

DETERMINANTS OF THE IMPLEMENTATION OF SUSTAINABLE FOOD SECURITY PROGRAMMES IN ARID AND SEMI-ARID REGIONS OF KENYA- A CASE OF TANA RIVER COUNTY

¹ABDIKADIR ADHAN MOHAMMED, ²MR. JOHNBOSCO KISIMBII

¹STUDENT - UNIVERSITY OF NAIROBI- DEPARTMENT OF OPEN & DISTANCE LEARNING

²LECTURER - UNIVERSITY OF NAIROBI- DEPARTMENT OF OPEN & DISTANCE LEARNING

Abstract: This study was carried out in order to examine the determinants of the implementation of sustainable food security programmes in arid and semi-arid regions of Kenya. The study was guided by the following four research objectives: to examine the extent to which peace building influences the implementation of sustainable food security programmes in arid and semi-arid regions Kenya; to determine the influence of Education on the implementation of sustainable food security programmes in arid and semi-arid regions of Kenya; to establish the extent to which crop diversification influences the implementation of sustainable food security programmes in arid and semi-arid regions of Kenya; and to assess the extent to which integrated water management influences the implementation of sustainable food security programmes in arid and semi-arid regions of Kenya. This study was guided by two theories i.e the development theory and the post development theory. This study adopted a descriptive survey design. The target population was 46, 123 farmers and 11 employees in the department of agriculture at the county level. In this study, the sample size was calculated by use of the Krejcie and Morgan table of 1970. A sample of 391 was used. The primary data from the field was obtained by use of a questionnaire. Data was analyzed using Statistical Package for Social Sciences (SPSS). The data was analyzed and presented using descriptive statistics such as means and percentages, frequency counts, and standard deviations. The hypothesis (relationship between the various variables) was obtained by use of the Chi-Square. Based on the findings, the research concluded that peace building significantly influences the availability, distribution and production of food thus enhancing food security. When there is peace, communities are engaged in productive activities that can lead to food production thus sustainability of the food security programme. Education is another major factor influencing food security in the county. Well educated individuals are able to use modern methods of food production, add value and use technology which in turn leads to sustainable food security. Crop diversification influences the sustainability of food security programme in the county significantly. This includes growing a variety of crops, intercropping, adoption of hybrid crops and moving to horticultural agriculture. Finally, integrated water management influences the sustainability of food security programme. This includes harvesting water during the rain seasons, using modern technology in irrigation, exploring underground waters and preservation of water catchment areas.

Keywords: sustainability, food security, peace building, education, crop diversification, integrated water management.

1. INTRODUCTION

Programmes that are aimed at ensuring the human race survives on earth have been implemented over a long time; with the Food Security Programme tracing itself to the land of Eden where the first man was compelled to work and produce agriculture related products for his use (Dawson, 2017). According to Paulina (2017), Food Security Programmes are among the first programmes that liberated the world as traced to the agrarian revolution. Paulina (2017) explains that the Agricultural Revolution Programme was a period of technological improvement and increased crop productivity that occurred during the 18th and early 19th centuries in Europe and it is considered as the greatest economic growth and development of today's European countries and its neighbors.

Food and Agriculture Organization (2017) has indicated the importance of food security in the world over almost century ago. According to FAO (2017), food security exists when 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. Household food security is the application of this concept to the family level, with individuals within households as the focus of concern. On the other hand, food insecurity exists when people do not have adequate physical, social or economic access to food etc. World Bank (2016) has shown the importance of FSP in the 21st century by indicating that food security is a central indicator of economic development in developing countries in Asia, Africa and South America. In its study that focused on poverty and hunger (issues and options for food security in developing countries), developing countries are performing poorly since most of its population is malnourished, is lacking enough nutrition, is lacking better access to water and other accompaniments that will make it healthy.

USDA (2017) has indicated that, growth in the agriculture sector has been found, on average, to be at least twice as effective in reducing poverty as growth in other sectors. Access to quality, nutritious food is fundamental to human existence. Secure access to food can produce wide ranging positive impacts, including: economic growth and job creation; poverty reduction; trade opportunities; increased global security and stability; and improved health and healthcare. Therefore USDA (2017) has always emphasized that food security programmes are not only drivers of economic development but drivers of social stability and human health-other drivers of economic development.

