

**CAPACITY BUILDING INTERVENTIONS ON SMALLHOLDER FARMERS AND
FOOD SECURITY IN SIAYA COUNTY, KENYA**

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DECLARATION

Declaration by the candidate

This research project is my original work and has not been presented at any other university.

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TABLE OF CONTENT

DECLARATION	ii
ACKNOWLEDGEMENT	iii
TABLE OF CONTENT	iv
LIST OF TABLES	viii
LIST OF APPENDICES	ix
LIST OF ABBREVIATIONS AND ACRONYMS	x
OPERATIONAL DEFINITION OF TERMS	xi
ABSTRACT	xii
CHAPTER ONE	1
1.0 INTRODUCTION.....	1
1.1 Background of the study	1
1.1.1 Capacity building interventions	1
1.1.2 Smallholder farmers.....	4
1.1.3 Food security global perspective	6
1.1.4 Kenyan perspective of food security.....	7
1.1.5 Government policy on food security.....	8
1.1.6. Project management approach to food security	9
1.2 Statement of the problem	11
1.3 Purpose of the study.....	12
1.4 Objectives of the study.....	12
1.5 Research questions.....	12

1.6 Significance of the study.....	13
1.7 Scope of the study.....	13
1.8 Limitations of the study	14
CHAPTER TWO	15
2.0 LITERATURE REVIEW	15
2.1 Introduction.....	15
2.2. Theoretical Framework.....	15
2.2.1 Training theory.....	15
2.2.2 Networking theory	17
2.2.3 Gender mainstreaming theory.....	18
2.3 Conceptual Framework.....	22
2.4 Empirical literature review	23
2.4.1 Training and food security	23
2.4.2 Networking and food security.....	24
2.4.3 Gender mainstreaming and food security.	27
2.5 Critique of the literature.....	30
2.6 Research Gaps.....	32
2.7 Summary.....	32

CHAPTER THREE	33
3.0 RESEARCH METHODOLOGY	33
3.1 Introduction.....	33
3.2 Research Design.....	33
3.3 Target population	34
3.4 Sample size and sampling technique	34
3.5 Research Instrument.....	36
3.6 Piloting.....	37
3.6.1 Instrument Validity	37
3.6.2 Instrument Reliability	38
3.7 Data collection method	38
3.8 Data analysis and presentation.....	39
CHAPTER FOUR.....	41
4.0 DATA ANALYSIS, PRESENTATION AND INTERPRETATION	41
4.1 Introduction.....	41
4.2 Response rate	41
4.3 Bio data of the respondents.....	42
4.3.1 Gender of the respondent	42
4.3.2 Ages of the respondents	42
4.3.3 Level of education of respondents	43

4.3.4 Marital status of the respondents	44
4.3.5 Primary occupation of the respondents.....	45
4.4 Land ownership and types of crops cultivated.....	46
4.4.1 Land ownership of smallholder farmers	46
4.4.2 Type of crops cultivated.....	46
4.5 Capacity building interventions and food security	48
4.5.1 Contribution of training to food security	48
4.5.2 Contribution of networking to food security	52
4.5.3 Contribution of gender mainstreaming to food security	57
4.5.4 Joint analysis of the contribution of capacity building interventions to food security	62
4.6 Summary of data analysis	66
CHAPTER FIVE	67
5.0 SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS	67
5.1 Introduction.....	67
5.2 Summary of key findings.....	67
5.3 Conclusions.....	69
5.4 Recommendations.....	70
5.5 Suggestions for further research	70
REFERENCES	71

LIST OF TABLES

Table 3.1: Distribution of the target population.....	34
Table 3.2: Sample distribution.....	35
Table 4.1: Response rate.....	41
Table 4.2: Gender distribution of the respondents.....	42
Table 4.3: Ages of the respondents.....	43
Table 4.4: Level of education of respondents.....	44
Table 4.5: Marital status of the respondents.....	44
Table 4.6: Primary occupation of the respondents.....	45
Tab 4. 7: Land ownership.....	46
Table 4.8: Types of crop cultivated.....	47
Table 4. 9: Planting of maize and beans.....	48
Table 4.10: Descriptive statistics for training and food security.....	48
Table 4.11: Regression analysis for training and food security.....	50
Table 4.12: Descriptive statistics for networking and food security.....	52
Table 4.13: Regression statistics for networking and food security.....	54
Table 4.14: Descriptive statistics for gender mainstreaming and food security.....	58
Table 4.15: Regression analysis for gender mainstreaming and food security.....	59
Table 4.16: Descriptive statistics for capacity building interventions and food security.....	62
Table 4.17: Pearson correlation matrix.....	63
Table 4.18: Linear regression analysis of the contribution of joint capacity building interventions to food security.....	64
Table 4.19: Summary of data analysis.....	66

LIST OF APPENDICES

Appendix 1: Questionnaire Smallholder Farmers.....	77
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LIST OF ABBREVIATIONS AND ACRONYMS

AFC	Agricultural Finance Cooperation
AfDB	African Development Bank
CDF	Constituency Development Fund
FAO	Food and Agriculture Organization
FISLs	Farm Inputs Savings and Loaning
GTZ	German Agency for Technical Cooperation
ICC	Intrahousehold Communication and Cooperation
ICRW	International Centre for Research on Women
IGE	Innovations in Gender Equality
NCPB	National Cereals and Produce Board
UK	United Kingdom
UNDP	United Nations Development Programme
UNESCO	United Nations Educational Scientific and Cultural Organization
WEF	Women Enterprise Fund
YDF	Youth Development Fund

OPERATIONAL DEFINITION OF TERMS

Food Security	Food security is a measure of having physical and economic consistent access to safe, adequate and nutritious food that meet dietary needs and enable an active and healthy life (FAO, 1996)
Smallholder farmer	The term is widely understood to include small farmers who own less than 2 acres of land. They produce relatively small volumes of produce on relatively small plots of land (FAO website)
Gender Mainstreaming	Is the process of assessing the implication for and men of any planned action, including legislation, policies or programmes at all areas and at all levels (Strasbourg et al 2004)
Community Mobilization	Application of logically interlinked steps, which produces an intended outcome or achieves a desired goal, namely the prevention or amelioration of community problems (Rothman 1984).
Capacity building	The process of improving or upgrading the ability of the person, team and institutions to implement their functions and achieve goals over time. (Horton, 2002)

ABSTRACT

How capacity building interventions on smallholder farmers contributes to food security remains a key challenge not only in Kenya but even globally. Despite the fact that smallholder farmers are the main rural actors in agriculture, they still experience food insecurity due an array of socioeconomic challenges that exists. The study was set to establish the contribution of capacity building interventions on smallholder farmers to food security in Siaya County, Kenya. The specific objectives of the study were: to determine the contribution of training of smallholder farmers to food security in Siaya County; to examine the contribution of networking smallholder farmers to food security in Siaya County; and to evaluate the contribution of gender mainstreaming among smallholder farmers to food security in Siaya County. The study was guided by training, networking and gender mainstreaming theories. Correlation design was used. The target population was 199,034 small holder farmers selected from 6 Sub Counties of Siaya. Sample size of 384 was arrived at through Fisher's model. Sampling technique was stratified random sampling. The research tool was structured questionnaire, which was tested for validity and reliability before administration. Data was analyzed through correlation and regression models and presented through tables. Training had a statistically significant weak positive correlation ($R = .262$) with food security. Training had a statistically significant contribution to food security ($F_{ratio} = 25.744$; $p < .05$) attributing 6.9% variance. For every one standard deviation increase in training, food security was improved by .262 units. Joint analysis showed that training with beta value of .175 ($p < .05$) made a statistically significant contribution to food security when networking and gender mainstreaming were controlled. Networking had a statistically significant positive weak correlation ($R = .258$) with food security. Networking had a statistically significant contribution to food security ($F_{ratio} = 24.942$; $p < .05$) attributing 6.7% variance. For every one standard deviation increase in networking, food security was improved by .258 units. Joint analysis showed that networking with beta value of .115 ($p < .05$) made a statistically significant unique contribution to the food security when training and gender mainstreaming were controlled. Gender mainstreaming had a statistically significant weak correlation ($R = .371$) with food security. Gender mainstreaming had a statistically significant contribution to food security ($F_{ratio} = 55.810$; $p < .05$) attributing 13.8% variance. It showed that for every one standard deviation increase in gender mainstreaming initiatives, food security improved by .371 units. A joint analysis showed that gender mainstreaming with a beta coefficient of .316 ($p < .05$) made a statistically significant unique contribution to food security when training and networking were controlled. In conclusion, gender mainstreaming made the strongest unique contribution in explaining food security; training made the second strongest unique contribution in explaining food security; and networking made the least contribution in explaining food security. The study recommends: intensified use of capacity building interventions; joint use of capacity building interventions; and identifying other capacity building interventions with a view to improving food security. The study was justified because it informed better gender capacity building interventions that supports the realization of smallholder farmers food security situation not only in Kenya but globally. The results have also extended knowledge base of capacity building interventions and food security.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the study

In this section, a detailed background of the study is provided. In particular, it discusses: capacity building interventions; smallholder farmers; food security, global perspective; Kenyan perspective of food security; government policy on food security; and project approach to food security.

1.1.1 Capacity building interventions

The concept of capacity has been broadened to include the building of capacity. As Hildebrand (n. d, p.39) stated; Capacity is the “mean”, or the ability, to fulfill a task or meet an objective effectively. According to Frank (1999) cited in Hussein (2006), there is a difference in meaning between capacity and capability. Capability is defined as the knowledge, skills and attitudes of individuals. In contrast, capacity is defined as the general ability of individuals or organizations to carry out the responsibilities required to achieve their goals. Baser and Morgan (2008) defined capacity as the collective skill and ability of organizations to achieve a particular process either inside or outside the organization. Goodman et al. (1998) cited in LaFond and Brown (2003) capacity is “the ability to carry out stated objectives.

Capacity used in a narrow sense refers to the skills of individuals and strength of specific organizations but training individuals and creating or strengthening single organizations is equated with capacity building. Capacity building therefore means a new build-up of capabilities (Kuhl, 2004). Capacity building is a concept that has different meanings for different people, but in general it relates to enhancing or strengthening a person’s or organization’s capacity to achieve their goals (Lusthaus, Adrien & Perstinger, 1999). Capacity building increases abilities and

resources of persons, communities and organizations to manage change (Coutts, Roberts, Frost & Coutts, 2005). Capacity building refers to activities that improve an organization's ability to achieve its mission or a person's ability to define and realize his/her goals or to do his/her job more effectively (Linnell, 2003).

Capacity building is as important as capital investment and infrastructure (Mati, 2008). UNESCO(2006) reports that capacity building focuses on increasing an individual and organization's abilities to perform core functions, solve problems, and objectively deal with developmental needs. This is supported by Morgan (1997) cited in Horton (2002) where capacity building is viewed as improving or upgrading the ability of the person, team and institutions to implement their functions and achieve goals over time. Capacity building is important for all levels, from individuals to national organizations (Horton, 2002). Capacity building also alludes to building the organizational capacities of communities, and supports the formation of non-profit organizations (Paul & Thomas, 2000).

Macadam et al. (2004) cited in McKenzie (2007) took capacity building as a concept involving people learning and sharing experiences together (co-learning), supported by people who have special expertise. Education, training and transfer of technology are simply tools that can be used to develop capacity. Capacity building is often equated with training, a one-time financial input or short-term external technical assistance (Potter & Brough, 2004) cited in Hartwig, Humphries and Matebeni (2008).

There are four common approaches to capacity building: top-down organizational- policy; bottom-up organizational- staff training; partnership organizational; and community organizing approaches (Crisp *et al*, 2000) cited in Hartwig *et al* (2008). Capacity building is important for

research and development organizations in developing economically and socially vibrant society (Horton, 2002). However, capacity building can be costly and time consuming (Low & Davenport, 2002).

Capacity building is recognized as a must for grassroots' and global organizations if they have to achieve sustainable development (Sessions, 1993). Capacity building is becoming an increasingly popular activity in many sectors including natural resource management- water and agriculture. As such the World Bank has endorsed mainstreaming of capacity building activities into all its operations and has remained highly relevant since 1996 (World Bank, 1997). The Bank has promoted institutional capacity building, believing that it is critical in successful, sound and equitable development.

Capacity building at local, regional and national levels has become central to the goals of development organizations working in developing countries (OECD 2000) cited in (Horton, 2002). This has been due to past failures of rural development programs in reducing poverty and empowering local people for livelihood improvement. Development organizations tended to transfer only funding and modern technology to farmers or provide formal education to rural communities (Horton, 2002). These activities are conducted by government or non-government organization researchers and extension officers, with little involvement of local people. After the project termination local people fail to sustain operations in their communities.

Improving capacity building of individuals, groups, organizations and communities is therefore necessary for rural development, poverty alleviation and environmental protection (Degnbol-Martinussen, 2002). Eade (2007) pointed out that if you give a man a fish, you feed him for a day, and if you teach him to fish, you feed him for a lifetime. Horton (1999) added that investment

alone cannot lead to the desired level of development. Building the capacity of local people, groups and organizations is vital because they must have the ability and responsibility to resolve their problems and develop their communities.

