours entrepreneurial success. Provision of credit to farmers is necessary to facilitate purchase of farm inputs to improve production of crops. The Kenya government estimated that by 1996, agriculture needed Ksh160 billion to achieve its expected growth rate, yet it only received 10% of its requirement with only 2% going to small scale farmers. The deficit in credit has greatly affected cultivation of new and traditional crops which are cultivated mostly by small- scale farmers.

Irrigation development is an expensive undertaking and a number of farmers are finding problems in securing adequate finance as initial capital to engage in irrigation farming. Credit institutions require collateral security before granting credits, and the majority of the farmers will

not have such. The financial institutions are reluctant to provide credit to many other irrigation enterprises because they are seen as unable to service their loans

The availability of credit also affects the demand for agricultural land. As the money supply and the supply of bank loans increase, a large number of applicants can secure funds. The result is a rise in the rate of business formation. Conversely, as the supply of money and loans decreases, fewer aspiring business owners can find funding. The rate of business formation then declines (Bateman & Zeithaml, 1996; Huuskonen, 1993).

The cost of transportation of farm produce from the farm to the storage or market point may influence one in deciding whether or not to engage in farming or to cultivate certain crops. Some people would want to own farms in locations where they will not be incurring very high transportation costs. Others would want to engage in irrigation farming schemes with good roads. Prospective farmers may be influenced by availability of agricultural infrastructure such as storage facilities for the perishable horticultural products (Darkoh, 1990; Peterson, 1997).

There seems to be a general view that market access is one of the critical factors that determine success of small-scale irrigation farming projects. This is an acceptable view even among professionals working in developing countries. For example, presenting results of an expert survey, Gabre-Madhin & 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 study, social scientists chose markets and favorable policy environment as the most prominent determinates of success.

In their study, Muhammad *et al.* (2004) included marketing practices among factors that have a potential to influence the level of success of small-scale irrigation farming. 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.

Hau *et al.*, (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.

Lipton (1996) among other factors identified market information as one of the reforms issues that have helped many developing countries to increase growth in farm output and employment and generally contributing to the success of Small-scale irrigation in South Africa. The current study will endeavour to find out whether availability of markets and market information for produce influence small-scale irrigation farming along the Tana River.

## **2.5 Technical factors influencing small-scale irrigation farming**

Innovation is a key component of successful irrigation farming. For millenniums, farmers have continuously domesticated, bred, and used new crops, invented new implements, changed their ways to produce crops and recombining their production factors (labor assets, capital, cash and land) in order to improve production, food security and income (Nelson and Winter, 1982).



Innovations which provide concrete economic benefits are easily adopted than those with low or no economic benefits (Geertz, 1963). Technology is a key factor influencing small-scale irrigation farming. Access to Agro-processing technology in Africa is very limited due to lack of expertise know how and affordable cost. The technological inadequacy coupled with lack of innovation results in undiversified low quality products which are not able to compete in the markets (Vanclay, 1992). These problems affect the performance of specific value chains because the quality and quantity of supply to the processors and eventually to the market or the consumer is affected (Gershon & Zilberman, 1982).

Agricultural extension services are critical to a farmer in undertaking farming. The basic information needs for a farmer are markets information, prices, weather forecast, transport facilities and information on storage. The second level of information needs is about crop diseases, and other farm inputs. In order for any new crop to be adopted by farmers effectively these information must be communicated well to the farmers to enable them to make an informed choice. Other facilities and services that may influence farming include adequacy of water, government laws on water usage and security of the farmers and their produce (Ikiara, 1986; Umali & Schwartz, 1994; World Bank, 1990; Yusuf, 1982).

De Lange (1994) identifies several issues that are important for the success of small-scale irrigators in South Africa. In this study, extension services have been shown as a very important aspect in improved small-scale irrigation management. This is mainly how the results of the agricultural research exercise reach the farmers. For some farmers, extension officers are the only contact farmers have with the government department of agriculture. In other areas,

extension officers play a role larger than just dissemination of information but assisting farmers in acquiring the factors of production including assistance in credit acquisition.

The majority of 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. In a study of IFAD funded smallholder irrigation projects in South -Africa, Manyatsi, (2004) found that the NGOs and Ministry of Agriculture and Cooperatives (agents responsible for implementing projects) had low capacity for small- scale irrigation construction. It was found that there was shortage of personnel trained at technician level in the maintenance of irrigation infrastructure and equipment). 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).

## **2.6 Physical environmental factors influencing small-scale irrigation farming**

Hogg (1984) investigated the sustainability of the Pokot irrigation furrows. He identified the problems of soil erosion, salinization and sedimentation as the major obstacles of irrigation development among the Pokot. He eventually proposed that the government should not establish new irrigation schemes, but rehabilitate the existing ones including the Pokot irrigation systems. Khayesi (1995) noted that in an attempt to solve the problems associated with irrigation furrows, the establishment and maintenance of irrigation furrows the Marakwet is based on communal spirit of mutual responsibility. This spirit of togetherness has positive impacts on irrigation development.

Brown (1992) in his examination of SSISs in Chad pointed out that the main areas where farmers had problems included water control/sharing among others. The availability or lack of water for irrigation is an important factor that will influence irrigation farming. The distance from the water source and its sustainability in water provision will determine the type of irrigation method to be used floods

Sibanda (1986) examined the ARDA irrigation schemes in Zimbabwe. He pointed out that there was insecurity of tenure as farmers were removed from the schemes due to poor performance. As a result, farmers were unwilling to invest in conservation and maintenance of waterways/furrows.

Rainfall amounts and distribution will determine the kind of farming to be undertaken whether rain-fed or irrigation farming. Its distribution and levels is critical in plant survival and as such, where rainfall fails to meet the farming demands, farmers may engage in irrigation as an alternative for food production.

## **2.7 Constraints facing Small- Scale Irrigation Farming**

Gores et.al (1995) examined the performance of irrigation schemes in Mexico. They found that the main problems experienced by farmers include, marketing, pests and lack of funds. They concluded that the government should take a leading role in solving farmer's problems if improved production was to be achieved. They established that the government had assisted farmers to come up with organizations whose responsibility is the management of these irrigation schemes and the marketing of produce from the schemes. They singled out increase in

food production as the primary benefit of government's involvement in irrigation farming. Thompson (1991) underscored the central role played by the government in solving problems faced by irrigation farmers. He identified areas where government assistance was needed as provision of technical and advisory support to farmers. According to Thompson, the efficiency of technical assistance would greatly influence the level of agricultural production.

Brown (1992) in his examination of SSISs in Chad pointed out that the main areas where farmers had problems included water control/sharing, choice of crops to be grown and marketing of produce. He reported that the farmers were able to solve these problems without involving the government because of their independence in decision making. He was therefore of the view that irrigation farming should be handled independently by farmers without involving the government. In Narayan, India, World Bank (1985) noted that when farmers are left alone to decide on major issues facing them especially the marketing of the produce, they have a greater stake in the resulting profits. The current study will attempt to find out the extent of government intervention in irrigation farming along the Tana River.

In Kenya, development initiatives in irrigation farming have failed in several places. Odegi-Awoundo (1990) showed that irrigation farming among the Turkana have brought many problems to the people. There was excessive taxation on the farm produce which led to high losses. He further found out that there was exploitation in marketing because the prices of farm produce were very low while those of farm inputs were so high.

Ruigu (1984) in his study of the Bura irrigation scheme brings out an interesting situation where the farmer is exploited by middlemen. The middlemen bought the farm produce at lower prices and ended up making huge profits by selling the same produce at high prices. This seems to be the main marketing problem in many SSISs. If the farmer had an opportunity of selling the produce directly without going through the middlemen, the returns could be substantial. The current study will be keen to establish whether such exploitation is experienced in the irrigation farming along Tana River.

In Kenya, there is poor linkage from the research-extension-farmer. Various research Institutes like KARI, Kenya Forestry Research Institute (KEFRI) and other international research institutes which deal with agriculture should be encouraged to work directly with farmers in developing and expanding new technologies. This will ensure research breakthroughs do not just remain within the institutes but is spread to farmers. These breakthroughs are recorded in journals by local regional and international organizations but have not reached the target groups. New varieties of crops like beans, cow peas and even grain amaranth have not been adopted well because their dissemination to the target group has remained low (Darkoh, 1990).

Accessing the technologies for farm use or for application by the processors is not always affordable. This is based on the fact that the taxation systems in the developing countries like Kenya are very high making the cost of the equipments very high for small holder farmer and processor. This affects the value chains in that the final products become very expensive and unable to compete in the market (Gershon & Zilberman, 1982).

For many years, income for many small-scale farmers has been inadequate because of myriad of factors but principally due to market access that restricts generation of revenue that can be used to purchase inputs like seeds and fertilizer for the next season. Potential and practicing irrigation farmers have not been able to secure sufficient funds for farming investment purposes. Lack of finance and access to adequate credit facilities discourages people from engaging in meaningful farming. Banks are reported to charge exorbitant interests and in most cases, prefer lending to the more expensive large scale farmers to the low and middle-income farmers. Other problems related to finances include poor loan servicing culture among the borrowers, high cost of managing loans, the unavailability of credit records of small scale farmers making the assessment of risks pertaining to credit lending difficult, slow and unfriendly judicial delivery system in the event of recovering unpaid loans or enforcing loan repayments (Huuskonen, 1993). Some governments of developing countries have been blamed for their wavering support towards agricultural development. The governments are blamed for failure to institute or enforce appropriate agricultural product standards /codes and by-laws. Inappropriate laws can distort and reduce the efficiency of markets, increase the cost of doing business and retard the development of a private sector such as individual farms. Cases of Kenya's horticultural products being rejected at the international markets is not a new thing. The concerned farmers suffer huge losses when this happens and some end up abandoning farming all together for other ventures or to seek for employment in urban areas (Odegi-Awoundo, 1990).

## **2.8 Theoretical Context of the Study**

The socio-psychological perspective in small-scale irrigation farming is in consonance with other theoretical approaches. The Human Relations Theory is relevant in explaining the socio-

psychological factors that influence farming. Important in this perspective is the belief that social needs have precedence over economic needs. Abraham Maslow is an important contributor to the field of human relations through his content (Needs) theory. Maslow suggested that humans have five levels of needs. The most basic needs are the physical needs for food, water and shelter. The others are the needs for safety; social needs or the needs for love, affection and acceptance as belonging to a group; need for esteem and the most advanced need is for self-actualization or self-fulfillment. People try to satisfy their lower level needs and then progress upward to the higher level needs (Armstrong, 2001).