In their study that focused on influencing factors of food security in China, Tang, Bai and Tang, (2015) has shown that there are a number of determinants influencing the implementation of food security in the country and these factors have placed the country in a better position of managing its food production for over decades. These factors include: agricultural mechanization, chemical fertilizer, efficient irrigation and food policy. Besides, the agricultural labor force, national financial allocation for agricultural science and technology, rural electricity consumption among others influence the performance of food security in the country. Another study by has indicated that, China's past success in grain self-sufficiency doesn't reflect its future vulnerability to food insecurity since the demand for crops for nonfood use is rising enormously. China is likely to remain self-sufficient in rice and wheat but will continue to be dependent on other countries for soybeans and corn to meet its growing appetite for meat and dairy products. Food and nutrition security scenario can worsen due to demographic pressures coupled with climate change, extreme pollution, diminishing arable land, and depleting aquifers.

A report by the In On Africa (2018) has shown that despite the fact that most African countries are food insecure, there are a number of these countries that have made a number of strides in achieving food security. The list indicates that, Tunisia leads in terms of food security in Africa with a mean food security score of 68.2%, followed by Mauritius with a score of 67.33%, Morocco with a score of 64.38%, Algeria- 63.86%, Egypt-60.03%, Gabon-58.81%, South Africa-57.88%, Ghana-53.57%, Senegal-52.16% and Namibia-51.42%. In the report, it is argued that, political will by governments to prioritize food security, combined with use of new crop and food production technologies, has allowed some of the above-mentioned countries to break the chains of food insecurity. In addition, other factors like crop diversification, use of modern technology in both irrigation and pests and diseases control, use of modern methods of water management, education and training to the farmers and many more have increased food security in Mauritius and Tunisia.

A report by FAO (2018) has shown East Africa as one region that rates high in terms of food insecurity. According to the report, factors such as climate change, droughts and frequent floods, diversion of food products for production of bio fuels, piracy, and increasing demand for food products from emerging countries have led to sharp increases in the prices

of food products in the region; making them uniquely vulnerable to food insecurity. According to Global Action Programme on Food Security (2017), in Uganda for example, a number of factors have posed a lot of threats to this country becoming food insecure. These factors include: limited land mass and population; fragile natural environments and lack of arable land; high vulnerability to climate change, external economic shocks, and natural disasters; typically, high dependence on food imports; dependence on only one or two economic pillars; and distance from global markets.

Studies in Kenya have indicated that the country has a very big index of food insecurity despite the fact that there are a number of strategies and advances that have been made to address this issue (FAO, 2018 and KARI, 2017). Kenya Agricultural Research Institute (2017) for example has shown that in the recent decade, and especially starting from 2008, the country 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; calling for urgent measures of tackling this problem.

In the marginalized regions like the Kenyan coastal counties and the northeastern part, the situation of food insecurity is worse with over 2.6 million people facing acute food insecurity (NDMA, 2017). According to NDMA (2017), reflecting the substantial decline in food security, the KFSSG short rains assessment that was conducted in 23 counties in January 2017 estimated that a total of 2.6 million people is acutely food insecure and require urgent humanitarian assistance, mainly in Kenya's pastoral and marginal agricultural areas. This represents an increase in needs by about 100 percent from the last long rains assessment in July 2016.

FAO (2017) has shown that, in pastoral areas in Kenya, including northwestern (Turkana, Samburu, West Pokot, Baringo), northeastern (Mandera, Wajir, Isiolo), northern (Marsabit), southeastern (Garissa, Tana River), and southern (Narok, Kajiado) regions, continue to experience an atypical decline in household food security, a situation that started even before the October – December 2016 short rains. The short rains, which were largely between 50 – 90 percent of normal, exacerbated dry conditions, following the longer and drier than normal June – October period. As a result, forage and water resources had a below-normal recovery, and the current prevailing warmer-than-normal land surface temperatures have further accelerated depletion. While rangeland conditions vary from region to region, ranging from fair to poor, certain areas are experiencing exceptionally severe forage and water deficits, including parts of North Horr and Laisamis in Marsabit, northern parts of Turkana (Todonyang and Nadapal), eastern parts of Turkana (Kapedo and Lomelo), Garissa (Ladgera, Balambala, Modogashe, Sankuri, Dadaab, Warsame, Sangole, and parts of Ijara), Tana River (Chifiri, Titila, Hakoka, Wayu, Bura, and Assa, Kone), Mandera (Shimbir Fatuma, Burmayo, and Guticha-Jiko), and northern parts of West Pokot and Baringo (East Pokot). As a result, pastoralists in these areas moved close to 80 percent of their livestock to dry season grazing areas, and earlier than usual. In some instances, pastoralists had decided to keep their livestock in the dry season fields even before the onset of the short rains, constraining household income and milk production and consumption; calling for urgent measures to address this situation.