Whereas the concept of capacity translates assets and abilities into performance, the concept of capacity building is associated with transformation processes and increments in capacities or performance. Increasing capacities can imply broadening the asset base, but this is insufficient for enhancing performance. The act of increasing capacities encompasses the enhancement of abilities to use assets productively. A major challenge facing food security projects is ensuring their capacity building activities are not only instrumental to the success of a specific project component, but that the new capacities will be put to use and contribute to the sustainability of food security in communities over the long-term. Therefore, food security projects can increase communities' asset bases by investing in infrastructure and providing other material and physical inputs, by developing new tools and by increasing the population's knowledge level in various domains, such as health, nutrition, agriculture, literacy, numeracy, accounting, bookkeeping and specific techniques used in income generating activities (Suzanne, 2004).

In project management, capacity building is an approach to strengthen designing, implementation, monitoring, management, and evaluation of projects. It is understood to address or provide solutions to well-documented problems (Samuel *et al*, 2009).

1.1.2 Smallholder farmers

Smallholder farming is the backbone of African agriculture and food security. Two-thirds of Sub-Saharan Africa's population resides in the rural areas and has majority of them engaged in smallholder farming. They derive their role in agricultural sector and economic development

because of concentration of poverty in rural areas. Smallholder concept is taken to mean such farmers have limited resource endowments relative to other farmers in the sector (Katurani *et al*, 2004).

Concept of smallholder differs between countries and between agro-ecological zones. In agriculturally favorable areas with high population densities they often cultivate less than one ha of land, whereas they may cultivate 10 ha or more in semi-arid areas, or manage 10 heads of livestock. Smallholders represent a large number of holdings in many developing countries. Evidence from the World Census of Agriculture for small number of selected countries in Africa shows that between 1980 and 1990, percentage of agricultural holdings of less than one hectare had increased from 50 percent to about 78 percent (FAO 1997).

Most smallholders have diverse sources of livelihood including significant off-farm income, yet are still vulnerable to economic and climatic shocks. Their characteristics differ by country and farming system zone. The actual farming system, household strategies, household behavior, and livelihood patterns are determined by resource endowments and institutional factors such as access to markets, organization of markets and information, finances, towns, public institutions and services. The gender of decision makers within the household is an important factor that influences household strategies (Ellis 2000)

In East Africa smallholders have faced several historical constraints such as: land tenure, access rights, and land management; credit access; access to input and output markets; infrastructure; extension services; institutional problems; climate change and food security; and more recently the global financial, food, and fuel price crises (Adeleke et al, 2010).

At macro level, the agriculture sector remains the backbone of the Kenyan economy, employing 70 per cent of the rural population and accounting for about 65 per cent of export earnings. Kenya's agriculture is predominantly smallholder. Evidence shows that agriculture-led growth in Kenya is more than twice as effective in reducing poverty as growth led by industry. The overall objectives of the country's Agricultural Sector Development Strategy (ASDS) 2010-2020 are to achieve an agricultural growth rate of 7 per cent per year and to reduce food insecurity by 30 per cent by promoting an innovative, commercially oriented and climate-smart modern agriculture, Kenya vision (2013). It is guided by two strategic thrusts: increasing productivity, commercialization and competitiveness of agricultural commodities and enterprises; and developing and managing the key factors of production.

1.1.3 Food security global perspective

Food security is a measure of having consistent access to safe, adequate and nutritious food for an active and healthy life. For a household to be considered food secure, its members must be able to acquire this food without resorting to emergency food programs, scavenging, stealing and other coping strategies. If a household does not meet these conditions for any part of the year, or if these conditions are uncertain, it is considered food insecure. For example, food insecure households include those that are unable to afford balanced meals, worried their food will run out before they have money to buy more, forced to skip meals because they can't afford enough food, and in more severe cases hungry because they can't afford enough food (Johns Hopkins center for a livable future 2011). According to FAO (1996) Food security, at the individual, household, national, regional and global levels is achieved when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.

Most hungry people in the world depend on the market for much of their food, including smallholder subsistence farmers who usually do not produce enough to meet their food needs year round. For the more than one billion people who live on less than \$1 a day (half the world nearly three billion people live on less than \$2 a day), much of their income is spent on food. Rapidly rising food prices force millions of poor people to reduce the amount and variety of food they consume, reduce expenditures on health and education, and reduce savings and sell assets, leading to further impoverishment. (Jel 2008).

Over the last decade, Latin America has out-performed North America and Europe in food security. This is particularly true of Brazil. While the Brazilian economy has become broader and more complex, its agricultural economy has kept pace and today represents one of the largest and fastest growing markets for agricultural inputs in the world. Brazilian agricultural sector has evolved rapidly in response to increasing acreage and profitability, geographic shifts in production, assimilation of technologies and new cropping techniques. The crop protection market now exceeds in value that of the US, with sales growing at 5.4% per year compared to 3% for the rest of the world. (Brazil agricultural input supply study by Context network, 2014). Despite making these strides, Brazil still faces challenges related to agricultural input access and output marketing, coupled with high cost of credit facilities (Jel Cjel Classifications, 2008).

1.1.4 Kenyan perspective of food security

The achievement of national food security remains a key objective of the agricultural sector. Food security in this case is defined as “ a situation in which all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life” (Kenya Food Security Steering Group, 2008). From

2008, Kenya has been facing severe food insecurity problems. These are depicted by a high proportion of the population having no access to food in the right amounts and quality. Official estimates indicate over 10 million people are food insecure with majority of them living on food relief. Households are also incurring huge food bills due to the high food prices. Maize being staple food due to the food preferences is in short supply and most households have limited choices of other food stuffs.

The current food insecurity problems are attributed to several factors such as: frequent droughts in most parts of the country; high cost of domestic food production due to high costs of inputs especially fertilizer; displacement of a large number of farmers in the high potential agricultural areas following the post-election violence which occurred in early 2008; high global food prices and low purchasing power for large proportion of the population due to high level of poverty.

1.1.5 Government policy on food security

The Government of Kenya has always responded to the food insecurity through three major policy interventions: supply, prices and income related policies. The supply policies revolve around subsidy on farm inputs, especially fertilizers, through involvement of the Government National Cereals and Produce Board (NCPB) in importing and distributing inputs and improvement in research and extension services. Provision of rural credit for farming, improvement of rural infrastructure, especially road network, development of agricultural markets and agri-business skills, improvement of the management and use of natural resources, especially water for irrigation, allowing for imports of tax free maize and ban on exports of Agricultural commodities. Provide farmers with planting materials and seeds, especially of the so called 'orphan crops-drought tolerant' which can be grown in the arid and semi-arid areas. Encouraging diversification

of crops planted. Encouraging the citizens to diversify their eating habits to other foods and avoid over reliance on maize.

Price related policies include the involvement of the NCPB in the purchase of maize from farmers at prices higher than market prices to provide incentive to producers. Provide subsidy to maize meal millers to bring down the consumer retail prices of the maize meal (price subsidy to the consumers). Raising the levels of the strategic food reserves to about 8 million bags (90kg) held by the NCPB in order to stabilize the maize prices. Providing a fund to purchase livestock from the drought stricken areas and allowing private sector to import maize at tax free.

The government has also developed income related policies by contributing to the costs of social amenities e.g. through the free education programme and reduced costs of health at public health facilities. This enables the population especially the poor to have a little more disposal income to spend on food. The Government transfer funds for development to the grassroots, especially the Constituency Development Fund –CDF, Youth Development Fund, Women Enterprise fund helping the local communities meet their development need while creating employment at the local level for those people who can provide specialized skills and labor. Assisting in establishing producer and marketing associations (common interest groups) for farmers to enable them exploit the economies of scale through collective action.

1.1.6. Project management approach to food security

According to Food Security in Kenya August 2009, the Kenya government has implemented a number of food security projects namely; National Accelerated Agricultural Input Access Project (NAAIAP) whose main capacity intervention was training of farmers on good Agronomic practices and provision of free inputs. National Agriculture and Livestock Extension Programme

(NALEP) was also introduced with an objective of institutionalizing demand driven and farmer-led extension services. The programme reached 1.2 million farmers per year with support of Kshs. 700 million every Financial Year funded jointly by the Government of Sweden and the Government of Kenya. From 2005 to 2013, Kenya Agricultural Productivity Programme (KAPP) was implemented to improve livelihoods of Kenyans through enhanced: supply and demand systems; bulk fertilizer procurement; Agricultural Mechanization Services Revitalization, Agriculture Sector Support Programme (ASPS); Agricultural Productivity and Income Generating Programmes, Small Scale Horticulture Development Project, Small Holder Horticulture Empowerment Programme (SHEP); and Smallholder Horticultural Marketing Project (SHoMaP).

Through Innovations in Gender Equality for Household Food Security Project 2013-2014, agriculture has been viewed as a social practice within which gender norms and relations are affected by capacity building interventions designed to promote food security. Social learning encourages various groups involved in an intervention to learn from each other, so that policy can reflect a range of different viewpoints (Stringer et al., 2006), while action research combines research and development to better understand problems and thereby find better solutions. This involves dealing with different interests, looking for synergies and tradeoffs, and reflecting on progress with partners (Frost et al., 2006). Another, less known tool based on this logic is problem-driven iterative adaptation (PDIA), which provides a systematic way of working towards uncertain outcomes through feedback mechanisms designed to facilitate effective reform processes (Andrews et al., 2012).

Lastly, theory of change is particularly useful for unifying the mentioned principles of critical reflection and adaptive management into a systematic approach to project planning and implementation (cf. Brouwers, 2013). Applying it stimulates organizations to make explicit how they expect to achieve change and how they view sustainability in this context. Valters (2015) outlines four key principles as guidance, saying that it should: focus on process, prioritize learning and interim adjustment, be locally led, and be viewed as a compass rather than a roadmap. Tools such as these allow practitioners to deal with some of the uncertainties that come from the integration of objectives between sectors and of methods between disciplines. Moreover, they provide possibilities for integration among stakeholders on different scales ranging from small scale farmers to NGOs, businesses and governance actors.

1.2 Statement of the problem

According to the 2015 Millennium Development Goals report, about 795 million people worldwide are undernourished. This is amplified by the incessantly rising world population and the impacts of climate change (UN, 2015a).

Kenya has about 80 per cent of its population residing in rural areas where agriculture is dominant. Out of these, over 60 per cent are women engaged in small holder farming. Despite the fact that Kenya has been implementing a number of food security projects, over 10 million Kenyans still suffer from chronic food insecurity and between two and four million people require emergency food assistance at any given time (Republic of Kenya, 2011). The 2010 Economic Review of Agriculture also indicates that 51 per cent of Kenyan population lack access to adequate food. Siaya County Integrated Development Plan 2013/2017 shows that the county produces food that can last only for nine months in a year. The output is nonetheless not stable and thus food gaps

go up to eight months in poor seasons. The three to four months food difference is sourced from the neighboring counties and even Uganda. Despite several capacity building interventions, Ministry of Planning and Finance 2001, attributes food insecurity to the continued use of local seeds, low use of modern farm inputs, poor crop husbandry practices and erratic or inadequate rainfall conditions. Some farmers even grow hybrid maize without fertilizers do not gain any profit. Also, most farms rely on family labour majorly provided by women (Mango, 1999).

1.3 Purpose of the study

To establish the contribution of capacity building interventions on smallholder farmer to food security in Siaya County, Kenya

1.4 Objectives of the study

- i. To determine the contribution of training of smallholder farmers to food security in Siaya County, Kenya
- ii. To examine the contribution of networking smallholder farmers to food security in Siaya County, Kenya.
- iii. To evaluate the contribution of gender mainstreaming of smallholder farmers to food security in Siaya County, Kenya.

1.5 Research questions

- i. What is the contribution of training on smallholder farmers towards food security in Siaya County, Kenya?
- ii. How does networking contribute on smallholder farmers towards food security in Siaya County, Kenya?

- iii. What is the contribution of gender mainstreaming on smallholder farmers towards food security in Siaya County, Kenya?

1.6 Significance of the study

The study will create a foundation for attaining food security among the smallholder farmers not only in Kenya but even globally. For instance, it will help in designing projects and developing local and national policies that reflect capacity building approaches that ensures that food security is attained among small holder farmers in Kenya. In particular, the study will provide an opportunity to assess the importance of training as a key intervention and how it contributes to food security of smallholder farmers. Additionally, the study will also provide more insight on how the gender mainstreaming and networking influence food security that will go a long way in helping smallholder farmers' access credit facilities. The research findings will also have the potential of helping researchers in widening the understanding of the relationship between capacity building and food security and acquire more knowledge in the variables under study. The research will provide literature to other researchers who may carry out similar study. The study will help policy makers and development partners to come up with food security projects and strategies for ensuring the most effective and economical involvement of gender in pro food security projects.