Following on the Human Relations Theory, one may therefore be influenced to engage in irrigation farming as a way of satisfying the need for food. Ominde (1988) argues that food is the largest item of household expenditure and that it has substantial social benefits. Some people also go out to engage in farming as the demand for more food occasioned by the increase of the size of household arises. Further, others would want to own irrigation farms to gain acceptance in their reference groups especially if their friends and members of their groups also own farms. Still, others practice farming or acquire farms following in their passions and early childhood and/or adulthood ambitions while others practice farming due to their upbringing and influences of their families especially if parents owned farms or practiced farming. Those who feel that they are masters of their own fate may also own farms as a way of realizing their destiny in farm ownership. This category will not wait for others to initiate the process but will do everything at their disposal to ensure that they acquire farms of their own (Bateman and Zeithaml, 1996).

The Instrumentality Theory which states that rewards or punishment serve as the means of ensuring that people behave or act in desired ways offers a good explanation of why people engage in irrigation farming. If a person perceives ownership of a farm or engaging in farming as a reward he/she will make efforts to own one or undertake farming. Similarly, if a person perceived continued buying of food (due to failed crops after failed rains) as a punishment, he/she may want to engage in irrigation farming as a way of liberating himself/herself from food shortages (Armstrong, 2001).

The environmental perspective in small- scale irrigation farming can be explained by a number of theoretical approaches. A more contemporary approach is the Quantitative Management theory. The theory emphasizes the application of quantitative analysis to management decisions and problems. The approach helps in making of decisions by developing formal mathematical models of the problems. Examples of these quantitative methods are the statistical decision-making, linear programming, queuing theory, simulation, forecasting, inventory modeling, network modeling and break-even analysis. Many a times, people are heard saying that if they continued buying food for the family for a certain period, the total cost would be higher than the cost of cultivating your own farm and producing food. Others would forecast the value and or cost of a farm today and in the future and arrive at decisions to own farms now since it would be expensive to do so in future. This is more when we consider that the cost of land does not go down but it is always increasing. Closely related with the Quantitative management theory is the Expectancy theory developed by Porter and Lawler. The theory argues that motivation is only likely when a clearly perceived and usable relationship exists between performance and outcome and the outcome is seen as a means of satisfying needs. One will therefore be motivated to



engage in irrigation farming if he/she perceives that doing so will solve food shortage problems or even enable him to earn income from the sale of farm produce in future. The act of farming satisfies current and future needs for food and/or income generation (Armstrong, 2001; Bateman & Zeithaml, 1996).

The Systems theory is also relevant in this study. This model is based on the thesis that everything is connected with everything else and that the whole is better than the sum total. This is a new approach in social science that has become a guiding principle in the study of the interrelationships of man and environment which can be conceived as a system (Sigh & Dhillon, 1984). Thus, the focus here is basically on the functional explanation of the structure of a system as a whole rather than on the parts that constitute a system. Moreover, the model analyses the relationship within a unit that consists of components that are interlinked (Waugh, 1990).

## **2.9 Conceptual Framework**

As presented in Fig 1, below, if irrigation farming was to be seen as a system, there are elements or variables that interact to give the desired output. The elements could be independent or interdependent and act in combination. The system analysis approach when applied in irrigation farming helps in showing how man interacts with nature through irrigation farming and the probable outcome of the interaction is seen in the living standards of the people. The organizational system requires inputs which are transformed in the organization into outputs which are received by the external environment. In small- scale irrigation farming, important inputs and processes include regulations such as government irrigation rules and codes; suppliers of capital (for example bank loans), labour and raw materials; customers for example potential

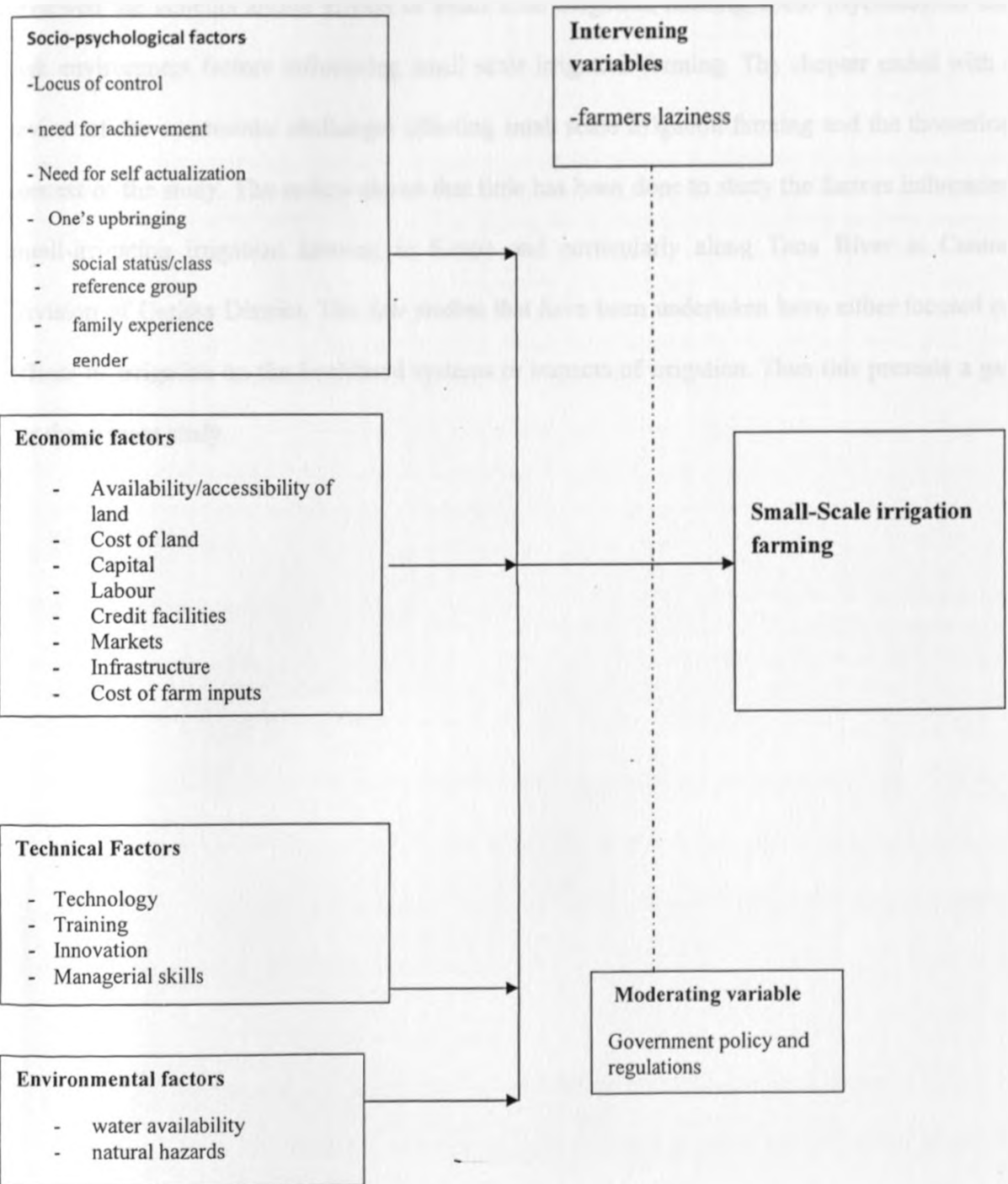
buyers of farm produce and competitors for example other potential farmers struggling for limited land and irrigation farms on sale, innovation. The physical environment like the occurrence of floods, the land terrain also play a role in irrigation farming because farmers may utilize the flood water when available while the distance and nature of terrain determines the method of irrigation to be used. All these components would influence small –scale irrigation farming in one way or another (Bateman & Zeithaml, 1996; Waugh, 1990).

Irrigation development in particular as a subsystem of the agricultural production industry cannot be complete without the improvement of communication and transport networks like roads. The government is expected to take the lead in improving the infrastructure, but the private and joint endeavours between the people and the government have been known to work. Access to and from the production sites is very crucial so as to ensure a good marketing link between the producing and consuming areas. On the other hand, communal participation is deemed necessary in small-scale irrigation farming. When this happens, farmers organize themselves into groups vested with the responsibility of maintaining irrigation furrows, acquisition of inputs, marketing of produce and other welfare issues. Therefore, key subsystems include the transportation and road network subsystem, water subsystem, security, employment subsystem and market subsystem (Darkoh, 1990; Huuskonen, 1993; Odegi-Awoundo, 1990; Perterson, 1997).

Fig. 2.1 provides a summary of the conceptual framework for studying the factors influencing small scale irrigation farming along the Tana River.

**Independent variables**

**Dependent variable**



**Figure 1: Conceptual Framework of the study**

## 2.10. Chapter Summary

This chapter mainly dealt with the review of relevant literature on the subject. The section reviewed the benefits and/or effects of small scale irrigation farming, socio-psychological and task environment factors influencing small scale irrigation farming. The chapter ended with a review of the constraints/ challenges affecting small scale irrigation farming and the theoretical context of the study. The review shows that little has been done to study the factors influencing small-irrigation irrigation farming in Kenya and particularly along Tana River in Central Division of Garissa District. The few studies that have been undertaken have either focused on effects of irrigation on the livelihood systems or impacts of irrigation. Thus this presents a gap for the present study.

## CHAPTER THREE

### RESEARCH METHODOLOGY

#### 3.1 Introduction

This chapter deals with the specific methodology of the study. It starts by stating the research design, target population. The chapter then describes the sampling procedure and the research instruments that were used in the study, including their validity and reliability. The chapter finally describes the data collection methods used and eventually explaining how data was analyzed and presented.

#### 3.2 Research Design

The study adopted a descriptive survey design. Thus the study employed both qualitative and quantitative approaches to data collection. This method is appropriate because the research intends to come up with conclusive results on the factors influencing small- scale irrigation farming. The descriptive survey research which aims at describing phenomena or narrating how various behaviors and events occur was instrumental in among others, describing the factors that influence small- scale irrigation farming. It was also crucial in narrating the challenges/problems that affect the irrigation farming sub-sector in Kenya.

The advantages of the design is that it allows variables to be measured once, needs a sample of about a hundred to a thousand for accurate estimate of variables relationship and no attempt is made to change the situations (Hopkins, 2000). However, it has disadvantages in that it may lack details or depth of the topic being investigated and one may not secure control of a high response

rate (Kalley, KATE et, al, 2003). These weaknesses were managed by having sample population that cut across geographical presentation and gender.

### **3.3 Target Population**

The population for this study consists of farmers who engage in small- scale irrigation farming along the Tana River in the Central Division of Garissa District. However, the population is defined as infinite because there are no complete lists of the farmers. The exact number of the small- scale irrigation farmers cannot be ascertained easily because the Kenya National Bureau of Statistics (KNBS) at the Kenya's Ministry of Finance and Planning does not have such data.