According to SAID (2017) besides the drought, there are numerous factors leading to food insecurity in Kenya and this has not only started recently but has been a rooted problem in Kenya. The report indicates that the current food insecurity problems are attributed to several factors, including the frequent droughts in most parts of the country, high costs 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 almost election periods, high global food prices and low purchasing power for large proportion of the population due to high level of poverty.

Due to the state of food insecurity in the country, various bodies and government agencies have come up with sustainability strategies to address the issue of food security in the country (NDMA, 2017). A number of these strategies were proposed in the early 2008 when the national drought management authority was formed and placed under the ministry of agriculture. Some of these strategies include: Education strategy; Crop diversification; Tackling climate change; integrated water management strategy; integrated nutrient management strategy; improved varieties and many more. However, despite the fact the government and other agencies have come up with a number of strategies; there still exist challenges since food insecurity is persistent and increases each day in Kenya.

2. RESEARCH PROBLEM

Studies across the globe have indicated that food security is among the global disasters besides epidemic diseases, terrorism, drug and substances and civil wars (UNDP, 2017). According to WFP (2018), the food strength in the world for over one century now has been on the shrinking trend due to population pressure and climate change. WHO (2017) has shown that food security is not only vital for economic development and stability but also best for the health of a nation. UNDP (2017) has shown that a country that is food secure achieves better nutrition for its citizens, eliminates unnecessary conflicts like scramble for food production for its individuals, eliminates basic diseases, achieves better manpower for economic development and enjoys more of innovation for economic growth and lifespan lives. Indeed, this makes the concept of food security very important in both developed and developing countries.

Reports by NDMA (2017) have indicated that despite the fact the Kenyan government through its constitution established the body in 2008 through an act of parliament and allocated it resources, there still exists a downward trend in food security in the country. In fact, the trend of food security in the country is declining each day calling for urgent measures to address the situation. WFP (2017) notes that Kenya has been pumping numerous funds towards drought management, food providence and food security check but its population is getting much hungrier each day than expected. Surely, this calls for an in-depth examination on the strategies employed to curb food insecurity in the country and whether there are other factors that are influencing the poor results achieved in relation to the implementation of food security programmes.

A number of studies that have focused on the topic of food security have shown that there are a number of factors influencing food security. For example, Micheni (2015) did a study on the factors influencing household food security among the pastoral communities: the case of Pokot North District in Kenya and found out that factors like: drought, insecurity, illiteracy; poverty, cultural beliefs and poor market structures influence food security. However, this study focused on food security at household levels and did not tackle the concept of sustainability of the whole process. Furthermore, Pokot north has a very different socio-economic constitution from that of Tana River where the current study is going to be carried out. On the other hand, Kubai (2014) did a study that focused on the factors influencing food security in East Africa; a case of Eastern Africa Farmers Federation and found out that that there is relationship between food security and agricultural resource allocation, agricultural inputs, agricultural credit as well as the agricultural policy implementation. However, he has failed to explain further whether these factors have a direct link to sustainable food security programmes implemented in East Africa. Secondly, the study addressed areas in east Africa region that have double maxima rainfalls and ranges of rainfall being over 1500mm per annum. The current study shall address this gap by looking at the sustainability concept, the ASALs concept and food security. It is also worth noting that there is no similar study as this one to be carried out by this researcher that has been carried in this region. The study therefore was carried out to examine the determinants of sustainable food security programme implementation in arid and semi-arid Kenya; a case of Tana River County.

3. OBJECTIVE OF THE STUDY

The study was guided by the following four research objectives:

- i. To examine the extent to which peace building influences the implementation of sustainable food security programmes in arid and semi-arid Regions of Kenya.
- ii. To determine the influence of Education on the implementation of sustainable food security programmes in arid and semi-arid Regions of Kenya.
- iii. To establish the extent to which crop diversification influences the implementation of sustainable food security programmes in arid and semi-arid Regions of Kenya.
- iv. To assess the extent to which integrated water management influences the implementation of sustainable food security programmes in arid and semi-arid Regions of Kenya.

4. RESEARCH HYPOTHESIS

The study tested the four hypotheses at the 95% level of significance.

- i) H_a : Peace building has a significant influence on the implementation of sustainable food security programmes in arid and semi-arid regions of Kenya.

- ii) Ha: Education has a significant influence on the implementation of sustainable food security programme in arid and semi-arid regions of Kenya.
- iii) Ha: Crop diversification influences the implementation of sustainable food security programmes in arid and semi-arid regions of Kenya significantly.
- iv) Ha: Integrated water management has a significant influence on the implementation of sustainable food security programmes in arid and semi-arid regions of Kenya.