1.7 Scope of the study

The study took one month from August 1st 2017 to August 31st 2017. The study was conducted in Siaya County. It was confined to training, networking and gender mainstreaming as key capacity building interventions on smallholder farmers and food security

1.8 Limitations of the study

Limitations are conditions beyond the control of the researcher that may restrict the achievement of study objectives and their application to other situations (Best *et al*, 2008). The study limitations included: financial resources for undertaking a more comprehensive study over a long period of time in order to cover a larger population in the county; time constraints given the study is specifically designed to meet certain academic timelines; and volunteering of information. The overall implication of the limitations is that the results were interpreted within the context of the study as defined by the assumptions made.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

This section comprises of theories that supports the study. In addition, the chapter provides the discussion of the empirical and general literature that relates to the study.

2.2. Theoretical Framework

This section reviews theoretical framework that discusses and explains capacity building of small holder farmers and food security in Kenya. The theories assist in appreciating how capacity building of smallholder farmers affects food security. The theories discussed are training theory, networking theory and Gender Mainstreaming theory.

2.2.1 Training theory

Training has been defined in various ways. Manpower Services Commission (MSC), U.K., (1981) define training as a planned process to modify attitude, knowledge, skill or behaviour through learning experience to achieve effective performance in any activity or range of activities. Its purpose, in the work situation, is to develop the abilities of the individual to satisfy current and future manpower needs of an organization. Training endeavors to impart knowledge, skills and attitudes necessary to perform job-related tasks. Training is characterized as an instructor-led, content-based intervention leading to desired changes in behaviour (Sloman, 2005)

Opinions differ as to whether a ‘changes of attitude’ should be included in the definition of training. Wills (1994) argues against such a definition, because attitudes are notoriously difficult to quantify, and he argues that training a lone is insufficient to bring about major long-term changes

in attitude. Instead, he defines training as ‘the transfer of defined and measurable knowledge or skills’. Hare *et al* (1996) stated that training is any activity or course either formal or informal helps in acquiring the knowledge and skills to do your job.

Overman (1994) argued that ‘what people heart feel, they forget and what they see they remember.’ Likewise, Hughey and Mussnug (1997) observed that ‘most employees simply do not learn very well when they are ‘talked to’. They need to be more actively involved in the learning experience.

The earliest roots of training as a concept can be traced back to the middle Ages in the form of apprenticeships (Shane, 2012). This evolved into vocational schools in the early 1800’s (Desimone, Werner, & Harris, 2002). Apprenticeship programs were shortened and what is now known as job instructional training (JIT) was developed around the First World War (Desimone, Werner, & Harris, 2002). It wasn’t until the twentieth century that training became a profession and formalized (Shane, 2012; Desimone, Werner, & Harris, 2002).

The 1970’s forever changed training to become what we know it as today. The workplace was filled with many different types of people: war veterans, great depression survivors, and young baby boomers. This forced employers to stray from one type of training that fits all and move towards a more focused training approach. Although training is still evolving today to make it more efficient, the workplace will never be able to conduct one training fits all again. The workplace is even more diversified today than it was then. Luckily, as technology advances it makes meeting the specific training requirements of each employee easier to accomplish. A variety of training methods have taken shape over the years. Lectures/demonstrations are the oldest forms and most traditional means of training. In its most basic state, lectures and demonstrations simply present information from the trainer to the trainee (Blanchard & Thacker, 2009). On-the-job

training (OTJ) is the next most widely used training process. OTJ is considered another form of traditional training, occurring in the workplace and consisting of methods such as apprenticeship, internship, mentoring among others (Blanchard & Thacker, 2009). Audio visual enhancements also provide a means for the trainees to not only absorb knowledge in a traditional, basic way, but also to gain insight by exploiting the auditory sense. In this case, retention is more easily transferred when easy viewing is exercised and technical difficulties have been eliminated (Blanchard & Thacker, 2009). Today, audio visuals are made available by computer technology. It is hard to imagine the workplace, much less employee training without computer-generated assistance. However, computers have not been around forever. Yet, with recent, rapid advancements, they revolutionized the work culture into a more technically sophisticated society.

2.2.2 Networking theory

A network is a simple concept. It consists of two things: nodes and links between those nodes. In social network analysis the nodes of concern are people, groups and organizations (Wasserman & Faust, 1994). In other areas of network analysis the nodes of concern may be pages in the World Wide Web, different species in an ecosystem or different compounds in a cell. In social network analysis links may be social contacts, exchanges of information, political influence, money, joint membership in an organization, joint participation in specific events or many other aspects of human relationships (Rick Davies, 2003). The defining feature of social network analysis is the focus on the structure of relationships between people (or whatever entity is of concern). This is contrasted with other areas of the social sciences where, it is claimed, the focus has been on attributes of actors the characteristics of people, groups and organizations, rather than the relations between them (Scott, 2002; Monge & Contractor, 2003).

The term “network” is generally used for the structure of ties among the actors in a social system (Nohria & Eccles, 1992). These actors could be roles, individual persons, organizations, industries, or even nation states. Their ties may be based on conversation, affection, friendship, kinship, authority, economic exchange, information exchange, or anything else that forms the basis of a relationship. In a network, flows between objects and actors and exchanges, which might contain an advice, information, friendship, career or emotional support, motivation, and cooperation, can lead to very important ties (Kadushin, 2004).

According to Habyarimana (2009), networking theory as applied in the field of food security to enhance the flow of food security information as “the transmission of food security information from one institutional unit to another to characterize the interconnection between food security actors, analysts and policymakers in an economy and their reactions towards food security policy formulation and implementation to define and accomplish relevant food security interventions, involving institutions such as non-financial corporations; financial corporations; government units; non-profit institutions serving households.

2.2.3 Gender mainstreaming theory

According to Strasbourg et al (2004), mainstreaming a gender perspective is the process of assessing the implication for women and men in any planned action, including legislation, policies or programmes, in all areas and at all levels. It is a strategy for making women and men concerns and experiences an integral dimension of the design, implementation, monitoring and evaluation of policies and programmes in all political, economic and societal spheres so that women and men benefit equally and inequality is not perpetuated. The ultimate goal is to achieve gender equality (Council of Europe, 2004). Gender mainstreaming is essentially a contested concept and practice.

It involves the reinvention, restructuring, and rebranding of a key part of feminism in the contemporary era. It is both a new form of gendered political and policy practice and a new gendered strategy for theory development. As a practice, gender mainstreaming is a process to promote gender equality. It is also intended to improve the affectivity of mainline policies by making visible the gendered nature of assumptions, processes, and outcomes (Walby, 2005)

The reconciliation of the goals of gender mainstreaming and economic prosperity is widely found to be a contested process, despite several accounts which make a strong link, including Walby and Olsen (2002) on gender and productivity analysis, Elson (1998) on the essential role of the domestic sector of the economy for the provision of labour, Grosser and Moon (2004) on gender and corporate social responsibility, Dex (2004) and Dex, Smith and Winter (2001) on the business case for family friendly policies, and Vinnicombe (2004) on the business case for women directors. In these papers, the contribution of women to economic success is carefully made in diverse ways. Dex (2004) and Dex et al (2001) provide a strong evidential basis for the business case for family friendly policies, using data from the workplace employee relations survey to quantify the benefit to private sector organizations of such policies on their economic performance. According to (Vinnicombe, 2004; Singh & Vinnicombe, 2003) the links between the appointment of women directors not only as indicators of good corporate governance is demonstrated. This correlation is explained by the way that women directors act as good role models to women employees and help build companies' reputations in the market place, thereby attracting future employees.

The conceptualization of this dualism between gender equality and the mainstream is central to many of the debates about gender mainstreaming. There are a variety of ways in which this mix of contestation and compromise can be analyzed and outcomes assessed in multiple

registers in several different theoretical vocabularies. These include the ‘frames’ of social movement theory (Ferree 2004; Verloo 2004). One vision of gender mainstreaming is that it offers ‘transformation’ (Rees 1998), that is, neither the assimilation of women into men’s ways, nor the maintenance of a dualism between women and men, but rather something new, a positive form of melding, in which the outsiders, feminists, changed the mainstream. Jahan (1995) contrasts two possible outcomes as either ‘agenda setting’ or ‘integration’, as do also Lombardo (2003) and Squires (2003), while Shaw (2002, 2003) makes a similar contrast between ‘embedded’ as compared with ‘marginalized’.

The concepts of Women in Development (WID) and Gender and Development (GAD) serve to capture the main distinction between approaches to promote the equality between men and women in international development (Ministry of Foreign Affairs, 1998).

The advocacy for gender mainstreaming is very successful and the ideas gain ground during the decade between the UN World Conferences on Women in Nairobi 1985 as stated by Ria Brouwers (2013). The Beijing (1995) embraced the term gender mainstreaming as a strategy to redress women’s unequal position in twelve critical areas of concern, including education, health, armed conflict, as victims of violence, economy, decision making and human rights. In every context the technique of gender mainstreaming is proposed in a uniform way, that Governments and other actors should promote an active and visible policy of mainstreaming a gender perspective in all policies and programs, so that, before decisions are taken, an analysis is made of the effects for women and men, respectively (Charlesworth, 2005).

During the World Conference on Women (1975), the General Assembly identified three key objectives that become the basis for mainstreaming gender in development work with focus on

gender equality and the elimination of gender discrimination, the integration and full participation of women in development as well as women's contribution in the strengthening of world peace. The progress was reviewed in a conference in Copenhagen on Nations Decade for Women: Equality, Development and Peace followed by a final review in Nairobi 1985 before the Beijing declaration in 1995. Further, Norad (2005) recommended that political commitment expressed in goals and objectives needs to be translated into a political commitment to making women and gender an active and visible part of dialogue, programming, and reporting, and that women and gender should be considered as across cutting issue at all levels of economic development, Norad (2004). To make substantial headways in gender mainstreaming, UNDP (2006) observes that performance targets and oversight mechanisms with regard to gender mainstreaming need to be included in results competence assessments of all program implementers.

Most importantly, food and nutrition insecurity is a gender justice issue. Low status and lack of access to resources mean that women and girls are the most disadvantaged by the inequitable global economic processes that govern food systems and by global trends such as climate change. Evidence shows strong correlations between gender inequality and food and nutrition insecurity – for example, despite rapid economic growth in India, thousands of women and girls still lack food and nutrition security as a direct result of their lower status compared with men and boys. Such inequalities are compounded by women and girls' often limited access to productive resources, education and decision-making (FAO, 2014)

According to Bridge (2014), women literally 'feed the world'. Despite their limited access to either local or global markets they constitute majority of food producers in the world and usually manage their families' nutritional needs. They achieve this despite entrenched gendered inequalities and increasing volatility of food prices. Yet their own food security and nutrition needs – and often

those of their daughters – are being neglected at the household level, where discriminatory social and cultural norms prevail.

2.3 Conceptual Framework

The conceptual framework illustrates the relationship between dependent and the independent variables as shown in figure 2.1.

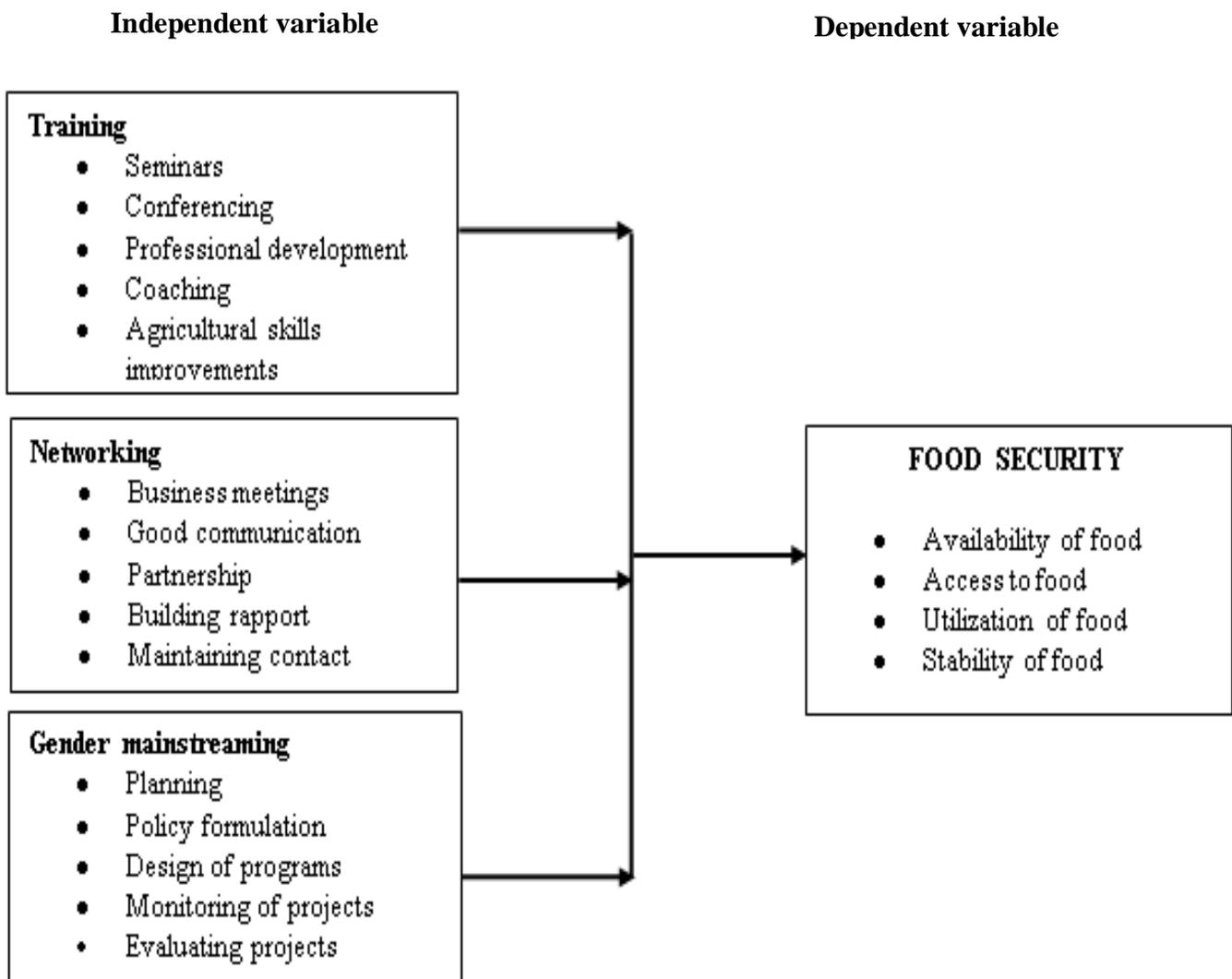


Figure 2.1: Conceptual Framework

Figure 2.1 is a conceptual framework of capacity building interventions and food security. Capacity building interventions is the independent variable and consists of training, networking and gender mainstreaming. On the other hand, food security is the independent variable and is measured through availability of food, access to food, utilization of food and stability of food.