### **3.4 Sample size and sampling procedure**

This study did not have a sampling frame. The population of small- scale irrigation farmers in this study is defined as infinite because it does not have a straight forward and easy to locate sampling frame of all the farmers by their names. This means that there are no complete lists of all farmers for reasons already explained thus making it impossible to construct complete lists. Therefore, the sample population for small- scale irrigation farmers in this study included only those farmers who were present in their farms or homes at the location of the study at the times of interviews and excluded those who were not be available for the interviews due to various crucial commitments (such as being away) or those who declined to be interviewed.

This study utilized non-probability sampling technique. Non-probability sampling refers to the process of case selection other than random selection (Singleton, 1993). Bearing in mind that there existed no complete records of all small- scale irrigation farmers in the area of the study at the time of the study, the researcher had to use his own judgement and discretion to select the

UNIVERSITY OF NAIROBI  
J. K. NYU LIBRARY  
G. Box 30197  
NAIROBI

farmers to be studied therefore utilizing judgemental/purposive sampling. The respondents were interviewed in their convenient places and confidentiality of their responses maintained.

The unavailability of a known population size of farmers (present for the research) made it impossible for the mathematical calculation of their sample size. Again, was not possible to predict how many farmers could have been available for the study. Therefore, a predetermined number of the sample size for the units of observation (that is, the farmers) was adopted and assumed that the samples corresponded to the population of interest. The study therefore targeted to interview a minimum of 120 farmers. According to Kathuri and Pals (1993), it is generally recommended that the minimal sample size for a survey research to be 100 respondents for each major subgroup.

### **3.5 Data Collection Methods**

This study collected data from the small-scale irrigation farmers using mainly structured face-to-face individual interviews. This approach helped in the creation of rapport and ensured validity of the data collected. The unstructured interview approach was also used at the end of each interview session to allow each respondent to give any other relevant comments or additional information on the subject of the research.

An interview schedule (which is appended on this document) consisting of both fixed and open-ended type of questions was used to solicit information from farmers and agricultural officers. While this study used an interview schedule written in English, the interviews were conducted in both English and Kiswahili languages depending on which language a particular respondent understood better. The researcher is conversant with the two languages and had minimal

problems interpreting the languages. However, the main researcher recruited two research assistants who were conversant with the local language.

The Observational Technique as a primary tool of scientific inquiry for data collection was also used to supplement the survey. This study employed the simple observation technique to collect data mainly on the physical status of farms and other infrastructural facilities and services in the location of the study. The data collected through observation therefore reinforces the data from the interviews.

Secondary data was also utilized in this study. The data materials include statistical records, personal documents, Government records, books, journals and mass media communication. This category of data was gathered from the Kenya National Bureau of Statistics' library, Ministry of Agriculture, Ministry of water and irrigation, Public and private Universities libraries among others. This provided useful sources of data on agriculture in general and small- scale irrigation farming in particular in Kenya.

### **3.6 Research instruments**

According to Kathuri and Pals (1993), interview schedules are the most suitable instruments for conducting research as they enable the researcher to get information without omissions or distortion of facts. Thus, the main instrument of the research was the questionnaire that was administered on farmers and agricultural officers, who acted as key informants. However, an observation schedule was also used to particularly capture information on the physical facilities,



types of crops grown, and observable constraints among others. Focus group discussions were also used. This involved groups of 8-12 people to and ore information on some objectives.

### **3.7 Validity of the instruments**

According to Gay (1992), validity refers to the degree to which an instrument measures what is supposed to measure for particular purpose and a particular group. To ensure validity of the research instruments, all questions posed to respondents were related to the topic under investigation.

The instruments for this study were therefore validated through application of content validity, which is determined by expert judgement. Gay (1992) identified that content validity is a matter of judgement by the researcher and professionals, and has no specific formula for determination. This study therefore established validity of the instruments by seeking views of colleagues, other lecturers who were not the researcher's supervisors, as well as expert advice through discussions with researcher's supervisor, and comments from the same

### **3.8 Reliability of the instruments**

This is a measure of the degree to which a research instrument yields consistent results or data repeatedly (Mugenda, 1999). The reliability of instruments for this study was assessed using split half technique. Reliability enables researchers to estimate error, thus the greater the reliability, the smaller the error and vice versa.

Further, to ensure reliability of the responses and information of the respondents, each respondent was asked the same questions and in the same order and wording. Respondents were interviewed one at a time at places where the respondents' confidentiality of responses was secured.

### **3.9 Data Analysis Methods**

Data obtained from the open and closed-ended questions was first be coded in a code sheet and then the computer was used in organizing, interpreting and presenting the data for the purpose of analysis. In particular, the Statistical Package for Social Sciences (SPSS) technique was used to analyze the data collected from the field and the data is presented in form of frequency and percentage tables. All the analyzed data in this study have been presented thematically guided by the objectives of the study.

### **3.10 Chapter Summary**

This chapter dealt with the aspects of the research methodology used in the study. The section described the research design and the population and sampling design where the details of the population of interest, the sampling design, sampling frame, sampling technique and sample size were clearly laid down. The later parts of the chapter dealt with the data collection methods, the research procedures and data analysis methods.

Table 1 :Operationalization of variables

OBJECTIVE RESEARCH QUESTION	TYPE OF VARIABLE	INDICATOR	MEASURE	LEVEL OF SCALE	APPROACH OF ANALYSIS	TYPE OF ANALYSIS	LEVEL OF ANALYSIS
	Dependent variable: small-scale irrigation	Production levels	Degree of Success	ordinal	quantitative	Non-parametric	Descriptive – mean, median, percentages
To investigate whether socio-psychological factors influence small- scale irrigation farming in the Central Division of Garissa District	Independent variable:scocio-psychological factors	Nature of upbringing Social status Gender Reference group	Level of satisfaction	ordinal	qualitative	Non-parametric	descriptive
To examine whether economic factors influence small- scale irrigation farming in the Central Division of	Independent variable: economic factors	-farmers income - size of land - infrastructure -capital invested - labour presence/absence - cost of inputs	Level of investment	ordinal	qualitative	Non-parametric	Descriptive

Garissa District.		- credit facilities					
To investigate whether technical factors influence small-scale irrigation farming.	Independent variable: technical factors	Training Technology Innovation	Training levels Methods of irrigation used Sources of information	nominal ordinal ordinal	Quantitative	Non-parametric	Descriptive
To examine the extent to which physical environmental factors influence small-scale irrigation farming in Central Division of Garissa District.	Independent variable: physical environmental factors	Availability of water Natural hazards -	Distance from water source Nature of hazard	ordinal	quantitative	Non-parametric	descriptive

## CHAPTER FOUR

### DATA ANALYSIS, PRESENTATION AND INTERPRETATION

#### 4.1. Introduction

This chapter presents findings from the study that sought to find out the factors that influence small- scale irrigation farming along Tana River in central division of Garissa District. The findings are presented in the format of bio data (sex, age, marital status and status in the family, highest level of education attained and household size), economic factors, socio-psychological factors, technical factors, physical environmental factors and problems facing irrigation farmers. The study sampled 120 respondents to participate in the quantitative study. These respondents were from Ziwani, Daladho, California, Hatata and Bakuyu areas in central division, Garissa district. The researcher also had an interview guide for Key Informants, and an observation checklist to better understand the subject matter.

#### 4.2 Bio-data

##### 4.2.1 Sex

The study noted sex of respondents to better understand the role it plays in socio-psychological contribution to small scale irrigation farming. Table 2a presents the sex of respondents while Table 2b presents their status in the family.

**Table 2a: Sex of the respondents**

<b>Sex</b>	<b>Frequency</b>	<b>Percent</b>
Male	64	53.3
Female	56	46.7
<b>Total</b>	<b>120</b>	<b>100</b>

**Table 2b Status in the family**

<b>Status</b>	<b>Frequency</b>	<b>Percent</b>
Head of family	96	80
Wife	24	20
<b>Total</b>	<b>120</b>	<b>100</b>

Table 2a shows that 53% and 47% of the farmers interviewed during this research were male and female respectively. Table 2b goes ahead to show the status of these respondents in the family. 80% of these respondents were head of their families with only 20% being wife of household head. All these respondents mentioned that they were married. This suggests that gender plays a role in influencing one to engage in irrigation farming. Men seems to be more active in irrigation farming probably due to their position in the family or their advantage of access to property ownership and use

#### **4.2.2 Age**

The respondents were requested to mention their ages. Three of the respondents did not mention their ages. Table.3 shows the different age groups of the respondents.

**Table 3: Age of the respondents**

<b>Age (yrs)</b>	<b>Frequency</b>	<b>Percent</b>
21 - 30	25	21.4
31 - 40	18	15.3
41 - 50	29	24.8
51 - 60	14	12.0
Above 60	31	26.5
<b>Total</b>	<b>117</b>	<b>100</b>

Table 3 shows that majority of the respondents totaling 26.5% were above 60 years old. This was then followed by age group 41 – 50 years that recorded 24.8%, 21 – 30 years that recorded 21.3%, 31 – 40 years that recorded 15.3% and lastly 51 – 60 years that recorded 12%. Therefore it can be deduced that as one advance in years, there is increased responsibility to provide for the family and this is the reason why the elderly are engaging in irrigation.

#### **4.2.3 Highest level of education**

Modern farming demands some level of education. For this reason, respondents were asked the highest level of education they had attained. Table 4 shows the collated highest level of education of respondents.

**Table 4: Highest level of education attained**

<b>Level</b>	<b>Frequency</b>	<b>Percent</b>
None	77	64.2
Primary	29	24.2
Secondary	11	9.2
Adult literacy	3	2.5
<b>Total</b>	<b>120</b>	<b>100</b>

The statistics on Table 4 was worrying as 64.2% of the respondents did not go through any formal education. Another 24.2% only went through primary level of education. This shows that any training for better agricultural practices should be very elementary and user friendly to be adopted by farmers. The figures also indicate that most people engaged in irrigation farming as a last resort when they cannot get alternative sources of livelihood.

#### **4.2.4 Household size**

The respondents' households had between 3 and 19 members. The average number of members per household stood at 8.67 with 6.94 children supported by each family and 5.97 children living in the household as at the time of the interview. An average of 1.61 relatives lives in each household.

#### **4.3 Economic factors influencing small-scale irrigation farming**

The economic factors being investigated by the study included farmer's and spouse's occupation, sources of income, average monthly income, ownership of farm, agricultural development



agencies operating in the area and their nature of activities, marketing of produce and mode of transport.

#### **4.3.1 Farmer's and spouse's occupation**

All those interviewed engage in farming with another seven also engaging in other activities 6 engaging in casual labour and 1 being in formal employment. The spouses were also majorly farmers, forming 31.7%. Other spouses engaged in formal employment 6.7%, business 5.8%, casual labour 2.5%, and just being housewife 53.3%. This indicates that where spouses worked together on the farm or had alternative sources of income, farming expansion would be possible through re-investment.