2.4 Empirical literature review

In this section, an empirical literature review of capacity building interventions and food security is discussed. In particular, it discusses: training and food security; networking and food security; and gender mainstreaming and food security.

2.4.1 Training and food security

Agricultural training intervention is any type of programme that aims at facilitating transfer of knowledge or skills on topics that are of agricultural benefit to farmers. Training interventions for farmers vary considerably. Some interventions focus directly on teaching farmers new skills using top-down ‘training and visit’ methods. Governments often package such interventions as extension services, a broad term for programmes which aim to ‘support and facilitate people engaged in agricultural production to solve problems and to obtain information, skills and technologies’ (Anderson 2007).

Although traditionally considered a top-down approach to training and extension services have over time become more participatory in nature (Waddington et al. 2014). Farmer field schools in particular, which may be one component of broader agricultural extension services, use a more

bottom-up approach to training and knowledge transfer. Farmer field schools are participatory, empowering and experiential in nature, focusing on problems and priorities identified by the farmers, rather than on issues and challenges determined by outsiders (Waddington et al. 2014).

According to the World Summit declaration on Food Security (2009) food security exists when all people, at all times, have physical and economic access to sufficient, safe, nutritious food to meet their dietary needs and food preferences for an active life (FAO, 2013). Food security is the availability of food and one's access to it.

An assessment of the composition of the poor and hungry indicates that they are mainly smallholder farmers, including livestock keepers, crop farmers and those dependent on natural resources such as forests and fisheries for their livelihoods. Roughly half of the 1 billion hungry in 2009 were smallholder farmers, 22 % are rural landless, 20 % are the urban poor, and 8 % are populations that depend mainly on natural resources, such as fishers, herders, and forest dwellers (Scherr, Wallace & Buck 2010). However questions remain on whether these groups can organize to have to express their needs in improving production so they can have secure livelihoods.

These clusters imply the eventual emergence of different interest groups around agricultural production but without adequate mobilization and support structures for these communities to make an input into the policies designed to improve their lives, chances are that they will remain locked in a dependence cycle that leaves them vulnerable to all kinds of shocks natural and economic. The sheer numbers of households dependent on smallholder agriculture for their livelihoods makes this an important aspect of food security in the developing world, particularly in Sub Saharan Africa (Pasteur, 2009).

2.4.2 Networking and food security

In this sub section, empirical studies about gender networking and food security are discussed. Networking means farmers working with other farmers or other institutions without any formal contracts with a view to accessing some gains. These may include supplier relationships, resource flows, trade association memberships, interlocking directorates, relationships among individual farmers, and prior strategic alliances (Nanthagopan, 2010).

In line with Public Policy Statements (2007) on community food security position of dietitians of Canada, it was recognized that community food security has broad scope that emphasize systematic and comprehensive approach to promote food security for everyone, and implicitly recognize the role of the larger food system in ensuring food security. Public Policy Statements (2007) reported that community food security involves long-term planning with a wide range of stakeholders working together toward a healthy, just, and sustainable food security system. Dietitians of Canada strongly encourage networking amongst themselves about issues, processes and advocate individually through participation in coalitions for the development and implementation of policies and programs that improve food security.

According to Innes-Hughes, Bowers, King, Chapman and Eden (2010), their paper on food security, food access was increasingly recognized as a key determinant of food security. In their view access was a subject of market influences and can be achieved through trade, bartering and community support networks. Innes-Hughes, *etal* (2010) also analyzed food security systems on a large and small scale, from global, national, and regional levels. Household and individual levels were also analyzed with the observation that food security systems occur at multiple levels and linked in such a way that problems at global or national levels affect people at individual and household levels. However, food security systems may also operate inequitably, creating wide variations in food availability, access and utilization which can lead to food deficiency.

Food security position paper presented by The Regional Universities Network- RUN (2013) in fields critical for food security- production, postproduction and in maintenance of resource base, at relevant ecological, social and economic dimensions engage professionals with knowledge, skills, expertise and development capacity to pioneer advances in food security in Australia. Such professionals uniquely network with food producers and collaboratively drive and oversee the adoption of innovation for food security.

A study conducted by Masi, Holley, Jack, and Leslie (2014) on the future of food security in stark county revealed that hunger networks are the most developed. A dense core indicated a number of leaders with connections to peripheral groups. However, the network was vulnerable, with small number of people serving as the main connectors to others. Supportive and local food sectors were observed to have much less developed networks with no evidence of core and scattered connections. Supporting organizations do appear to provide a potential “bridging” role between individuals involved with hunger and local food with the view that addressing food security comprehensively require a greater degree of connectivity between hunger organizations and others that can provide additional supports or sources of local, healthy foods.

Omosa (2013) while investigating the role of social relations and networks in household food security and nutrition in Kenya observed that ability to access and consume nutritious food is to some extent an outcome of membership and relationships with other members of the society such as daughters, sisters, mothers, daughter-in-laws, aunts, cousins, grandchildren, development sociologists, employees, land owners, and even students. Also, being able to access nutritious foods from any relatives, networks and market through gifts, exchange arrangements, loaning or purchase was also observable. However, individuals and households were no longer able to rely to a large extent on membership in society in achieving food and nutritional security.

According to Anne (2013) on the publication Kenya food security brief, in parts of the high potential farming livelihood zones, markets are highly connected within the livelihood zones and with key urban centers, due to a fairly sophisticated trade infrastructure. In these areas, distances from markets are relatively low, and there are a number of market participants across the marketing chain, thus minimizing transaction costs. Subsequently, food price fluctuations are fairly low leading to improved food security. However, poor market infrastructure, particularly in northern parts of the country, restricts access to markets and results in higher transactions costs, more price fluctuations and volatility, and higher prices with a lot of food insecurity.

According to Lamb (2011) in a thesis investigating the relationship between smallholder farm household networks for food acquisition and agricultural production, food security and dietary quality in the Mount Elgon region of western Kenya and eastern Uganda revealed that both food acquisition networks and technology networks for agricultural production had a statistically significant positive impact upon calorie procurement across the sites included in the study. However, networks for agricultural production appeared to operate differently in various locations with regard to dietary quality.

2.4.3 Gender mainstreaming and food security.

In this sub section, empirical studies about gender mainstreaming and food security are discussed. Gender mainstreaming is the process of assessing the implications for women and men of any planned action, including legislation, making women's as well as men's concerns and experiences integral dimensions in the design, implementation, monitoring and evaluation of policies and programmes in all political, economic and social spheres so that women and men benefit equally and inequality is not perpetuated (FAO, 2011).

A study commissioned by Asian Development Bank (2013) on gender equality and food security-women's empowerment as a tool against hunger reported that women's empowerment is not only a priority goal in itself but an intrinsic human right; recognized as such in pledges and commitments by governments. The report recognized instrumental value of gender equality and conditions for the society as factors leading to increased contribution of women to food security and adequate nutrition. Asian Development Bank (2013) further reported that the society urgently needs full potential of women's contribution, which can only materialize with wider recognition and acknowledgment by both women and men alike if it has to benefit all in the society.

A study conducted by FAO (2010) office of knowledge exchange, research and extension reported gender: inequalities along the entire food production chain, "from farm to plate" impede the attainment of food and nutritional security; inequalities in access to productive resources (land, labour, fertilizer, credit, technology, extension and markets) for example, negatively affect food availability; relations between and among men and women are important in determining vulnerability to food insecurity and malnutrition; and discrimination in the allocation of household resources, including those related to nutrition, may result in an increased incidence of malnutrition among women and girls.

Food and nutrition insecurity is a gender justice issue. Low status and lack of access to resources mean that women and girls are the most disadvantaged by the inequitable global economic processes that govern food systems and by global trends such as climate change. Evidence shows strong correlations between gender inequality and food and nutrition insecurity – for example, in India, thousands of women and girls still lack food and nutrition security as a direct result of their lower status compared with men and boys. Such inequalities are compounded by women and girls'

who often have limited access to productive resources, education and decision-making (Bridge, 2014).

Empowering women and girls is not just necessary for their well-being, but also a means to broader agricultural development and food security, and economic soundness. Studies in Africa show that, if women farmers were given the same access to resources (such as land, finance and technology) as men, their agricultural yields could increase by 20 to 30 percent; national agricultural output could rise by 2.5 percent; and the number of malnourished people could be reduced by 12 to 17 percent (Senay, Tim, Lucy & Agnes, 2012). Senay, *etal.* (2012) observed that eliminating gender-based discrimination under the law, ensuring gender-sensitive policies and programming decisions, and giving women greater voice in decision-making at all levels are necessary for mainstreaming gender in agriculture and enhancing food security.

Senay, *etal* (2012) studied sustainable rural livelihoods programme in eastern Uganda designed to improve food security, nutrition and health at the household and community levels. The programme enriched women's human capital through training and experience gained in developing leadership skills, improved nutrition and health, and community wide respect for sources of valuable knowledge. Women who were involved in farm groups and emerging marketing associations observed significant increase in household food security.

According to Kassie, Wagura, and Shiferaw (2012) women in Kenya face significant barriers in agriculture, especially inequalities in access to and control over crucial resources and inputs such as land, labour, fertilizer and formal finance. Women also face barriers to membership in rural organizations and cooperatives, agricultural inputs and technology such as improved seedlings, training and extension as well as in marketing services. Kassie, Wagura, and Shiferaw (2012)

found that in Kenya female headed households are 13 per cent less likely to be food secure than male headed households. Their study also found that female headed households face 12 per cent higher probability of chronic and transitory food. This was observed could be attributed to gender based discrimination, which renders female-headed households more vulnerable to food insecurity and poverty.

2.5 Critique of the literature

Majority of the rural poor in Africa engage in smallholder farming as a livelihood strategy. At the same time, supporting the practice of smallholder agriculture holds the potential to improve farming households' level of food security as well as local economies in rural areas. Agricultural productivity in Africa stands at one-third to half of global productivity and, although the Green Revolution has rapidly improved social and economic livelihoods in other former developing regions, it is by and large absent from the continent (Stewart et al, 2016).

Of the 800 million people who live in sub-Saharan Africa, around 500 million (63 percent) live in rural areas (Livingston *et al.* 2011). The rural poor are predominantly smallholder farming households, whose agricultural production and income is insufficient to maintain secure livelihoods (FAO *et al.* 2013). At the same time, agriculture remains the primary sector of most national economies in Africa (Masset *et al.* 2011), and African states obtain most of their national food supply from smallholder farmers (AGRA 2013). National and international development policymakers regard rural development as key to sustainable national socio-economic development (IFAD 2011; Word Bank 2007). As a result, they are increasingly supporting smallholder farmers.

Despite their potential to improve national food supply and foster local economic growth, smallholder farmers in Africa are one of the most impoverished population groups. With less than US\$2 per day, a smallholder farmer's average income from agricultural production is not enough to meet household needs and to finance investment (AGRA 2014; IFPRI 2011). Subsistence farmers are at constant risk of food insecurity due to small plot size, low use of agricultural inputs such as fertilizers and unfavorable soil and climate conditions. The Alliance for a Green Revolution in Africa (AGRA) estimates that 223 million people in Africa, most of whom live in rural areas, do not meet their dietary needs and are undernourished (AGRA 2014). The 2014 Global Nutrition Report found high rates of stunting and wasting are particularly prevalent in smallholder households (IFPRI 2014).

The African agricultural sector underperforms when compared to global productivity and output rates (IFPRI 2011; AGRA 2013). For example, between 2000 and 2010, average grain yields in Africa were 1.1–1.5 tonnes per hectare: between one-third to one-half of the global average of 3.2 tonnes per hectare. This discrepancy in performance is largely attributed to the slow spread and adoption of green revolution technologies in Africa (Terry 2012; World Bank 2007). High-yielding seed varieties, the use of fertilizers and irrigation techniques are the main inputs that have been driving rural development since the 1980s, resulting in large-scale development successes, particularly in Asia (World Bank 2007). But African smallholder farmers have been slow to make use of such technologies for various reasons, including limited market access and climate conditions (Terry 2012).

2.6 Research Gaps

Although there are interventions, namely; training, networking and gender mainstreaming in the capacity building literature, their study in relation to food security is too general. The studies bring out merely descriptions of food security and intervention situations and stops at that. The studies bring out neither the attribution of each of the interventions nor their contributions in the attainment of the food security. It is this gap that the study tried to bridge through succinct hypothetical testing and brought out the attributions and contributions of each of the capacity building variables for the first time.

2.7 Summary

This chapter reviewed the literature that informs the formation of study variables. In particular, it reviewed the theoretical framework where training theory, networking theory and gender mainstreaming theory were reviewed. Conceptual framework was then modelled. Empirical literature review, critiques of the literature and research gaps are presented.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Introduction

In this chapter, research methodology is presented. In particular, it presents research design, target population, sample size and sampling technique, data collection methods, validity of research instrument, reliability of research, data analysis and presentation and ethical consideration are presented.

3.2 Research Design

Research design is a way a study is designed to be carried out. It is a plan that is used to generate answers to research problems. It is a blueprint for conducting a study with maximum control over factors that are likely to interfere with the validity of the findings (Kothari, 1990). The study employed both descriptive survey and correlation designs. Descriptive survey design was considered suitable because it did not only involve analysis of the situation as it was without manipulation of data but also involved measurement, classification, comparison and interpretation of data (Kothari, 1990). In view of the current study, descriptive design was used to describe how capacity building interventions of smallholder farmers relates to food security situation in Siaya County, Kenya. According to Saunders, Lewis and Thornhill (2009), correlation is the degree to which two or more variables relate. Correlation design was used to assess the degree of relationship that existed between capacity building interventions and food security situation in Siaya County.

3.3 Target population

A population is a complete set of elements, persons or objects that possess some common characteristics. Target population is a particular group of people that is identified as the recipient for the purpose of a study or a set of elements having a trait of concern that are being investigated (Mugenda and Mugenda, 2003). The target population of the study comprised an aggregate of 199,034 smallholder farmers from Siaya County (Institute of Economic Affairs, 2011). The distribution is shown in table 3.1.

Table 3.1: Distribution of the target population

Sub County	Respondents	Respondents (%)
Alego	42,593	21.4
Bondo	29,457	14.8
Rarieda	28,462	14.3
Gem	29,059	14.6
Ugunja	29,059	14.6
Ugenya	40,404	20.3
Total	199,034	100.0

Source: Institute of Economic Affairs (2011)

3.4 Sample size and sampling technique

Sample design is a joint procedure of identifying the population of interest, estimating the sample size, deciding on appropriate sampling technique and selecting representatives from the population (Yogesh, 2006). In order to arrive at the required sample size, Fisher's model as cited in Mugenda and Mugenda, (2003) was used. In the model, when the target population is more than 10,000 the sample size may be approximated by

$$n = \frac{z^2 pq}{d^2}$$

where

p = Proportion of target population with traits being investigated;

q = Proportion of target population without traits being investigated represented by $(1 - p)$;

d = Statistical level of significance set; and

z = Normal statistical deviation

The model further outlines that if the proportion of the target population with the trait being investigated is not known then 50% is considered appropriate. At 95% confidence level

$$\therefore n = \frac{1.96^2 \times 0.5 \times 0.5}{0.05^2} \\ \approx 384$$

The distribution of the sample size is shown in table 3.2.

Table 3.2: Sample distribution

Sub County	Respondents	Respondents (%)
Alego	82	21.4
Bondo	57	14.8
Rarieda	55	14.3
Gem	56	14.6
Ugunja	56	14.6
Ugenya	78	20.3
Total	384	100.0

Source: Adapted from Institute of Economic Affairs (2011)

In order to collect data from the estimated sample, the study adopted stratified random sampling.

The strata were sub counties within Siaya County from which smallholder farmers were selected

randomly. This was appropriate because of the homogeneity of farmers within each sub county. The units of the study were small holder farmers in each in each sub county. The sample size in each sub county was apportioned in proportion to the target population. This technique was most appropriate for the current because of its ease of administration and homogeneity of small holder farmers in each Sub County (Mugenda and Mugenda 2003). According to Denscombe (2007), the technique was more appropriate because the researcher could assert some control over the selection of the sample in order to guarantee that crucial smallholder farmers or factors were covered in proportion to the manner in which they existed in the wider population. This helped the researcher in making generalizations from the findings of the study.

3.5 Research Instrument

The study used structured questionnaire as data collection instrument. A questionnaire is a research tool designed to collect data, which can be used subsequently for analysis. It consists of a written list of questions. Each person who answers a particular questionnaire reads an identical set of questions to allow for consistency and precision in terms of wording the questions (Denscombe, 2007; Kothari, 1990; Oso & Onen, 2009). Questionnaire was considered appropriate for the study because it was: of relatively low cost; easy to arrange; standardized in answers provided to the extent that all respondents were exposed to exactly the same set of questions; and pre-coded in answers for easy management at analysis (Denscombe, 2007). In particular, standardized questionnaire showing capacity building interventions of small holder farmers and food security indicators was used. The questionnaire was divided into three sections, namely; demographic characteristics of small holder farmers, capacity building interventions and food security. Demographic characteristics included: sex; age; marital status; highest level of education; primary occupation; land ownership; and types of crops grown. Capacity building interventions included:

training; networking; and gender mainstreaming. Food security considered both physical and economic conditions of the small holder farmers.

3.6 Piloting

Piloting is trying out a study in small scale to determine whether or not the study will produce expected results (Creswell, 2009). This stage was crucial in research process because it enabled the researcher to detect problems or weaknesses that could have been encountered during the main research. Piloting was conducted with smallholder farmers in Rarieda Sub County. According to Yogesh (2006) in order for piloting results to be valid, it should involve respondents' equivalent to 10% of the sample size. In the current study, 38 smallholder farmers were randomly selected and engaged in piloting the questionnaire.

3.6.1 Instrument Validity

Validity is the extent to which the results of the study can be accurately interpreted and generalized to the populations (Mugenda and Mugenda, 2003). The questionnaire was tested to check its content, construct and face validity. Content validity was done to ensure that contents of the instrument contained adequate sample of the domain of content it was supposed to represent. Face validity deals with the format of the instrument and includes aspects like clarity of printing, font size and type, adequacy of workspace, and appropriateness of language among others. Construct validity determine the nature of psychological constructs or characteristics measured by the instrument. Validity was ensured through the use of research experts who were research supervisors at Jomo Kenyatta University of Agriculture & Technology. The questionnaire was given to the supervisors to evaluate and rate each item in relation to the objectives as not relevant or relevant on the 1-4 scale. Validity index was determined from the ratio $n_{3/4}/N$ as .82, where $n_{3/4}$

was the number of items marked 3 or 4 by both supervisors, and N was the total number of items assessed. The score was above the recommended minimum validity index of .70 (Oso & Onen, 2009). The questionnaire was therefore valid.

3.6.2 Instrument Reliability

Reliability is the extent to which research results are consistent and replicable (Amin, 2005; Kothari, 2011). Reliability is the consistency of scores when the research instrument is administered from one set of items to another, and also from one point in time to another (Frankel & Wallen, 2006). The instruments was pre-tested for reliability using Cronbach alpha (α) with a sample of 10% of smaller holder farmers randomly selected from the Rarieda Sub County. Ten percent was chosen for pre-test because it is the smallest number that yields meaningful results in data analysis of a survey research Yogesh (2006). The reliability index of .809 was computed and since it was greater than 0.7 the minimum recommended value the questionnaire was accepted as reliable.

3.7 Data collection method

Before the administration of the research instruments, there was need to seek for permission from the relevant authorities. Permission to collect data was sought from The School of Graduate Studies Jomo Kenyatta University of Agriculture and Technology. Notification letters were thereafter be sent to village heads in the Sub Counties. While doing this, the researcher was cautious that short-circuiting proper channels of authority could have been dangerous may have led to difficulty in getting data (Denscombe, 2007). Research assistants were: thoroughly trained on research ethics; made to understand the instructions and content of the instruments; instructed to take all measurements in the most consistent manner across all respondents; and advised to

record and compile data accurately. Data collection took two weeks. A check list was used to monitor the despatch and return of questionnaires.

3.8 Data analysis and presentation

Data analysis is the examination of what has been collected and making deductions and inferences hence a process which involves uncovering underlying structures, extracting important variables, detecting any anomalies and testing any underlying assumptions (Yogesh, 2006).

Preliminary to entering data in Statistical Package for Social Sciences version 20 ready for processing, completed questionnaires was: edited for consistency; and coded to enable the responses to be grouped into appropriate categories. Both descriptive statistics and inferential statistics were used to analyze quantitative data. Descriptive statistics was used to analyze demographic characteristics while inferential statistics was used to analyze data on how capacity building interventions contribute to food security. Results of the analysis were presented through tables with written interpretations and discussions of results.

Objectives one to three were analyzed through simple linear regression models assessing the contribution of each of the capacity building interventions to food security. The general simple linear regression model used was

$$y = \beta_0 + \beta_1 x + \varepsilon \tag{3.1}$$

In model 3.1, y represented food security and x represented each of the explanatory variables, namely; training, networking and gender mainstreaming. The term ε was the *residual* or *error* and represented the deviation of the observed value of food security from that expected from the model. β_0 and β_1 were constants to be determined.

The contribution of joint capacity building interventions on food security was analyzed through multiple linear regression model

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_q x_q + \varepsilon \quad (3.2)$$

Model 3.2 was a general linear multiple regression model for the change in food security, y , with respect to changes in observed q capacity building interventions x_1, x_2, \dots, x_q . The term ε was the *residual* or *error* and represents the deviation of the observed value of food security from that expected from the model. The error term was assumed to have a normal distribution with variance σ^2 . $\beta_0, \beta_1, \beta_2, \dots, \beta_q$, were coefficients to be determined.

CHAPTER FOUR

4.0 DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

In this chapter, data is analyzed, presented, interpreted and discussed. In particular, response rate, bio data of the respondents, land ownership and types of crops cultivated, and capacity building interventions and food security are analyzed, presented, interpreted and discussed.

4.2 Response rate

In this section, data was provided on the extent respondents' participated in the study. The details are shown in table 4.1.

Table 4.1: Response rate

Categories	Respondents	Respondents (%)
Response	351	91.4
None response	33	8.6
Total	384	100

Source: Survey data (2017)

Table 4.1 shows that out 384 questionnaires distributed 91.4% (351) were properly filled and returned. The non response proportion accounted for 8.6% (87). According to Mugenda & Mugenda (2003) a response rate of at least 50% is considered adequate for data analysis. In this regard the response rate for this survey was considered adequate to generate accurate results.

4.3 Bio data of the respondents

In this section, bio data of the respondents is analyzed. In particular, gender of the respondents, age of the respondents, level of education of the respondents, marital status of the respondents, and primary occupation of the respondents.

4.3.1 Gender of the respondent

In this sub section, data on gender of the respondents was sought. This was necessary to show whether the researcher recognized the roles of both males and females in research participation.

The details are provided in table 4.2.

Table 4.2: Gender distribution of the respondents

Gender	Respondents	Respondents (%)
Males	176	50.1
Females	175	49.9
Total	351	100.0

Source: Survey data (2017)

Table 4.2 shows that of the 351 respondents who participated in the study, 50.1% (176) were males, while 49.9 % (175) were females. This shows that there was equity in genders participation in the study.

4.3.2 Ages of the respondents

In this case, data was sought on the ages of the respondents who participated in the survey. Age was important as a matter of mental maturity in understanding items in the questionnaire. The results are shown in table 4.4.

Table 4.3: Ages of the respondents

Age bracket	Respondents	Respondents (%)
<20	7	2.0
20-29	69	19.7
30-39	105	29.9
40-49	59	16.8
>49	111	31.6
Total	351	100.0

Source: Survey data (2017)

Table 4.3 shows that 2.0% (7) of respondents were below 20 years of age, 66.4% (233) were between 20 years and 49 years of age, while 31.6% (111) were above 49 years of age. This shows that a large proportion of the respondents was in their vibrant and energetic age and had knowledge and mental maturity to handle tasks related to food security in their households. They therefore had adequate understanding of capacity building and food security issues in their households.

4.3.3 Level of education of respondents

Data was sought on the highest educational level of the respondents. This was necessary in measuring their fluid and crystallized intelligence on issues related to food security. The details are shown in table 4.5.

Table 4.4: Level of education of respondents

Level of education	Respondents	Respondents (%)
No formal education	52	14.8
Primary	117	33.3
Secondary	112	31.9
Tertiary	52	14.8
University	18	5.1
Total	351	100.0

Source: Survey data (2017)

Table 4.4 shows that out of the 351 respondents who took part in the survey, 14.8%(52) had no formal education, 33.3% (117) had primary education, 31.9% (112) had secondary, 14.8% (52) had tertiary, and 5.1% (18) had university. This shows 51.8% (182) had secondary education, tertiary education and university education. They had the capacity of working memory, abstract reasoning, paying attention, processing complex information, use of vocabulary, and comprehension. They therefore had an advantage in responding to capacity building and food security issues in the questionnaire.