The major source of income for farmers was small- scale farming that accounted for 70.6% of the total number of respondents. This was then followed by formal employment at 14.3%, business at 11.1% and wages from casual labour at 4%. Spouses received income from sale of property 47.3%, small scale farming 19.2%, business 16.2% and formal employment 5.4%.

The respondents earn amounts of between Ksh 500 and 20,000 a month with an average income per household calculated at Ksh 4,128.70. Out of this, it is calculated from the data collected that a household saves Ksh 975 towards small- scale farming. Spouses earn an average of Ksh 3,380 per month and save Ksh 524 per month towards small scale farming. It is therefore estimated that averagely a household earns Ksh 7,508.70 per month and save Ksh 1,499 per month toward small scale farming.

### 4.3.2 Land ownership

When respondents were asked if they owned the land on which they farm, a total of 45 37.5% said yes while the rest 62.5% said no. Those who said no mentioned that they were either squatters or tenants. The respondents own farms of up to 7 acres. The average ownership per household was calculated at 1.69 acres. Even though only 37.5% of the respondents own the land on which they cultivate, the tenants and squatters also mentioned the year when they started using the land as shown in Table 5.

**Table 5: Year when land was acquired**

Year	Frequency	Percent
Up to 1970	14	11.7
1971 - 1980	9	7.5
1981 - 1990	13	10.8
1991 - 2000	7	5.8
2001-2010	66	55.0
2011-date	11	9.2
<b>Total</b>	<b>120</b>	<b>100</b>

From Figure 5, most of the farms were acquired between 2001 and 2010 this also coincides with the period in which respondents indicated to have experienced serious droughts. A look at acquisition trend also tells us that more people acquired their land before the 70s and in the 80s. According to the findings, land for irrigation is acquired as per the needs of the farmers. The average cost of an acre of land then, was calculated at Ksh 400. Respondents were also asked to name sources of finance to own and practice irrigation farming. Their collated response is in

Table 6. The frequencies under 'to own farm' are single response while the frequencies under 'to practice farming' are multiple response.

**Table 6: Sources of finance to own and to practice irrigation farming**

Source	To own farm		To practice farming	
	Frequency	Percent	Frequency	Percent
Family land	18	30	6	4.2
Wages from casual labour	12	20	40	28.2
Sale of farm produce	6	10	35	24.6
Business	14	23.3	35	24.6
Formal employment	6	10	11	7.7
Family/group contribution	3	5	9	6.3
Borrowing from friends	1	1.7	6	4.2
<b>Total</b>	<b>60</b>	<b>100</b>	<b>142</b>	<b>100</b>

As shown in Table 6, the main source of funding for owning land or irrigation is the family as reported by majority respondents (30%). This further shows that when the family owns land, people may engage in irrigation because land as a resource that needs to be utilized is available. On the other hand, 23.3% of the farmers used money from business to secure farm land, 20% used wages from casual labour to secure land. Others got finances to secure land from sale of farm produce, formal employment, family/group contribution and from borrowing from friends. There was however a slight change when it came to source of money to practice farming: A total of 28.2% used money from wages from casual employment, 24.6% from sale of farm produce

and business each, 7.7% from formal employment, 6.3% from family/group contribution and 4.2% from friends.

The existence of other sources of income apart from irrigation farming for instance shop keeping, charcoal burning and casual/manual labour is not special to farming along Tana river. Khayesi (1997) noted that farmers in the Marigat scheme engaged in other forms of employment apart from the main, that is, irrigation farming in order to supplement their income.

Table 7 provides a list of decision makers on the need to acquire family land. It shows that this decision is majorly made by the family (husband and wife) 36% or self who happens to be the head of household 40% and husband (12.4%).

**Table 7: Decision on the need to acquire family land**

<b>Decision maker</b>	<b>Frequency</b>	<b>Percent</b>
Self	42	40
Family	44	36.2
Husband	13	12.4
Friends/ neighbours	6	5.7
<b>Total</b>	<b>105</b>	<b>100</b>

As shown in 7, about 40% of the respondents made their own decisions on land acquisition while 36% of respondents indicated that the family plays a crucial role on decision making pertaining to acquisition of land for irrigation and subsequent engagement in irrigation farming. Other

farmers made independent decisions to engage in irrigation farming while others depended on their spouses or were influenced by friends who were already engaging in irrigation farming.

According to our findings, 59.2% of the respondents opined that nature and level of income of household influences the ownership and cultivation of an irrigation farm. The reasons for this opinion included; desire to provide food security to the family 43.3%, desire to eradicate poverty 20.8%, brought up in a farming family 5% and influenced by friends who were farmers 2.5%.

A total of 43.9% of the respondents opined that national economy has a role in influencing the engagement in irrigation farming. The general performance of the national economy is deemed to have a trickle-down effect to affect the grass root farming situations. In fact, 98.3% of the respondents mentioned that the government should intervene in irrigation farming in Garissa. There were another 81.2% of the respondents who mentioned that own/spouse's occupation does also encourage engagement in irrigation farming. The reasons advanced for own/spouse's occupation's encouragement to engagement in irrigation farming included; farming is my occupation 48.2%, the activity complements provision of basic needs at household level 35.3%, there is ready market for farm produce 7.1%, always create time to do farming 3.5%, spouse helps with some farm activities 3.5% and the desire to engage in commercial farming 2.4%.

Respondents mentioned several factors that they believed influenced performance of small- scale irrigation farming. Their views were collated as presented on table 8, where inadequate finance accounted for 16.2%, lack of information (15.2%), access to Tana River (14%), use of poor farming methods (11%) and use of poor farming methods (11%). Others included; access to

Tana River, vast farming land, Poverty eradication, Existence of market demand, increased family needs, convenient mode of transport and poor attitude.

**Table 8: Factors influencing performance of small -scale irrigation farming in Garissa.**

<b>Factors</b>	<b>Frequency</b>	<b>Percent</b>
Lack of adequate finance	34	16.2
Lack of information	32	15.2
Access to R. Tana	30	14.3
Hunger	23	11.0
Use of poor farming methods	23	11.0
Vast farming land	21	10.0
Poverty eradication	12	5.7
Existence of market demand	12	5.7
Increased family needs	9	4.3
Convenient mode of transport	8	3.8
Poor attitude	6	2.9
<b>Total</b>	<b>210</b>	<b>100.0</b>

During data collection, respondents were asked to accept/reject factors that they believed influenced them in the process of owning land or undertaking irrigation farming. As shown in table 9, the major reasons mentioned to have influenced owning land or undertaking irrigation farming were; availability of adequate water for irrigation 98.3%, existence of personal needs,

availability of land for establishment of irrigation farm, availability of finances and existence of suppliers among others. Apart from these, 73.3% of the respondents said that one's economic status influences him/her to own an irrigation farm and/ or to engage in farming.

**Table 9: Influencers to owning land or undertaking irrigation farming**

<b>Factor</b>	<b>Frequency</b>	<b>Percent</b>
Availability of adequate water for irrigation	118	98.3
Personal needs	112	93.3
land for establishment of the irrigation farm	100	83.3
Finances	92	76.7
Suppliers	75	62.5
Educational facilities and services	74	61.7
Transport and communication network	68	56.7
Credit and/or mortgage facility	66	55
Innovation	63	52.5
Technology	62	51.7
Customers	45	37.5
Regulators	39	32.5
Competitors	17	14.2
<b>Total</b>	<b>931</b>	<b>100</b>

#### **4.3.3 Existence of agricultural development agencies**

Crop farming, let alone irrigation farming is a new concept in Garissa. To help internalize the concept, several NGOs and government institutions were in the areas of research for technical and financial support to ensure the project is a success. The organizations that were mentioned by the respondents to be operating in the area include; KEFRI, KARI, Farmers Training Centre (FTC) and Ministry of Agriculture. A total of 52 (43.3%) of the respondents had received assistance from these agricultural agencies for development. The assistance came in form of farm inputs and technical support. Those who had not received assistance from these agricultural agencies for development blamed it on lack of information on the existence of the organizations and believe the organizations are discriminative.

#### **4.3.4 Marketing of produce**

Results show that 87% of the farmers interviewed market their produce individually. Another 10.4% market as a group while 2.6% use middlemen. Garissa open market is the main market for the produce as reported by 75.2% of the farmers and Mororo (24.8%). However, to a great extent, farming is undertaken for subsistence purposes.

The mode of transport include: human labour (55.8%), Cart (22.5%), bicycle 20 (16.7%) and vehicle (5%). Human labour, cart and bicycle are preferred because they are affordable, available and easy to use. A vehicle was preferred because it carries bulky goods and is more reliable. Further, the choice of mode of transport could be due too the poor road networks in the study area.



#### **4.4 Socio-psychological factors**

This section covered the influence of farming situation in early years to current owning of irrigation land or engaging in irrigation farming and influence of parents'/friends' activities in owning a farm or engaging in irrigation farming.

##### **4.4.1 Influence of farming situation in early years to current owning of irrigation land or engaging in irrigation farming**

The early practices can influence one's behavior. This study asked respondents if parent's farming situation in the respondent's early life influenced their owning an irrigation farm or engaging in irrigation farming. Majority (82.5%) of the respondents said yes. Influence from friends contributed to 36.7% of the total number of respondents. Reasons for influence are listed in Table 10. The reasons included; Need to follow on parent's footsteps( 39%), to improve livelihood (37.7%), need to feed the family (13%), source of income (9.1%) and own decision without influence of earlier behavior.

From the findings, it can be seen that the parent's family situation strongly influences engagement in irrigation, either because of the need to continue the farming legacy or endeavouring to change the parent's poor situation by ensuring food sufficiency or meeting the financial and other family needs.

**Table 10: Influence of parents' farming situation in early years on current owning of irrigation land or engaging in irrigation farming.**

<b>Reason</b>	<b>Frequency</b>	<b>Percent</b>
Wanted to follow parents' legacy	30	39.0
To improve livelihood/living standards of family	29	37.7
Need to feed the family	10	13
Source of income	7	9.1
Own decision	1	1.3
<b>Total</b>	<b>77</b>	<b>100.0</b>

Besides cultural or family influence, there were other ambitions that drove respondents to own land or engage in irrigation farming. These ambitions included; desire for stable family, working towards food security, improving income, engaging in agriculture related business and ability to have descent shelter. A total of 56.7% of the respondents felt that owning an irrigation farm/engaging in irrigation farming has given them personal fulfillment. A total of 59.2% of the respondents have had their economic status improved as a result of irrigation farming. The responses seem to follow Maslow's hierarchy of needs, where one would want to meet the most basic needs first.

#### **4.5 Technical factors influencing owning irrigation land and engaging in irrigation farming.**

In considering the technical factors, the researcher asked questions about use of fertilizer, membership of farmers' organization, related training attended, sources of agricultural training and use of extension services.

##### **4.5.1 Use of farm inputs**

Respondents were asked if they use farm inputs like fertilizers, herbicides and/or pesticides. Only 17.5% of the respondents were using these inputs. The reasons given for using farm inputs include; eliminating pests and diseases, to improve fertility of soil and increase food production, to protect crops from pests and diseases and to help crops grow faster. Those who do not use these inputs had reasons ranging from lack of money to buy inputs, lack of relevant training and that the inputs are not easily available.

##### **4.5.2 Membership to a farmers' organization**

A total of 8.3% of the respondents belonged to a farmers' organization. The organizations they belonged to were NAAM and BAKUYU. A total of 90% of farmers who belonged to a farmers' organization were registered with NAAM. These are groups operating as self help groups that fall short of cooperative societies.

##### **4.5.3 Access to agricultural training**

Of all respondents/farmers interviewed, only 16.7% had attended a course pertaining to irrigation at Farmers training Centre, Garissa. This training was carried out at FTC in 2010 and 2012. Majority of the farmers who had not received training in irrigation farming attributed it to lack of training time, information, illiteracy of farmers and lack of funds to finance the training.

However, it should be noted that the land ownership status i.e. tenants and squatters, would not be willing to invest time and financial resources on training pertaining to long term farming practices because they see themselves as temporary on the farm. Thus the driving force is to maximize production within a short time without minding on long term practices like prevention of soil erosion among others.

**Table 11: Sources of irrigation information**

<b>Source</b>	<b>Frequency</b>	<b>Percent</b>
Chief's baraza	52	32.5
Trial and error	39	24.4
Neighbour	28	17.5
FTC	16	10.0
Agricultural officers	15	9.4
Radio	10	6.3
<b>Total</b>	<b>160</b>	<b>100.0</b>

As shown in Table 11, the major source of irrigation information in the study area is Chief's baraza accounting for 32.5%, neighbours 17.5%, FTC 10%, agricultural officers 9.4% and radio 6.3%. The reasons for the source of information are to a large extent influenced by farmer's level of education. As indicated earlier, 64.2% of respondents have had no formal education, hence the use of basic mode of information gathering. Use of alternative sources of information like trial and error comes as a result of inadequate/laxity of Agricultural Extension personnel and farmer's

negative attitude towards the officers and eventually may be reluctant to attend agricultural seminars and trainings.

Irrigation methods used by farmers are basic and to some extent traditional and included furrow/drainage 33.3%, bucket 23.3%, floods/rain water 15.8%, and sprinkle 2.5%. The methods used were subject to availability of water, affordability and ease of use and existence of others using similar method

#### **4.5.4 Access to extension services**

Few farmers had access to extension services as only four farmers had one visit every week, and another eight were visited two times in one year. These visits were for supervision and education on good farming practices. Thus, farmers through experience have developed practical knowledge as far as farming activities are concerned.

As noted by Milkan and Hapgood (1967), although small-scale farmers are aware of the possibilities for increasing crop yields, the quest for security in domestic food requirements is often their basic concern. Hence farmers may be reluctant to adopt an innovation (new methods advocated by the officers) if it requires deviating from the long established production methods or involves cash outlay.

#### **4.6 Physical environmental factors**

The physical environmental factors touched on issues relating to sources of water for irrigation, presence of drought and presence of floods.

#### 4.6.1 Sources of water for irrigation

Results indicate that a large portion (94.2%) of the respondents use River Tana for irrigating their farms. Only 1 respondent uses a well to irrigate his farm while the rest uses rain water/floods to irrigate their farms. Respondents also mentioned the distance from farm to water source as a factor to influencing irrigation. The distances were collated and are presented in table 12. The study revealed that 30% of the respondents had their farms by the river side, 58 48% had a distance of between 100 and 500 metres from the river, 12% were between 600 metres and 1 km from the river and 10% had a distance of above 1 km from the river.

Long distances from water sources are worrying bearing in mind that the area is synonymous with drought. Water sufficiency is also a problem as only 53.3% of the respondents sufficiently access the river water. The years when the area experienced high level drought were given by respondents as 2011, 2010 and 2007.

**Table 12: Distance of farm from water source**

<b>Distance</b>	<b>Frequency</b>	<b>Percent</b>
Next to the river	36	30.0
100 - 500 metres	58	48.4
600m - 1 km	14	11.7
1.5 km	6	5.0
2 km	6	5.0
<b>Total</b>	<b>120</b>	<b>100.0</b>

#### **4.6.2 Existence of drought and floods**

Even though the area experiences long drought spells, there were a few times when they experience floods. When this happens, 25% of the respondents take the opportunity to use the water to irrigate their farms. The rest did not use flood water because they were comfortable with access to river water or did not have the facilities/knowledge to help them irrigate their farms using flood water.

#### **4.7. Constraints facing irrigation farmers**

This sub section looks at the problems facing irrigation farmers along Tana River and suggestions for solving existing problems.

##### **4.7.1a Constraints facing irrigation farmers along Tana river**

When respondents were asked to state the problems that they face as irrigation farmers along Tana River, several issues were brought to light as shown in Table 13. The problems that farmers mentioned included; Lack of relevant information (27.4%), Lack of modern technology, equipment, facilities (26.9%), Limited finances (16.1%), Presence of pests and diseases (10.8%) and Presence of wild animals (7.5%) among others. All these individually or in combination hinder improved production.

**Table 13: Constraints facing irrigation farmers along Tana River**

<b>Problems</b>	<b>Frequency</b>	<b>Percent</b>
Lack of relevant information	51	27.4
Lack of modern technology - equipment, facilities	50	26.9
Limited finances	30	16.1
Presence of pests and diseases	20	10.8
Presence of wild animals	14	7.5
Drought	9	4.8
Dangerous plant - Mathenge	6	3.2
Floods	3	1.6
Lack of adequate/variety of seeds	3	1.6
<b>Total</b>	<b>186</b>	<b>100</b>

#### **4.7.1b Other related problems**

The researcher made a list of perceived problems/challenges that respondents reacted to. The responses are presented in table 14.



**Table 14 Challenges affecting to irrigation farming**

<b>Statement</b>	<b>Frequency</b>	<b>Percent</b>
Crop diseases and pests	120	100
Lack of funds/ loan facility	116	96.7
Inefficiency of technical assistance	110	91.7
Water borne diseases	109	90.8
Soil erosion	106	88.3
Low dissemination of innovations to the target farmers	105	87.5
Unaffordable and inaccessible appropriate farm technologies	102	85
Water logging	100	83.3
Transportation problems	87	72.5
inappropriate laws	76	63.3
Water pollution	69	57.5
Storage of produce	64	53.3
Water shortage	58	48.3
Salinization and sedimentation	54	45
Exploitation by middlemen who distort marketing of produce	33	27.5
<b>Total</b>	<b>372</b>	<b>100</b>

From table 14, the major problems facing Small-scale irrigation farmers in the study area include: crop diseases and pests (100%), lack of funds/ loan facility (96.7%), Inefficiency of technical assistance (91.7%), water born diseases (90.8%), soil erosion (88.3%), low

dissemination of innovations to the target farmers (87.5%), unaffordable and inaccessible appropriate farm technologies (85%) and water logging (83.3%) among others.

#### 4.7.2 Suggested solutions

Respondents also suggested solutions to existing problems. Their recommendations were put together as shown in Table 15. Among the solutions were; training of farmers through seminars etc (38.7%), provision of financial support (16.7%), enhancement of extension services (11.9%), provision of irrigation facilities (10.1%) among others.

**Table 15: Suggestions towards solving existing problems**

<b>Suggestions to solve problems</b>	<b>Frequency</b>	<b>Percent</b>
Training of farmers through seminars etc	65	38.7
Provide financial support	28	16.7
Enhance extension services	20	11.9
Provide irrigation facilities	17	10.1
Use pesticides	11	6.5
KWS to restrict the wild animals	8	4.8
Use of pipes to supply water to the farms	5	3.0
Build water reservoirs	4	2.4
Provide farm inputs	4	2.4
Uprooting mathenge plant	3	1.8
Have measures to safeguard against floods/drought	3	1.8
<b>Total</b>	<b>168</b>	<b>100</b>

## CHAPTER FIVE

### SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 Introduction

This chapter summarizes findings of the study that set out to understand the factors that influence small scale irrigation farming along Tana River in central division of Garissa District. This is then followed by conclusions and the recommendations.

#### 5.2 Summary and Discussion of findings.

The study was carried out under the following objectives: To investigate whether socio-psychological factors influence small -scale irrigation farming in the Central Division of Garissa District; To examine whether task economic factors influence small- scale irrigation farming in the Central Division of Garissa District; To investigate whether technical factors influence small-scale irrigation farming along Central Division of Garissa District and lastly to examine the extent to which environmental factors influence small scale irrigation farming in Central Division of Garissa District

##### 5.2.1 Influence of socio-psychological factors on small- scale irrigation farming in the Central Division of Garissa District

The study found out that parent's farming situation in one's early life influences one's ownership of an irrigation farm or engagement in irrigation farming as was confirmed by 82.5% of the respondents. Influence from friends was also a contributor to one's desire to own farming land or engagement in irrigation farming. The need to follow on parent's footsteps and to improve livelihood featured prominently.

Gender, age, and the need to change family's prior poor family experience in terms of income and food insecurity were also found to be determinants of initiating, operating and success of small-scale irrigation farming along the Tana River in Garissa District.

Farmers also engage in irrigation farming to derive personal fulfillment because of owning land and/or engaging in irrigation farming.

### **5.2.2 Influence of economic factors on small- scale irrigation farming in the Central Division of Garissa District**

All respondents and most spouses engaged in farming and few doubling with casual labour and formal employment. As a result, the major source of income was small- scale farming and a few receiving income from formal employment, business and wages from casual labour. Average earning per household (for respondent and spouse) was Ksh 7,508.70 per month. Out of this, they averagely saved Ksh 1,499 per month toward small- scale farming.

Only 37.5% of the respondents owned land on which they do irrigation farming. The rest were either tenants or squatters. Each household owns an average of 1.69 acres of irrigation farming land. Much of land acquisition took place between 2001 and 2010. Even though majority (30%) own family land, 23.3% of the people who bought farming land used money from business, wages from casual labour and formal employment to secure land. There was however a slight change when it came to source of money to practice farming with 28.2% using money from wages from casual employment, 24.6% from sale of farm produce and business each.

Respondents also opined that nature and level of income of household influences the ownership and cultivation of an irrigation farm because there was desire to provide food security to the family, desire to eradicate poverty and being brought up in a farming family.