4.3.4 Marital status of the respondents

Data was sought on the marital status of the respondents. This was necessary in defining their responsibility in terms of household food security management. The findings are shown in table 4.6.

Table 4.5: Marital status of the respondents

Marital status	Respondents	Respondents (%)
Single	53	15.1
Married	197	56.1
Married and Polygamous	37	10.5
Widow/widower	64	18.2
Total	351	100.0

Source: Survey data (2017)

Table 4.5 shows that out of the 351 respondents who took part in the study, 15.1% (53) were single, 56.1% (197) were married, 10.5 % (37) were married and polygamous and 18.2 % (64) were widows/widowers. This shows that a large proportion of the respondents, 84.9% (298) were household managers and were well a breast with food security management issues. They therefore understood the items in the questionnaire.

4.3.5 Primary occupation of the respondents

Data was sought on the primary occupation of the respondents. This was necessary to assess their level of participation in small holder farming. The findings of the study are shown in table 4.6

Table 4.6: Primary occupation of the respondents

Primary occupation	Respondents	Respondents (%)
None	10	2.8
Farmer	200	57.0
Agricultural labourer	28	8.0
Shop owner	40	11.4
Hawking	11	3.1
Boda boda	20	5.7
Selling food	29	8.3
Tailor	15	4.3
Fishing	11	3.1
Raising livestock	46	13.1
House worker	11	3.1
Driver	11	3.1
Others	44	12.5

Source: Survey data (2017)

Table 4.6 shows that primary occupation of majority of the smallholder farmers was farming 57.0% (200). This was followed by raising livestock at 13.1% (46) and then shop owners (11.4%). The proportion without primary occupation was 2.8% (10). The result shows that a large proportion of the smallholder farmers had some primary occupation generating income to supplement farm output for sustainability of food security.

4.4 Land ownership and types of crops cultivated

In this section, data on land ownership and types of crops cultivated by smallholder farmers was sought. In particular, it covers land ownership of smallholder farmers, types of crops cultivated and planting of maize and beans.

4.4.1 Land ownership of smallholder farmers

Data was sought on who owns the land household was farming. This was important because land ownership is directly linked to food security of a particular household. The results are shown in table 4.7.

Tab 4. 7: Land ownership

Land ownership	Respondents	Respondents (%)
Family land	284	80.9
Leased	82	23.4
Total	366	104.3

Source: Survey data (2017)

Table 4.6 shows out of the 351 respondents who took part in the survey, 80.9% (284) used family owned land for farming while 23.4% (82) leased land for farming. This results shows that there was adequate family owned lands in Siaya County and therefore could be used effectively to achieve household food security

4.4.2 Type of crops cultivated

Data on the type of crops cultivated was sought. This was necessary to assess whether the farmers had the right of crop mix that could guarantee food security. The results are shown in table 4.8.

Table 4.8: Types of crop cultivated

Types of crop	Respondents	Respondents (%)
Maize	339	96.6
Beans	319	90.9
Cowpeas	71	20.2
Sorghum	128	36.5
Groundnuts	97	27.6
Cabbage	15	4.3
Kale	76	21.7
Sweet potatoes	149	42.5
Tomatoes	62	17.7
Onions	37	10.5
Other grains/cereals	29	8.3
Other vegetables	38	10.8
Bananas	104	29.6
Napier grass	90	25.6
Soya beans	22	6.3
Green grams/lentils	3	3.7
Others	28	8.0

Source: Survey data (2017)

Table 4.8 shows of the 351 respondents who took part in the survey, 96.6% (339) cultivated maize, 90.9% (319) cultivated beans, 36.5% (128) grew sorghum, 27.6%(97) cultivated groundnuts, 21.7% (76) grew kales, 42.5% (149) grew sweet potatoes, 29.6% (104) cultivated bananas, 25.6% (90) planted Napier grass, 10.5%(37) cultivated onions, 8.3% (29) planted other grains/ cereals, 6.3% (22) cultivated soya beans, 4.3%(15) cultivated cabbage and 3.7%(3) grew green grams/lentils. The results shows despite the fact that most smallholder farmers in Siaya County cultivating varieties of crops, maize, beans, sorghum and sweet potatoes supported them immensely in terms of food security.

4.4.3 Planting of maize and beans

Data was sought on how smallholder farmers grow their maize and beans in the county. This was necessary to show good land management practices with a view to boosting crop yield towards food security. The findings are shown in table 4.9.

Table 4. 9: Planting of maize and beans

Planting type	Respondents	Respondents (%)
Separately	131	37.3
Intercropped	220	62.7
Total	351	100.0

Source: Survey data (2017)

Table 4.9 shows that of the 351 respondents who took part in the survey, 37.3% (131) planted maize and beans separately. The remaining 62.7% (220) of the respondents practiced intercropping. The findings show that most of the small holder farmers practiced intercropping, which is a good form of land management for food security.

4.5 Capacity building interventions and food security

In this section, data was sought on capacity building interventions and food security. In particular, it dwells on: contribution of training to food security; contribution of networking to food security; and contribution gender mainstreaming to food security.

4.5.1 Contribution of training to food security

The contribution of training of smallholder farmers to food security is analyzed, presented and interpreted. Descriptive statistical results of valid data items, means and standard deviations for training and food security are shown in table 4.10.

Table 4.10: Descriptive statistics for training and food security

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Training	351	4.12	.45	-.69	.13	1.82	.26
Food Security	351	4.30	.36	-.53	.13	1.90	.26

Key: 1.0 - 1.4- strongly disagree; 1.5 - 2.4- disagree; 2.5 - 3.4- not sure; 3.5 - 4.4-agree; 4.5 - 5.0-strongly agree

Source: Survey data (2017)

Table 4.10 shows the means and standard deviations for training (M=4.12; SD= .45). There was general agreement that training programs were being practiced in Siaya County. Training was achieved through: engagement in seminars; engagement in conferencing; continued professional development; coaching programs; mentoring programs; and literacy improvement programs. Table 4.10 also shows the mean and standard deviation for food security (M=4.30; SD=.36). There was general agreement that Siaya County had improved food security; that is, there was improvement in food availability, accessibility; utilization and stability.

Table 4.10 also shows test for normality of error distributions for the study variables: training; and food security through skewness and kurtosis. According to Tabachnick and Fidell (2007) the distribution of a variable is considered normal if its kurtosis and skewness value falls in the interval -2.0 and +2.0. Table 4.10 shows the variables training and food security had their values of skewness and kurtosis within the recommended interval. Normality test was therefore satisfied.

Though table 4.10 shows training took place in Siaya County and there was improved food security, it could not show how training contributed to food security. Moreover, the mean for food security was higher than that for training by some points casting doubt as to whether there was a correlation between them. Simple linear regression analysis was therefore sought. The simple linear regression model was

$$y = \beta_0 + \beta_1 x + \varepsilon \quad (4.1)$$

The response variable y was food security and the explanatory variable x was training. The term ε was the *residual* or *error* and represented deviation of observed values of food security from those approximated by the model.

Preliminary tests on model 4.1 were satisfied. The contribution of training to food security was therefore examined. The contribution was tested at 5% significance level. The results are shown in table 4.11.

Table 4.11: Regression analysis for training and food security

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	3.436	.172		20.004	.000
1 Training	.210	.041	.262	5.074	.000
Best line of fit					
R=.262 ^a					
R ² =.069					
Adjusted R ² =.066					
F _{ratio} =25.744					
P<.05 ^b					

a. Dependent Variable: Food Security

b. Predictors: (Constant), Training

Source: Survey data (2017)

Table 4.11 shows a weak degree of statistically significant positive correlation (R=.262; p<.05) between training and food security. R-square of .069 measured part of food security, which was explained by training. It showed that approximately 6.9% of the variation in food security was attributed to variation in training initiatives. The adjusted R-square provided an idea of how the model could have been generalized. It should have been close to R-square as much as possible if not the same. In the study, the difference from the final model was small; i.e. .003 or .3%. This meant that if the model was derived from the population rather than a sample, then it could have accounted for approximately .3% less variance in results. The linear regression model was statistically significant ($F_{ratio} = 25.744$; $p < .05$). Standardized beta coefficients, showed that for one standard deviation increase in training practices, food security improved by approximately .262 units.

Table 4.11 and model 4.1 also provides the optimum simple linear regression equation between training and food security as

$$Y = 3.436 + .210x \quad (4.2)$$

The linear regression model 4.2 provided a statistically significant correlation ($R = .262$; $p < .05$) between variation in food security and training. The model was 6.9% explained by the variation in training. The linear regression model 4.2 also showed that without training, food security situation was measured by approximately 3.436 units and for every unit increment in training, food security situation improved by .210 units.

While the current study described training of smallholder farmers as: engagement in seminars; engagement in conferencing; continued professional development; coaching programs; mentoring programs; and literacy improvement programs, Anderson (2007) described training of farmers as teaching farmers new skills using top-down approach through extension services aimed at supporting and facilitating people to engage in agricultural production for food security management. Despite this Waddington et al. (2014) viewed training as participatory in nature and uses bottom-up approach to transfer knowledge identified as priorities by farmers, rather than issues and challenges determined by outsiders. Though the current study linked training to food security, studies conduct by Anderson (2007) and Waddington et al. (2014) failed to link training to food security. Moreover, while the current study revealed use regression models, Anderson (2007) and Waddington et al. (2014) were not particular about models of analysis.

World Summit declaration on Food Security(2009) described food security to exist when all people, at all times, have physical and economic access to sufficient, safe, nutritious food that meets their dietary needs and food preferences for an active life. In this perspective, food security

was viewed as the availability of food and one’s access to it (FAO, 2013). The description of food security by FAO (2013) was in concurrence with what was described in the current study. The current study described food security as availability of food, access to food, utilization of food and stability of food. More so, while FAO (2013) report did not link food security to training, the current study advanced knowledge by linking training to food security. This was advanced by bringing the contribution of training to food security.

4.5.2 Contribution of networking to food security

The contribution of networking of smallholder farmers to food security is analyzed, presented and interpreted. Descriptive statistical results of valid data items, means and standard deviations for networking and food security are shown in table 4.12.

Table 4.12: Descriptive statistics for networking and food security

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Food Security	351	4.30	.36	-.53	.13	1.90	.26
Networking	351	4.17	.38	-.13	.13	.42	.26

Key: 1.0 - 1.4- strongly disagree; 1.5 - 2.4- disagree; 2.5 - 3.4- not sure; 3.5 - 4.4-agree; 4.5 - 5.0-strongly agree
Source: Survey data (2017)

Table 4.12 shows the means and standard deviations for networking (M=4.17; SD= .38). There was general agreement that networking programs were being practiced among smallholder farmers in Siaya County. Networking was achieved through: attending agricultural meetings; focusing on communication with other farmers; encouraging partnership with other farmers; accessing resources from other farm institutes; maintaining contact with other agricultural institutes; and interaction among smallholder farmers themselves. Table 4.11 also shows the mean and standard deviation for food security (M=4.30; SD=.36). There was general agreement that Siaya County

had improved its food security situation; that is, there was improved food availability, accessibility; utilization and stability.

Table 4.112 also shows test for normality of error distributions for the study variables: networking; and food security through skewness and kurtosis. According to Tabachnick and Fidell (2007) the distribution of a variable is considered normal if its kurtosis and skewness value falls in the interval -2.0 and +2.0. Table 4.11 shows the variables networking and food security had their values of skewness and kurtosis within the recommended interval. Normality test was therefore satisfied.

Though table 4.12 shows networking of smallholder farmers were being practiced in Siaya County and there was improved food security, it could not show how networking contributed to food security. Moreover, the mean for food security was higher than that for networking by some points casting doubt as to whether there was a correlation between them. Simple linear regression analysis was therefore sought. The simple linear regression model was

$$y = \beta_0 + \beta_1 x + \varepsilon \quad (4.3)$$

The response variable y was food security and the explanatory variable x was networking. The term ε was the *residual* or *error* and represented deviation of observed values of food security from those approximated by the model.

Preliminary tests on model 4.3 were justified. The contribution of networking to food security was therefore examined. The contribution was tested at 5% significance level. The results are shown in table 4.13.

Table 4.13: Regression statistics for networking and food security

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	3.268	.208		15.700	.000
1 Networking	.248	.050	.258	4.994	.000

Best line of fit
 $R = .258^a$
 $R^2 = .067$
Adjusted $R^2 = .064$
 $F_{ratio} = 24.942$
 $P < .05^b$

a. Dependent Variable: Food Security

b. Predictors: (Constant), Networking

Source: Survey data (2017)

Table 4.13 shows a weak degree of statistically significant positive correlation ($R = .258$; $p < .05$) between networking and food security. R-square of .067 measured part of food security, which was explained by networking. It showed that approximately 6.7% of the variation in food security was attributed to variation in networking initiatives. The adjusted R-square provided an idea of how the model could have been generalized. It should have been close to R-square as much as possible if not the same. In the study, the difference from the final model was small; i.e. .003 or .3%. This meant that if the model was derived from the population rather than a sample, then it could have accounted for approximately .3% less variance in results. The linear regression model was statistically significant ($F_{ratio} = 24.942$; $p < .05$). Standardized beta coefficients, showed that for one standard deviation increase in networking practices, food security improved by approximately .258 units.