National economy has a role in influencing the engagement in irrigation farming. In fact 98.3% of the respondents mentioned that the government should intervene in irrigation farming in Garissa. Lack of adequate finance, lack of information, hunger and use of poor farming methods negatively influenced performance of small- scale irrigation farming. The positive influence included access to River Tana, vast farming land, Poverty eradication, Existence of market demand, increased family needs and convenient mode of transport.

Availability of adequate water for irrigation 98.3%, existence of personal needs, availability of land for establishment of irrigation farm, availability of finances and existence of suppliers were the major factors that influenced owning land or undertaking irrigation farming. Apart from these, 73.3% of the respondents said that one's economic status influenced ownership of an irrigation farm and/ or engagement in farming.

Several organizations and government departments like KEFRI, KAPP, KARI, FTC and Ministry of Agriculture offer agricultural technical assistance and provision of farm inputs to the locals. There was however very weak marketing for produce with most farmers opting to go it alone.

Transportation was a problem as most farmers relied on human labour, carts and bicycles as they were viewed to be affordable, available and easy to use.

### **5.2.3 Influence of Technical factors on small -scale irrigation farming along Central Division of Garissa District**

Few farmers (17.5%) use farm inputs to eliminate pests and diseases, improve fertility of soil, increase food production, and protect crops from pests and diseases and to help crops grow faster. Those who do not use these inputs do so because of lack of money to buy inputs, lack of relevant training and that the inputs are not easily available.

There was very low (10%) membership to farmers' organization. Farmers only belonged to two organizations; NAAM and BAKUYU.

Most (83.3%) of the farmers had not received any training on irrigation farming attributing it to lack of training time and place information, illiteracy of farmers and lack of funds to finance the training. The major sources of irrigation information were Chief's baraza, neighbours, FTC, agricultural officers and radio. Irrigation methods used included furrow/drainage, bucket, floods/rain water and sprinkle. The methods used were subject to availability of water, affordability and ease of use and existence of others using similar methods. Few farmers had access to extension services.

### **5.2.4 Influence of physical environmental factors on small scale irrigation farming in Central Division of Garissa District**

Almost all respondents use River Tana to irrigate their farms. Around a third of the respondents had their farms by the river side, while another half had their farms at a distance of between 100 and 500 metres from the river.

Even though the area experiences long drought spells, there were a few times when they would experience floods. When this happens, 25% of the respondents would take the opportunity to use the water to irrigate their farms.

### **5.3 Conclusions**

In Kenya, food shortage has been greatly experienced in the ASALs, especially in Eastern and North Eastern Provinces. A part from increasing population and generally poor climatic conditions prevalent in the ASALs, drought is seen as the main cause of food deficits in these areas (Shisanya, 1996:2).

In this study, the influence of socio-psychological factors on small- scale irrigation farming like parent's farming situation in one's early life, influence from friends, improving livelihood and personal fulfillment derives a person's ambition to ownership of an irrigation farm or engagement in irrigation farming.

Farming is highly being adopted in Central division of Garissa district with each household cultivating an average of 1.69 acres. A lot of household income was therefore from small- scale farming. Money to practice farming was mostly from wage from casual employment. The respondents believed that the national economy had a role in influencing the engagement in irrigation farming and as such need government intervention.

Several organizations and government departments like KEFRI, KARI, FTC and Ministry of agriculture offer agricultural technical assistance and provision of farm inputs to the locals even though there was very little use of farm inputs like fertilizers, pesticides etc, very low

membership to farmers' organization and very little training/information on irrigation farming. Most of the farmers use River Tana to irrigate their farms as majority have their farms around the river bank.

The main challenges facing farming in the study area include lack of capital to finance farming, lack of or inadequate technical skills for farming due to inadequate assistance from agricultural officers among others

## **5.4 Recommendations of the study**

### **5.4.1 For local institutions and Policy makers**

Based on the findings from the study, the researcher recommends that in order to improve irrigation farming in Central Division of Garissa District, the following needs to be done.

1. The organizations/institutions overseeing implementation of irrigation agriculture at the area of study needs to capitalize on existing positive socio-psychological factors to enhance small- scale irrigation farming. In particular, the youth should be targeted and encouraged to engage in irrigation farming because findings of this study showed that those in farming are the elderly people.
2. Irrigation farming, having been an infant in the Division, a lot of technical, equipment and other inputs assistance still needs to be advanced to the Division to make the locals realize that irrigation farming can work in their area. Provision of loans/funds to the farmers will enable them to expand their production.
3. Formation of farmer's Cooperative Societies should be encouraged through which farmers can purchase inputs and market their produce.



4. A lot of training and information sharing needs to be assured by implementing organizations as well as government institutions.
5. Ensure systems that can allow for irrigation for as far as 2 km from the river as some of the farms were that far from the river. Farmers should therefore be assisted through provision of water pumps and ensuring that they have increased access to water sources. This will help them irrigate distant plots away from the river with ease, hence boosting the general crop production and turning the ASAL regions into food granaries. As of now, most farmers use furrow irrigation which is not only expensive, but limited in coverage.

#### **5.4.2 Recommendations for further Research**

Research should be done on the effects that have accrued from small-scale irrigation farming along the Tana River. Further, there is need for studies to be done to ascertain the problems facing farmers in along the Tana River and other basins.

## REFERENCES

- Adams, W. M. (September, 1992). *Turnover. Disengagement and Capture: Indigenous irrigation and Development in Africa*. Unpublished Paper presented at ASAUK Conference, University of Stirling.
- Alila, P.O. (1987). *Grassroots participation in small-scale and large-scale irrigation Agriculture: - The Kenyan experience in Ruigu, G. M. and Rukuni, M. (eds.) Irrigation Policy in Kenya and Zimbabwe*. Nairobi. PP. 65-84.
- Aron, I. (1992). *Agriculture in Dry lands: Principles and practice*. London: Elsevier.
- Armstrong, M. (2001). *A handbook of Human Resource Management Practice (8<sup>th</sup> Edition)*. London: Kogan Ltd.
- Barrow, C. (1987). *Water Resources and Agricultural Development in the Tropics*. Longman: Hailow.
- Bateman, T. S., & Zeithaml, C. P. (1996). *Management: Function and Strategy (2<sup>nd</sup> edition)*. Texas: Irwin Publishers.
- Bergmann, H., & Boussard, J. M. (1976). *Guide to Economic Evaluation of Irrigation Projects*. Paris: Organization for Economic Co-operation and Development.
- Boserup, E. (1965). *The conditions of Agricultural Growth: The Economics of Agrarian Change Under Population Pressure*. Chicago: Aldine Publishing Company.
- Brown, E. P., & Nooter, R. (1992). *Successful Small-scale irrigation in the Sahel*. Washington D.C: World Bank.
- Central Bureau of Statistics. (1996). Kenya Population Census 1989: Analytical Report Projections. Nairobi: Ministry of Planning and National Development.

- Conklin, J. E. (1995). *Criminology (5<sup>th</sup> Ed.)*. London: Allyn and Bacon.
- Cooper, D. R., & Schindler, P.S. (2000). *Business Research Methods*. Boston: McGraw-Hill Irwin.
- Darkoh, M.B.K. (1990). *Towards Sustainable Development of Kenyan ASALS: Public Lecture I* conducted from Kenyatta University, Nairobi.
- Dixon, J. A., Talbot, L.M., & dLe Moigne, O. (1989) *Dams and the Environment: Consideration in World Bank Project*. Washington D.C: World Bank.
- Farah, K.O., Nyariki, D.M., Noor, A.A., Ngugi, R.K., & Musimba, N.K. (2001). *The Socio-economic and Ecological Impact of Small-Scale Irrigation Schemes on Pastoralists and Dry lands in Northern Kenya*. Nairobi: University of Nairobi.
- FAO. (1987). *The struggle for food Security*. Rome: FAO
- FAO. (1984). Participatory Experiences in Irrigation Water Management: Proceedings of Expert consultation on Irrigation Water Management in Yogyakarta and Bali, Indonesia (16-22). Rome: FAO.
- Finkel, M., & Darkoh, M.B.K. (1991). Sustaining the Arid and Semi-Arid (ASAL) Environment in Kenya through improved pastoralism and Agriculture. *Journal of E.A Research and Development*. 21(1-20).
- Gabre-Madhin, E.Z., & Haggblade, S. (September, 2001). *Successes in African Agriculture: Results 16 of an Expert survey*. Washington D.C: IFPRI.
- Gay, L.R (1992). *Educational Research: Competencies for Analysis as application*, (3<sup>rd</sup> edition.). Columbus: Merrils.
- Geertz, C. (1963). *Agricultural Innovation*. Berkeley: University of California Press.

- Gershon, F., Just, E., & R, Zilberman, D. (1982). *Adoption of Agricultural Innovations in Developing Countries*. Washington D.C:World Bank.
- Gorris, C. M., Subramaniap., & Simas, J. (1995). *Irrigation Management Transfer in Mexico: Process and Progress*. World Bank Technical Paper (292)., Washington D.C.: World Bank.
- Hardoy, J. E., & Satterthwaite, D. (1981). *Shelter: Need and Response. Housing, Land and Settlement Policies in Seventeen Third World Nations*. New York: John Wiley and Sons.
- Hau, A.M., & Von Oppen, M. (2002). Market Access and Agricultural Productivity in Doi Inthanon Villages. International Symposium: Sustaining Food Security and Managing Natural Resources in Southeast Asia - Challenges for the 21st Century January 8-11, 2002 at Chiang Mai, Thailand
- Helland, J. (1987). *Turkana Briefing Notes*. Chr\_Michelsen Institute: Development Research and Action Programme.
- Hogg, R. (1984). Pokot Traditional Irrigation and its Future Development (A Report on Traditional Irrigation in West Pokot District).
- Hopkins, Will. G. (2000). *Quantitative research designs*: John More University.
- Hugel, B. (1999). *Starting Your Own Business- Scholastic Choices*. 14 (5).
- Huuskonen, V. (1993). *The Process of Becoming an Entrepreneur: A Theoretical Framework of Factors Influencing Entrepreneurs' Start-up Decisions (preliminary results)* in Kladt, H. (1993) (eds). *Entrepreneurship and Business Development*. Avebury.
- Ikiara, O. K. (1986). *Small-Scale Rice Irrigation Projects in Kenya*.( Ruigu, O. M. & Rukuni, M. (eds.). *Irrigation Policy in Kenya and Zimbabwe, Papers of Joint Seminar Nairobi 27-28th Nov. 1986, Nairobi*.

- IIMI, (1989). *Managing Irrigation in the 1990s: A brief Guideline to the strategy of the International Irrigation Management Institute*. Colombo: IIMI,
- Jaetzold, R., & Schmidt, H. (eds.) (1983). *Farm management Handbook of Kenya, Vol. II/C East Kenya: Natural Conditions and Farm Management Information*. Nairobi: Ministry of Agriculture/OAT NB and GTZ Eschbom.
- Kate Kelly, et al. (2003). *Good practice in the conduct and reporting of Survey research*. West Sussex. UK :Worthing & Southlands hospital. NHS. Worthing.
- Kathuri, N. J & Pals, D. A. (1993). *Introduction to Educational Research.*, Nakuru: Education Media Centre, Egerton University.
- Kenya, Republic of. (2009). *Garissa District Development Plan, Kenya Vision 2030, Ministry of Planning and National Development and the Economic and the Economic and Social Council*. Nairobi: Government Printers
- Kenya, Republic of. (2007). *Kenya Vision 2030, Ministry of Planning and National Development and the Economic and the Economic and Social Council*. Nairobi: Government Printers.
- Kenya, Republic of. (1997). *National Development Plan 1997-2001*. Nairobi: Government Printer.
- Kenya, Republic of. (1994). *Sessional Paper No. 1 of 1994 on Recovery and Sustainable Development to the Year 2010*. Nairobi: Government Printers.
- Kenya, Republic of. (1989). *Kenya Population Census. 1989 Vol. 1*, Nairobi: C.B.S.
- Khayesi, M (1997). *Impacts of Intervention in Beekeeping and Irrigation on ousehold Welfare in the Kerio-valley Development Basin. Kenya.*, Research Project Report submitted to the Organisation of Social Science Research in Eastern and Southern Africa (OSSREA), Addis Ababa, Ethiopia.

- Khayesi, M.(1995). *Development interventions in the Kerio River Basin: Observations and Emerging Research Issues*, Paper presented at the Bureau of Education Research staff Seminar, Kenyatta University.
- Kiplagat, H.K.(1990). *An Economic Evaluation of Perkerra Irrigation Scheme in Baringo District*, Paper Submitted for B.Ed. Arts, Kenyatta University.
- Klein, K.E. (2002). *Measuring Entrepreneurial Aptitude*. *Business Week* (online). 1/28/2002.
- Koul, L. (1984). *Methodology of Educational Research*. New Delhi: Vikas Publishing House PVT Ltd.
- Lipton, M. (1996). *Rural Reforms and Rural Livelihoods: The Contexts of International Experience*. ( M. Lipton, M. de Klerk & M. Lipton (Eds.) *Land, Labor and Livelihoods in Rural South Africa*. Volume One: Durban: Indicator Press, University of Natal.
- Makanda, D. W.(1987). *Small-scale irrigation in Kenya: A case study of Kibirigwi and Kangocho irrigation Schemes*. (G.M. Ruigu, & M. Rukuni, (eds.) *Irrigation Policy in Kenya and Zimbabwe*. (186-214). Nairobi: IDS
- Michael, A.M. (1978). *Irrigation Theory and Practice*. New Delhi: Vikas Publishing House PVT Ltd.
- Migot-Adhola, S. E., & Ruigu, G.M., (1989). *Issues On irrigation farming in Kenya*. Discussion Paper No. 287. Nairobi: IDS,
- Milikan, M.F., & Hapgood, D (1967). *No easy Harvest: The Dilemma of Agriculture in Developing Countries: Malaysian Journal of African Geography*.

- Mugenda, O.M., & Mugenda, A.G.(1999). *Research methods: Quantitative and qualitative Approaches*. Nairobi :Acts press.
- Muhammad, S., Tegegne, F., & Ekanem, E. (2004). Factors Contributing to Success of Small Farm Operation in Tennessee. *Journal of Extension*. 42 (4).
- Muturi, S .N. (1986). Statement Opening Remark. (Ruigu, G.M. and Rukuni, M.) (eds). *Irrigation Policy in Kenya and Zimbabwe, Papers of Joint Seminar, Nairobi 27-28 Nov.* IDS, Nairobi.
- Odegi - Awoundo, C.(1990). *Life in the Balance: Ecological Sociology of Turkana Nomads*. Nairobi: Acts Press
- Ominde, S. H. (1988). *Kenya's Population Growth and Development to the Year 2000 AD*. Nairobi: Heinemann Kenya Limited.
- Olomi, D.R. (1996). *Entrepreneurial Characteristics and Small Business Performance: Knowledge Gaps and Priority Research Issues*. (Rutashobya & Olomi) (eds). African Entrepreneurship and Small Business Development: DUP Ltd.
- Orodho, J.A., (1998). *Population Growth. Gender and Food Production in Kenya: The case of Small-scale Farmers in Vihiga District*. Nairobi: Union for African population studies..
- Ruigu. G.M., (1987). *Large-scale Irrigation Development in Kenya: Past performance and Future Prospects, Food and Nutrition Planning Unit*. Leiden: Ministry of Planning and Development and African Studies Centre.
- Ruigu, G.M., and Rukuni, M., (eds) (1987). *Irrigation policy in Kenya and Zimbabwe*. Nairobi: IDS.

- Ruigu, G.M., Alila, P.O., & Chitere, P.A. (1984). *Bura Irrigation Settlement Project Survey*. Nairobi: IDS.
- Schutt, K. R. (1996). *Investigating the Social World: The Process and Practice of Research*. California: Pine Forge Press.
- Shisanya, C.A. (1996). *Chances and Risks of Maize and Bean Growing in the Semi-arid Areas of S.E Kenya During Expected Deficient, Normal and Above Normal Rainfall of the Short Rainy Seasons*. Materialien Zur Ostafrika Forschung Helfi 14 Trier.
- Sign. I., & Dhillon, S. (1984). *Agricultural Geography*. New Delhi: Tata McGraw Hill.
- Singleton, A. R. (1993). *Approaches to Social Research (2<sup>nd</sup> ed)*. Oxford: Oxford University Press.
- Southgate, C. and Hulme D. (1996). *Rural Resources, Rural Livelihoods, Land, water and Local Governance in Kenyan Wetland in Dry land: The Kimana Group Ranch and its Environs*. Institute for development Policy and Management. Manchester: University of Manchester.
- Ssenyonga, J.W. (1987). *Policy implications of the shift to community irrigation*. ( G.M. Ruigu, & M. Rukuni, *Irrigation Policy in Kenya and Zimbabwe*. pp. 100-117.
- Thompson, J. (1991). *Combining Local Knowledge and Expert Assistance in National Resources Management: Small-scale Irrigation in Kenya*. Nairobi: World Resource Institute (WRI) and Acts.
- Umali, D.L., & Schwartz, L, (1994). *Public and Private Agricultural Extension: Beyond Traditional Frontiers*. In World Bank. Discussion Paper 236.
- Vanclay, F. (1992). *The Social Context of farmers of Environmentally Sound Farming*. World Development Report (2008).



- Wisner, B., & Mbithi, P.M. (1974). Drought in Eastern Kenya: Nutritional Status and Farmer Activity. (G. White(ed.). *Natural Hazards* New York: Oxford University Press. pp.87-97.
- World Bank. (1990). *Gezira Irrigation Scheme in Sudan: Objectives, Design and Performance*. Plusquellec, H, World Bank Technical Paper 20 Washington D.C.
- World Bank. (1989). *The Challenge of Hunger in Africa: A call for Action*. Washington D.C.: World Bank.
- Waugh, D. (1990). *Geography: An integrated Approach*. Edinburgh: Thomas Nelson and Sons Ltd.
- Yusuf, J.A. (ed.). (1982). *Environmental Guidelines for irrigation in ASAL Areas*. TINEP.

**APPENDIX 1**

**INTRODUCTION LETTER**

Isaac Kipkogei Sargoi

P.O. Box 85,

Garissa.

TO WHOM IT MAY CONCERN

**RE: RESEARCH ON FACTORS THAT INFLUENCE SMALL SCALE IRRIGATION FARMING ALONG TANA RIVER IN CENTRAL DIVISION OF GARISSA DISTRICT**

My name is Isaac K. Sargoi, a Student at Nairobi University (Reg.No.L50/60733/2011). I am undertaking a research study on **“Factors that Influence Small Scale Irrigation Farming along Tana River in Central Division of Garissa District.”** I would like to ask you some questions related to the subject. In particular, I would like to know the factors that influenced you in engaging in small- scale irrigation farming. This research is meant for academic purposes and the information you give will be treated in confidence. I would highly appreciate if you can spare some time to answer the following questions.

Thank you,



**I.K. Sargoi,**

## APPENDIX 2



UNIVERSITY OF NAIROBI  
SCHOOL OF CONTINUING AND DISTANCE EDUCATION  
DEPARTMENT OF EXTRA-MURAL STUDIES (GARISSA E.M.C.)

Telegram: "CEES"  
Telephone: 066-32029/32117/8/21  
Fax: +254-066-32467  
Email: [info-cces@uonbi.ac.ke](mailto:info-cces@uonbi.ac.ke)  
Website: [www.unobi.ac.ke](http://www.unobi.ac.ke)

P.O Box 30197 NAIROBI.  
P.O Box 92, Kikuyu, Kenya.  
P.O Box, 1207, Garissa.  
22<sup>nd</sup> MARCH, 2012.

### TO WHOM IT MAY CONCERN

**RE: RESEARCH PERMIT FOR MR. ISAAC KIPKOGEI SARGOI L50/60733/2011**

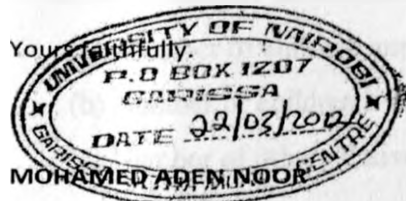
The bearer of this note Mr. Isaac Kipkoge Sargoi Registration No: L50/60733/2011 is a Post-Graduate student pursuing Masters of Arts in Project Planning and Management, at the University of Nairobi, School of Continuing and Distance Education, Department of Extra – Mural Studies.

He is supposed to carry out data collection for his project in the field.

Any assistance given to him will be highly appreciated and will be treated confidentially.

Kindly please accord him the necessary assistance.