Table 4.13 and model 4.3 also provides the optimum simple linear regression equation between networking and food security as

$$Y = 3.268 + .248x \quad (4.4)$$

The linear regression model 4.4 provided a statistically significant correlation ($R = .258$; $p < .05$) between variation in food security and networking. The model was 6.7% explained by the variation in networking. The linear regression model 4.4 also showed that without networking, food security situation was measured by approximately 3.268 units and for every unit increment in networking, food security situation improved by .248 units.

Public Policy Statements (2007) on community food security position of dietitians of Canada recognized that a larger food system had a role in ensuring food security. This was observed to involve long-term planning with a wide range of stakeholders working together toward a healthy, just, and sustainable food security system. While the current study cited networking strategies such as attending agricultural meetings; focusing on communication with other farmers; encouraging partnership with other farmers; accessing resources from other farm institutes; maintaining contact with other agricultural institutes; and interaction among smallholder farmers themselves, Public Policy Statements (2007) talked of stakeholders working together but did not specify what working together entails. Also the current study used linear regression models to reveal a metric contribution of networking to food security. Public Policy Statements (2007), however, was silent about the model of analysis and the metric contribution of stakeholders working together to food security.

Innes-Hughes, Bowers, King, Chapman and Eden (2010), in their paper on food security, observed that access to food through trade, bartering and community support networks was significant in enhancing food security. This was in agreement with the current study where networking smallholder farmers was achieved through: attending agricultural meetings; focusing on

communication with other farmers; encouraging partnership with other farmers; accessing resources from other farm institutes; maintaining contact with other agricultural institutes; and interaction among smallholder farmers themselves. Though the current study was very explicit about the model of analysis and even revealed the contribution of networking to food security, Innes-Hughes, Bowers, King, Chapman and Eden (2010) results was silent about the model used and did not reveal the metric contribution to food security.

The results of the current study was also in agreement with the paper on food security presented at The Regional Universities Network- RUN (2013) where it was observed that relevant ecological, social and economic dimensions engage professionals with knowledge, skills, expertise and development capacity to pioneer advances in food security in Australia. Such professionals uniquely network with food producers and collaboratively drive and oversee the adoption of innovation for improved food security. While the current study applied regression models to arrive at the results, RUN (2013) did not specify the model applied in linking networking strategies to food security.

Masi, Holley, Jack, and Leslie (2014) while studying the future of food security in stark county revealed that hunger networks are the most developed and a dense number of leaders with connections to peripheral groups had better standards of food security. However, while the current study was so specific on networking strategies, Masi, Holley, Jack, and Leslie (2014) did not specify their networking strategies. Also, while the current study was more objective through revealing metric results, Masi, Holley, Jack, and Leslie (2014) results were rather subjective in approach.

Omosa (2013) while investigating the role of social relations and networks in household food security and nutrition in Kenya observed that ability to access and consume nutritious food is to some extent an outcome of membership and relationships with other members of the society such as daughters, sisters, mothers, daughter-in-laws, aunts, cousins, grandchildren, development sociologists, employees, land owners, and even students. Anne (2013) however, observed networking with reference to poor marketing infrastructure, restricting access to markets resulting into higher transactions costs, price fluctuations and volatility, and higher prices with a lot of food insecurity. Omosa (2013) and Anne (2013) studies support of the current study where networking was seen to significantly contribute to food security. However, the dimensions of networking were different in both studies. Moreover, Omosa (2013) and Anne (2013) did not reveal networking metric contribution to food security.

The current study found that networking significantly contributed to food security in Siaya County. This was in agreement with Lamb (2011) study on the relationship between smallholder farm household networks for food acquisition and agricultural production, food security and dietary quality in the Mount Elgon region of western Kenya and eastern Uganda where both food acquisition networks and technology networks had a statistically significant positive impact upon calorie procurement. Moreover, both the current and Lamb (2011) studies used correlation models.

4.5.3 Contribution of gender mainstreaming to food security

The contribution of gender mainstreaming of smallholder farmers to food security is analyzed, presented and interpreted. Descriptive statistical results of valid data items, means and standard deviations for gender mainstreaming and food security are shown in table 4.13.

Table 4.14: Descriptive statistics for gender mainstreaming and food security

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Food Security	351	4.30	.36	-.53	.13	1.90	.26
Gender Mainstreaming	351	4.39	.37	-.10	.13	-.37	.26

Key: 1.0 - 1.4- strongly disagree; 1.5 - 2.4- disagree; 2.5 - 3.4- not sure; 3.5 - 4.4-agree; 4.5 - 5.0-strongly agree

Source: Survey data (2017)

Table 4.14 shows the means and standard deviations for gender mainstreaming (M=4.39; SD=.37). There was general agreement that gender mainstreaming was being practiced among smallholder farmers in Siaya County. Gender mainstreaming was achieved through: engaging both men and women in planning farm activities; engaging both men and women in farm policy formulations; engaging both men and women in designing farm programs; and engaging both men and women in monitoring and evaluating farm programs. Table 4.14 also shows the mean and standard deviation for food security (M=4.30; SD=.36). There was general agreement that Siaya County had improved its food security situation; that is, there was improved food availability, accessibility; utilization and stability.

Table 4.14 also shows test for normality of error distributions for the study variables: gender mainstreaming; and food security through skewness and kurtosis. According to Tabachnick and Fidell (2007) the distribution of a variable is considered normal if its kurtosis and skewness value falls in the interval -2.0 and +2.0. Table 4.14 shows the variables gender mainstreaming and food security had their values of skewness and kurtosis within the recommended interval. Normality test was therefore satisfied.

Though table 4.15 shows gender mainstreaming was being practiced among smallholder farmers in Siaya County and there was improved food security, it could not show how gender mainstreaming contributed to food security. Moreover, the mean for food security was lower than

that for gender mainstreaming by some points casting doubt as to whether there was a correlation between them. Simple linear regression analysis was therefore sought. The simple linear regression model was

$$y = \beta_0 + \beta_1x + \varepsilon \quad (4.5)$$

The response variable y was food security and the explanatory variable x was gender mainstreaming. The term ε was the *residual* or *error* and represented deviation of observed values of food security from those approximated by the model.

Preliminary tests on model 4.5 were justified. The contribution of gender mainstreaming to food security was therefore examined. The contribution was tested at 5% significance level. The results are shown in table 4.15.

Table 4.15: Regression analysis for gender mainstreaming and food security

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	2.718	.213		12.766	.000
Gender Mainstreaming	.361	.048	.371	7.471	.000
Best line of fit					
R=.371 ^a					
R ² =.138					
Adjusted R ² =.135					
F _{ratio} =55.810					
P<.05 ^b					

a. Dependent Variable: Food Security

b. Predictors: (Constant), Gender Mainstreaming

Source: Survey data (2017)

Table 4.15 shows a weak degree of significant positive correlation (R=.371; p<.05) between gender mainstreaming and food security. R-square of .138 measured part of food security, which

was explained by gender mainstreaming. It showed that approximately 13.8% of the variation in food security was attributed to gender mainstreaming. The adjusted R-square provided an idea of how the model could have been generalized. It should have been close to R-square as much as possible if not the same. In the study, the difference from the final model was small; i.e. .003 or .3%. This meant that if the model was derived from the population rather than a sample, then it could have accounted for approximately .3% less variance in results. The linear regression model was statistically significant ($F_{\text{ratio}} = 55.810$; $p < .05$). Standardized beta coefficients, showed that for one standard deviation increase in gender mainstreaming practices, food security improved by approximately .371 units.

Table 4.15 and model 4.5 also provides the optimum simple linear regression equation between gender mainstreaming and food security as

$$Y = 2.718 + .361x \quad (4.6)$$

The linear regression model 4.6 provided a statistically significant correlation ($R = .371$; $p < .05$) between variation in food security and gender mainstreaming. The model was 13.8% explained by the variation in gender mainstreaming. The linear regression model 4.6 also showed that without gender mainstreaming, food security situation was measured by approximately 2.718 units and for every unit increment in gender mainstreaming, food security situation improved by .361 units.

A study commissioned by Asian Development Bank (2013) recognized the instrumental value of gender equality and conditions for the society as factors leading to increased contribution of women to food security and adequate nutrition. This was in agreement with results of the current study which also showed that gender mainstreaming contributed significantly to food security.

However, while the current study considered both gender in equity measures, Asian Development Bank (2013) investigation was more inclined to women.

While the current study revealed gender mainstreaming as contributing to food security, FAO (2010) office of knowledge exchange, research and extension reported gender inequalities along the entire food production chain, “from farm to plate” as impeding the attainment of food and nutritional security. Also, while the current study revealed gender mainstreaming to be significantly contributing to food availability, stability and accessibility, FAO (2010) observed that relations between and among men and women are important in determining vulnerability to food insecurity and malnutrition. The current study used linear regression models in analysis. FAO (2010), however, did not specify the model that was used in arriving at the results.

While the current study revealed gender inclusiveness and equity to have increased food security, evidence by Bridge (2014) showed a strong correlation between gender inequality and food and nutrition insecurity. For example, in India, Bridge (2014) revealed thousands of women and girls as lacking food and nutrition security because of their low status compared to men and boys. Such inequalities were found to have been compounded by women and girls’ who often have limited access to productive resources, education and decision-making.

Senay, Tim, Lucy and Agnes (2012) study in Africa showed that, if women farmers were given the same access to resources (such as land, finance and technology) as men, their agricultural yields could increase by 20 to 30 percent; national agricultural output could rise by 2.5 percent; and the number of malnourished people could be reduced by 12 to 17 percent. While this study was more confined strengthening women, the current study looked at gender parity and found that it contributed significantly to food security in Siaya County.

4.5.4 Joint analysis of the contribution of capacity building interventions to food security

Joint analysis of the contribution of capacity building interventions namely; training, networking and gender mainstreaming to food security in Siaya County was conducted. Comparative analysis of the contribution of capacity building interventions to food security was therefore made possible. Descriptive statistical results of valid data items, means and standard deviations for capacity building interventions and food security are shown in table 4.16.

Table 4.16: Descriptive statistics for capacity building interventions and food security

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Food Security	351	4.30	.36	-.53	.13	1.90	.26
Training	351	4.12	.45	-.69	.13	1.82	.26
Networking	351	4.17	.38	-.13	.13	.42	.26
Gender Mainstreaming	351	4.39	.37	-.10	.13	-.37	.26

Key: 1.0 - 1.4- strongly disagree; 1.5 - 2.4-disagree; 2.5 - 3.4- not sure; 3.5 - 4.4-agree; 4.5 - 5.0-strongly agree
Source: Survey data (2017)

Table 4.16 shows the mean and standard deviation for food security (M=4.30; SD=.36). The means and standard deviations for independent variables: training (M=4.12; SD= .45); networking (M=4.17; SD=.38); and gender mainstreaming (M=4.39; SD=.37) are also shown. Table 4.16 also shows test for normality of error distributions for the study variables: training; networking; gender mainstreaming; and food security through skewness and kurtosis. According to Tabachnick and Fidell (2007) the distribution of a variable is considered normal if its kurtosis and skewness value falls in the interval -2.0 and +2.0. Table 4.16 shows that all the variables had their values of skewness and kurtosis within the recommended interval. Normality test was therefore satisfied.

Though there was general agreement that smallholder farmers in Siaya County engage in training, networking and gender mainstreaming, table 4.16 did not show how they contribute to food security. Moreover, the mean for food security was higher than those of training and networking

except for gender mainstreaming by some units. There was doubt whether jointly the interventions could be statistically significant contributors to food security. The multiple linear regression model sought was

$$y = \beta_0 + \beta_1x_1 + \beta_2x_2 + \beta_3x_3 + \varepsilon \quad (4.7)$$

The response variable y represented food security while explanatory variables x_1, x_2 and x_3 represented training, networking, and gender mainstreaming respectively. The term ε was *residual* or *error* and represented deviation of observed value of food security from that estimated by the model. The model (4.7) was first tested for multi-collinearity. The results are shown in table 4.17.

Table 4.17: Pearson correlation matrix

		Training	Networking	Gender Mainstreaming	Food Security
Training	Pearson Correlation	1			
	Sig. (2-tailed)				
	N	351			
Networking	Pearson Correlation	.353**	1		
	Sig. (2-tailed)	.000			
	N	351	351		
Gender Mainstreaming	Pearson Correlation	.147**	.259**	1	
	Sig. (2-tailed)	.006	.000		
	N	351	351	351	
Food Security	Pearson Correlation	.262**	.258**	.371**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	351	351	351	351

** . Correlation is significant at the 0.01 level (2-tailed).

Source: Survey data (2017)

Table 4.17 shows the highest correlation coefficient ($R = .353$; $p < .01$) was between networking and training. This was followed by gender mainstreaming and networking ($R = .259$; $p < .01$). The least correlation coefficient ($R = .147$; $p < .01$) was between gender mainstreaming and training. All were statistically significant at 1% level. The correlation coefficients between independent variables were all within the recommended interval of $-.70$ to $.70$ (Robert, Douglas & William, 1999). There was therefore no multi-collinearity between the independent variables.

Multiple linear regression analysis was therefore sought. The results are provided in table 4.18.

Table 4.18: Linear regression analysis of the contribution of joint capacity building interventions to food security

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.916	.267		7.170	.000
1 Training	.141	.041	.175	3.392	.001
Networking	.110	.051	.115	2.170	.031
Gender Mainstreaming	.307	.049	.316	6.313	.000
Goodness of fit:					
R=.439					
R ² =.193					
Adj R ² =.186					
F _{ratio} =27.628					
P<.05					

a. Dependent Variable: Food Security

b. Predictors: (Constant), Training, Networking, Gender mainstreaming

Source: Survey data (2017)

Table 4.18 shows a moderate degree of statistically significant positive correlation ($R = .439$; $p < .05$) between joint capacity building interventions and food security. R-square of $.193$ measures part of food security, which was explained by capacity building interventions. It shows that approximately

19.3% of the variation in food security was attributed to capacity building interventions. The joint linear regression model was statistically significant ($F_{\text{ratio}} = 27.628$; $p < .05$). Capacity building interventions therefore contributed to food security. Table 4.18 also shows standardized Beta coefficients used to compare contributions of capacity building interventions to food security. The largest Beta coefficient of .316 ($p < .05$) was for gender mainstreaming and was statistically significant. It made the strongest unique contribution in improving food security, when the variance explained by training and networking in the model was controlled. The Beta value for training of .175 ($p < .05$) was also statistically significant and made the second strongest unique contribution in improving, when the variance explained by networking and gender mainstreaming was controlled. Networking with Beta value of .115 ($p < .05$) was also statistically significant. It made the least contribution in improving food security, when the variance explained by gender mainstreaming and training in the model was controlled. The optimum linear regression model for the relationship between food security and capacity building interventions: training; networking; and gender mainstreaming was provided as

$$Y = 1.916 + .141x_1 + .110x_2 + .307x_3 \quad (4.8)$$

The linear regression equation 4.8 had a moderate degree of positive multi-correlation ($R = .439$; $p < .05$) between variation in food security and variation in capacity building interventions: training; networking and gender mainstreaming factored in the model. The linear model (4.8) was approximately 19.3% explained by variation in capacity building interventions and was statistically significant.

The un-standardized coefficients were also used to interpret model (4.8). The constant 1.916 was the predicted value of food security when there was no training, networking, and gender

mainstreaming practices. The coefficients showed that for every unit increment in: training, food security improved by .141 units while networking and gender mainstreaming were controlled; networking, food security improved by .110 units keeping training and gender mainstreaming constant; and gender mainstreaming, food security improved by .307 units while training and networking were controlled.

4.6 Summary of data analysis

In this section, summary of data analysis is tabulated. The details are as shown in table 4.19.

Table 4.19: Summary of data analysis

Hypotheses	Results		
	Correlation	F-ratio	Contribution (%)
There is no statistically significant contribution of training of smallholder farmers to food security in Siaya County	$R = .262; p < .05$	$F_{ratio} = 25.744; p < .05$	≈ 6.9
There is no statistically significant contribution of networking of smallholder farmers to food security in Siaya County	$R = .258; p < .05$	$F_{ratio} = 24.942; p < .05$	≈ 6.7
There is no statistically significant contribution of gender mainstreaming to food security in Siaya County	$R = .371; p < .05$	$F_{ratio} = 55.810; p < .05$	≈ 13.8

Source: Survey data (2017)

CHAPTER FIVE

5.0 SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

In this chapter, summary of key findings, conclusions, recommendations and suggestions for further research are outlined.

5.2 Summary of key findings

In this section, key findings of the study are presented. The presentation is done in line with the study objectives.

First, the study was set to determine the contribution of training of smallholder farmers to food security in Siaya County. The results revealed a statistically significant weak positive correlation ($R=.262$; $p<.05$) between variations in training and food security. Training attributed approximately 6.9% of the variation in food security. The linear regression model between training and food security was statistically significant ($F_{ratio} = 25.744$; $p<.05$). There was statistically significant contribution of training of smallholder farmers to food security in Siaya County. Standardized beta coefficients, showed that for every one standard deviation increase in training practices, food security improved by approximately .262 units. Also, a joint analysis of capacity building interventions, namely; training, networking and gender mainstreaming revealed that training with beta value of .175 ($p<.05$) made a statistically significant contribution to food security when networking and gender mainstreaming was controlled.

Second, the study was set to examine the contribution of networking of smallholder farmers to food security in Siaya County. The results showed a statistically positive weak correlation ($R =$

.258) between variations in networking and food security. Networking explained approximately 6.7% of food security. The linear regression model between networking and food security was statistically significant ($F_{\text{ratio}} = 24.942$; $p < .05$). There was statistically significant contribution of networking smallholder farmers to food security. Standardized beta coefficients, showed that for every one standard deviation increase in networking practices food security improved by approximately .258 units. Also, a joint analysis of capacity building interventions, namely; training, networking and gender mainstreaming revealed that networking with beta value of .115 ($p < .05$) made a statistically significant contribution to food security when training and gender mainstreaming was controlled.

Third, the study was set to evaluate the contribution of gender mainstreaming of smallholder farmers to food security in Siaya County, Kenya. The results showed a statistically significant weak correlation ($R = .371$) between variations in gender mainstreaming and food security. Gender mainstreaming explained approximately 13.8% of food security. The linear regression model between gender mainstreaming and food security was statistically significant ($F_{\text{ratio}} = 55.810$; $p < .05$). There was statistically significant contribution of gender mainstreaming of smallholder farmers to food security. Standardized beta coefficients, showed that for every one standard deviation increase in gender mainstreaming practices, food security improved by approximately .371 units. Also, a joint analysis of capacity building interventions, namely; training, networking and gender mainstreaming revealed that gender mainstreaming with beta value of .316 ($p < .05$) made a statistically significant contribution to food security when training and networking was controlled.

5.3 Conclusions

There was a statistically significant weak positive correlation between variations in training and food security. Training of smallholder farmers attributed to the variation in food security. The contribution of training to food security in Siaya County though present was negligible.

There was a statistically significant weak positive correlation between variations in networking and food security. Networking smallholder farmers attributed to the variations in food security. The contribution of networking smallholder farmers to food security in Siaya County though present was negligible.

There was a statistically significant weak correlation between variations in gender mainstreaming and food security. Gender mainstreaming among smallholder farmers attributed to the variation in food security. The contribution of gender mainstreaming to food security though evident, was small.

Jointly, Capacity building interventions had a moderate degree of positive correlation with food security. Food security situation in Siaya County was attributed to capacity building interventions. There was evidence that capacity building interventions contributed to improved food security though on a small scale. Comparatively, gender mainstreaming made the strongest unique contribution in improving food security, when the variance explained by training and networking was controlled. Networking made the second strongest unique contribution and training made the contribution in improving food security.

5.4 Recommendations

Capacity building interventions, namely; training, networking and gender mainstreaming both contributed to improved food security in Siaya County. The study therefore recommends field agricultural officers should intensify the use of such interventions with a view to enhancing sustainable food security.

Smallholder farmers should engage in joint application of capacity building interventions. It is evident from the results that when training, networking and gender mainstreaming are jointly applied then their contribution to food security is immensely improved.

Capacity building is a wide field with numerous operational interventions. Siaya County Department of Agriculture should therefore invest in research to identify other capacity building interventions to be put in use for sustainable food security.

5.5 Suggestions for further research

The current study was based on the contribution of capacity building interventions and food security. Future researchers should therefore introduce a third variable in the study. The third variable should be introduced as a moderator so that its moderating effect on the contribution of capacity building interventions to food security can be studied. For example, monitoring the operation of capacity building interventions should be introduced as a moderator in the study.

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Appendix 1: Questionnaire Smallholder Farmers

Dear respondent,

I am student at Jomo Kenyatta University of Agriculture & Technology. I am carrying out a research on “Capacity Building Interventions on Smallholder Farmers and Food Security in Siaya County, Kenya” as a partial requirement for the award of Master of Science degree in Project Management of Jomo Kenyatta University of Agriculture & Technology. The questionnaire has been designed to gather information from smallholder farmers. Your views as smallholders’ farmers are considered as valuable part and parcel of this study. Kindly complete the questionnaire to the best of your ability and return it to the researcher as soon as may be possible. The information provided shall be treated with strict confidentiality.

Sincerely yours

Tedson Richard Nyongesa
HD317-CO12-0820/2013

SECTION A: BIO DATA OF THE RESPONDENTS

Kindly tick (√) in the box next to the right option

A₁: Gender

Male

Female

A₂: Age

<20

20–29

30-39

40-49

>49

A₃: Your highest level of education

No education

Primary

SECTION C: CAPACITY BUILDING INTERVENTIONS

Constructs of capacity building interventions have been developed in this section. The main capacity building interventions herein are: training; networking; and gender mainstreaming.

C1: TRAINING

This subsection shows a series of constructs on **training as a capacity building intervention** offered to you as smallholder farmer. Please indicate your level of agreement/disagreement by ticking (√) against each of them in the space provided.

Key: Strongly Disagree (**SD**); Disagree (**D**); Neutral (**N**); Agree (**A**); and Strongly Agree (**SA**)

	Constructs	SD	D	N	A	SA
C1.1	Experienced farmers of your community shape inexperienced farmers to fit in existing and future farm initiatives					
C1.2	Farmers in your community frequently engage in seminars					
C1.3	Farmers of your community frequently engage in conferencing					
C1.4	Farmers in your community are involved in continued professional development programs					
C1.5	Farmers in your community are coached by agricultural instructors					
C1.6	There are farmers mentoring programs in your community					
C1.7	Your community has instructor led agricultural literacy improvement programs					
C1.8	Your community has instructor led agricultural skills improvement programs					

C2: NETWORKING

This subsection shows a series of constructs on **networking as a capacity building intervention** practiced by you as smallholder farmer. Please indicate your level of agreement/disagreement by ticking (√) against each of them in the space provided.

Key: Strongly Disagree (**SD**); Disagree (**D**); Neutral (**N**); Agree (**A**); and Strongly Agree (**SA**)

	Constructs	SD	D	N	A	SA
C2.1	You frequently attend farm business meetings with other farmers/agricultural institutes					
C2.2	You focus on good communication with other farmers/agricultural institutions					
C2.3	You focus on encouraging partnership with other farmers/agricultural institutions					

C _{2.4}	You have the capacity to access available resources from other farmers/ agricultural institutions					
C _{2.5}	You have well built rapport with other farmers/ agricultural institutions					
C _{2.6}	You normally maintain contact with other farmers on issues of strategic farming					
C _{2.7}	Farmers within your community have well built networks amongst themselves on farming issues					
C _{2.8}	Your community has invested on agricultural networking initiatives					

C₃: GENDER MAINSTREAMING

This subsection shows a series of constructs on **gender mainstreaming as a capacity building intervention** practiced in your community. Please indicate your level of agreement/disagreement by ticking (√) against each of them in the space provided.

Key: Strongly Disagree (**SD**); Disagree (**D**); Neutral (**N**); Agree (**A**); and Strongly Agree (**SA**)

	Constructs	SD	D	N	A	SA
C _{3.1}	Women in your community are involved in planning for farming activities					
C _{3.2}	Men in your community are involved in planning for farming activities					
C _{3.3}	Women in your community are involved in farming policy formulation					
C _{3.4}	Men in your community are involved in farming policy formulation					
C _{3.5}	Men in your community are involved in design of farming programs					
C _{3.6}	Women in your community are involved in design of farming programs					
C _{3.7}	Men in your community are involved in monitoring of farming programs					
C _{3.8}	Women in your community are involved in monitoring of farming programs					
C _{3.9}	Men in your community are involved in evaluating farming programs					
C _{3.10}	Women in your community are involved in evaluating farming programs					

SECTION D: FOOD SECURITY

This section shows constructs on conventional food security. Please indicate your level of agreement/disagreement by ticking (✓) against each of them in the space provided.

Key: Strongly Disagree (**SD**); Disagree (**D**); Neutral (N); Agree (**A**); and Strongly Agree (**SA**)

	Constructs	SD	D	N	A	SA
D.1	You normally have enough food from your farms					
D.2	You normally have enough food from the markets					
D.3	Food from your farm is safe and nutritious					
D.4	Food from the markets is safe and nutritious					
D.5	Your household obtain foods for a nutritious diet as gifts					
D.6	Your household obtain foods for a nutritious diet through transfers					
D.7	Your household observe food standard preparation standards					
D.8	Your households observe the diversity in diet					
D.9	Your community practice intra-household distribution of food					
D.10	Your community experience food risks due to climatic changes					
D.11	Your community experience food risks due to conflicts					
D.12	Your community experience food risks due to diseases					
D.13	Your community experience food risks due to price shocks					

Thanks for your cooperation!