Yours faithfully,



ADMINISTRATOR –GARISSA EMC

### APPENDIX 3

## QUESTIONNAIRE- FOR SMALL-SCALE IRRIGATION FARMERS

### TOPIC: FACTORS THAT INFLUENCE SMALL SCALE

### IRRIGATION FARMING ALONG TANA RIVER IN CENTRAL DIVISION OF GARISSA DISTRICT

Field Research Centre: \_\_\_\_\_

Respondent Number: \_\_\_\_\_

Date of Interview: \_\_\_\_\_

Time of Interview: \_\_\_\_\_

#### Background Information

1. Sex of the respondent \_\_\_\_\_
2. Age of farmer (yrs) \_\_\_\_\_
3. (a) Marital Status: \_\_\_\_\_  
(b) Respondent's status in the family: \_\_\_\_\_
4. Highest level of Education :  
1. None 2. Primary 3. Secondary 4. Secondary  
5. University/College (Specify) \_\_\_\_\_ 6. Adult Literacy
5. Size of household: \_\_\_\_\_
6. (a) Number of children supported: \_\_\_\_\_  
(b) Number of children living with you in the house \_\_\_\_\_  
(c) Number of other relatives living with you in the house \_\_\_\_\_

#### Questions on economic factors

- 7 Farmer's Occupation (s) \_\_\_\_\_
8. (a) what are is your source (s) of income?  
\_\_\_\_\_

(b) How would you rate your average monthly income (in Kenya Shillings) \_\_\_\_\_

(c) How much of your average monthly income do you save or you were saving towards your small- scale farming? \_\_\_\_\_

9. Farmer's spouse's Occupation \_\_\_\_\_

10. (a) Source of income of spouse (if applicable):

1. Formal employment

2. Business

3. Small scale Farming

4. Other (specify) \_\_\_\_\_

5. N/A

(b) Farmer's spouse's average monthly income in Kenya Shillings. \_\_\_\_\_

(c) How much of the spouse's average monthly income is saved or you were saving towards small scale farming? \_\_\_\_\_

11. How much of the combined average monthly income of the spouses is saved or was being saved towards small scale farming?  
\_\_\_\_\_

12. (a) Do you own the plot you farm? Yes \_\_\_ No. \_\_\_\_\_

(b). If No, what is the nature of ownership? (please tick where appropriate)

(i) Squatter (ii) tenant (iii) other, specify \_\_\_\_\_

13.a) What is the size (in acres) of the irrigation farm you cultivate? \_\_\_\_\_

(b) When did you acquire the farm? \_\_\_\_\_

(c) If you bought the farm, how much did it cost you then? Kshs. \_\_\_\_\_

14. (a) who decided on the need to acquire a family land?

15. Would you say that a household's nature and level of income influences the ownership and cultivation of an irrigation farm? Yes 2. No

Please explain \_\_\_\_\_  
\_\_\_\_\_

16. Does the national economy have a role in influencing the engagement in irrigation farming?

1. Yes 2. No

17. Does your occupation and/or spouse's occupation (if applicable) encourage engagement in irrigation farming? 1. Yes 2. No.

If yes, please Explain \_\_\_\_\_

18. (a) What were your sources(s) of finances used to own the farm?

\_\_\_\_\_  
\_\_\_\_\_

(b) What are your sources(s) of finances used to do the farming?

\_\_\_\_\_  
\_\_\_\_\_

19. (a) State the agricultural development agencies in this area that you know. \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

(b) Have you ever received any assistance from the Agricultural agencies for development agencies? 1. Yes 2. No

20. Explain your answer \_\_\_\_\_

21. Where did you get your initial capital? \_\_\_\_\_ How much \_\_\_\_\_

22. Where do you market your produce? \_\_\_\_\_

23. How do you market your produce? (a) Individually (b) group (c) Middlemen (d) other, specify

24. (a) what is your main form of transport for your produce? \_\_\_\_\_

(b) Please explain reasons for choice of transport method  
\_\_\_\_\_  
\_\_\_\_\_

25.(a) In your own view, what are the main factors that influence performance of small-scale irrigation farming in Garissa?

\_\_\_\_\_  
\_\_\_\_\_

26. Did the following influence you in the process of owning land/or undertaking irrigation farming in any way?

Factor	Response		
	1. Yes	2. No	3. I don't know
Transport and communication network			
Land for establishment of the irrigation farm			
Credit and/or mortgage facility			
Educational facilities and services			
Finances.			
Availability of adequate water for irrigation			
Your needs			
Suppliers (e.g. of labour, farm materials, sellers or those hiring out the farms, etc)			
Customers (e.g. other potential farm tenants, buyers of produce, those willing to hire your farm, etc)			
Regulators (i.e. government agencies and laws on water usage, land			
Competitors (e.g. farm/land grabbers, other potential buyers/farm owners			
Innovation			
Technology			
Other, specify			

27. Do you agree that one's -economic status influences him/her to own an irrigation farm and/or to engage in farming?

1. Yes – I agree    2. No - I don't agree

**Questions on Socio –psychological factors**

28. When did you start irrigation farming? \_\_\_\_\_

29. Who first mooted the idea of you owning an irrigation farm and/or engaging in irrigation farming?

1. Yourself 2. Your spouse 3. Your parent (s) 4. Your children 5. Your sibling (s)-(brothers and sisters) 6. Your friend (s) 7. Your neighbour (s) 8. Your employer (s)

Any other (specify) \_\_\_\_\_

30. Please list down the needs you wanted to address by owning an irrigation farm and/or engaging in irrigation farming. \_\_\_\_\_  
\_\_\_\_\_

31. Would you say that your parents' farming situation in your early years of life influenced you in owning an irrigation farm and/or engaging in irrigation farming? 1. Yes 2. No ,  
Please explain \_\_\_\_\_  
\_\_\_\_\_

32. In order of priority, list down some of the things you had always thought you needed to achieve before engaging in irrigation farming  
\_\_\_\_\_  
\_\_\_\_\_

33. Would you say that owning an irrigation farm and/or engaging in irrigation farming has given you a personal fulfillment/ self-actualization? 1. Yes 2. No  
Please explain \_\_\_\_\_  
\_\_\_\_\_

34. Has owning an irrigation farm and/or engaging in irrigation farming improved your economic status? 1. Yes 2. No

35. Is your owning an irrigation farm and/or engaging in irrigation farming following in your parents' footsteps of owning assets and/or business (es) and engaging in farming? 1. Yes 2. No

36. (a) Do some of the friends you interact with closely own an irrigation farm and/or engage in irrigation farming? 1. Yes 2. NO

(b) Would you say that you decided to own an irrigation farm and/or engage in irrigation farming to be like the friends? Yes 2. No

**Questions on technical factors**

37. (a) Do you use (i) fertilizer (ii) herbicides (iii) Pesticides? Yes..... No.....

(b) Explain your answer above \_\_\_\_\_  
\_\_\_\_\_

38. (a) do you belong to any farmer's organization? Yes..... No. ....

(b) If yes, Name it \_\_\_\_\_



39. Have you attended a course in farmers training centre pertaining irrigation? Yes..... No  
.....

40. (a) If yes, where and when \_\_\_\_\_

(b) if No, give reasons \_\_\_\_\_

41. What are your main sources of irrigation crop growing information (please tick where appropriate)

(i) Agricultural officers (ii) Agricultural show (iii) FTC (iv) Chief's barazas (v) neighbour  
(vi) radio (vii) trial and error (viii) other, specify.....

42(a) How many times has the Agricultural Officer visited your farm in a week \_\_\_\_\_  
month \_\_\_\_\_ Year \_\_\_\_\_

(b) for what reason \_\_\_\_\_

43 (a) What method of irrigation do you use? \_\_\_\_\_

(b) Give reasons for using this method

\_\_\_\_\_

\_\_\_\_\_

44. Do you receive any external assistance from the government/NGOs? If yes, what kind of assistance? \_\_\_\_\_

### Questions on Physical Environmental Factors

45.(a) What is your source of water for irrigation? \_\_\_\_\_

46. How far is your farm from the water source? \_\_\_\_\_

47. Is the water sufficient to meet your irrigation needs \_\_\_\_\_

48. (a) is drought experienced in this area? \_\_\_\_\_

(b) If yes, indicate when last serious drought you can remember occurred \_\_\_\_\_

49. Do you experience floods in this area? \_\_\_\_\_

(b) Do you utilize flood water for irrigation? Please explain

\_\_\_\_\_

\_\_\_\_\_

**Questions on Problems facing irrigation farmers**

50. In your own view, what are the major problems facing irrigation farmers along Tana River? \_\_\_\_\_

51. What suggestions do you give to solve these problems?

52. Do you experience any of the following problems?

Constraints/challenges	Response		
	1. Yes	2. No	3. I don't know
Exploitation by middlemen who distort marketing of produce			
Crop diseases and pests			
Lack of funds/loan facility			
Inefficiency of technical assistance			
Water shortage			
Marketing			
Storage of produce			
Excessive taxation on farm produce			
Transportation			
Soil erosion			
Salinization and sedimentation			
Water logging			
Water pollution			
Water borne diseases			
Low dissemination of innovations to the target farmers			
Unaffordable and inaccessible appropriate farm technologies			
Inappropriate laws			
Other-specify			

53. Do you think the government should intervene in irrigation farming in Garissa?

Yes \_\_\_ No. \_\_\_\_\_

Explain your answer \_\_\_\_\_

(b) How can the problems be minimized in order to encourage people to own an irrigation farm and/or engage in irrigation farming?

54. Please give any other relevant comments and/or recommendations. \_\_\_\_\_

**THANK YOU .**

## APPENDIX 4

### INTERVIEW GUIDE- FOR AGRICULTURAL OFFICERS

#### A. GENERAL INFORMATION

Name of officer \_\_\_\_\_

Designation \_\_\_\_\_

Date of interview \_\_\_\_\_

#### B. SPECIFIC INFORMATION

1. Give a brief history of small-scale irrigation farming along the Tana River.

---

---

2. What do you think are the main factors that influence small-scale irrigation along Tana River?

---

---

3. What do you think are main problems facing irrigation farmers along the Tana River?

---

---

---

4. How do you assist farmers in solving these problems?

---

---

5. What role does the government play in irrigation farming along the Tana River?

---

---

6. What incentives do you give farmers in order to encourage them in their farmwork?

---

---

7. How often do you visit the farmers and for what reason?

---

---

8. What challenges do you encounter while in serving the farmers in the Tana River basin?

---

---

9. How do you overcome the challenges facing you?

---

---

10. In your opinion, do you think irrigation farming is beneficial compared to rain-fed agriculture in Garissa? 1. Yes 2. No Give reasons.

---

---

---

## APPENDIX 5

### OBSERVATIONAL SCHEDULE TO GUIDE INTERVIEWERS

#### A. GENERAL INFORMATION

Date of visit \_\_\_\_\_

Observer \_\_\_\_\_

Farmer \_\_\_\_\_

#### B. OBSERVATION

1. Describe the environmental and human conditions of the household.

---

---

---

2. Identify the main activities taking place on the farm.

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

3. List the crop varieties grown by the farmer.

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

4. What irrigation benefits can you identify to have accrued to the farmer?

---

---

---

5. Identify any problems/negative effects you have noticed on the farm.

---

---

---

6. Identify the method of irrigation used by the farmer.

---

7. Describe the general transport network and marketing channels available to the farmer.

---

---

8. Give your general impression of the farm/farmer's activities.

---

---