5. JUSTIFICATION OF THE STUDY

This study is expected to benefit the national government by allowing it have the first hand information of the various factors that influence the performance of the food security programmes in the country. The study will specifically give the required information of what needs to be done to ensure food security currently and in the future without interfering with the environment negatively. The Ministry of Agriculture and the NDMA will be able to understand why the food security issue has been deteriorating over time and what needs to be done to address the situation currently without having bad future effects.

The county government shall be able to get the first-hand information that will help the Department in charge of agriculture and natural resources management, and the department in charge of special programmes to come up with measures that can address the current situation of food insecurity in the county while taking care of the future situation.

The study is also expected to benefit the various NGOs and other bodies that struggle to feed the hungry people in Tana River through relief food to understand on some issues that they can address to ensure sustainability in the food security situation in the county.

Finally, the study shall be very important to the farmers and various households since they will get relevant information on some factors they need to consider in food production so that they can achieve sustainability.

6. REVIEW OF LITERATURE

6.1 Concept of implementation of Sustainable Programmes:

According to FAO (2017), food security exists when all people at all times have physical, social and economic access to sufficient, safe and nutritious food. FAO (2017) continue to show that in relation to the modern concept that touches on sustainable food production, food security is built on four pillars: availability, access, utilization and stability. Food and nutrition security embraces meeting energy, protein and nutrient needs for healthy life. In this case, stability means that the food is available in the right quantities, right qualities, right time and an assurance of it being available in the future without interfering with the biodiversity in what is known as sustainable food production.

The ERA-Net SUSFOOD (Sustainable FOOD production and consumption) project defines sustainability in the food area as a food system that supports food security, makes optimal use of natural and human resources and respects biodiversity and ecosystems for present and future generations, is culturally acceptable and accessible, environmentally sound and economically fair and viable, and provides the consumer with nutritionally adequate, safe, healthy and affordable food (The ERA-Net SUSFOOD, 2018).

In detailed explanation, The World Bank (2017) has indicated that sustainability in relation to food security refers to the concept of implementing food production programmes that ensure the natural resources are utilized to the maximum to produce food that satisfies its population. This food production programmes should ensure that the amount of food produced, the times of production and the qualities are right and they must not interfere with the current natural environment. Besides, they must ensure that this production takes care of the future production and consumption.

According to WHO (2017) for sustainable food security programmes to be implemented in the world effectively, they should embrace the concept of sustainable agriculture. According to FAO (2017) sustainable agriculture is the production of food, fiber, or other plant or animal products using farming techniques that protect the environment, public health, human communities, and animal welfare. The AfDB (2017) adds that most African states have failed to come up with various projects that can feed their growing population due to failure in identifying the gaps that intertwine the concepts of environmental protection, food production, health, socio-economic stability and cultural changes.

According to WFP (2014) due to uncertainties in climate changes, population pressure patterns, urbanisation, technology change and changes in lifestyles across the globe, countries have resorted to food strategies that can address this issue. The strategies have not only been founded on grounds of meeting the current demands but also taking care of the future demands without destroying any of the available channels of production; in what is referred to as sustainability in agriculture. Roberto (2014) notes that, to meet the global food human needs by 2050, the world's agricultural system must simultaneously produce far more food for a growing population provide economic opportunities for the rural poor who depend on agriculture for their livelihoods and reduce environmental impacts. The concept here thus calls for the knowledge, understanding and integration of sustainability idea in food production.

6.1.1 Peace Building and implementation of Sustainable Food Security Programmes:

Studies by various bodies and scholars have documented substantial evidence that conflicts, wars and misunderstandings between countries, individual communities and regional blocks has a very sphere negative effects on food security (FAO, 2017; WB, 2017; AfDB, 2017). According to WFP (2015), the effects may be minor, as when spontaneous protest demonstrations over rising food prices take place in or around food markets and disrupt or close down vendors' operations. At the other extreme, there are food wars—"a concept which includes the use of hunger as a weapon in active conflict and the food insecurity that accompanies and follows as a consequence," according to Ellen Messer et al. (2000). They reported that such wars affected nearly 24 million people in 28 countries in 2000.

Emmy (2017) her study that focused on harvesting peace: food security, conflict, and cooperation, has shown that peace and stability is a cornerstone of sustainable food security. In this study that was carried out in 3 countries (Syria, Somalia and Southern Sudan), food availability and distribution greatly depend on the availability of peace. She has indicated further that, conflict negatively affects all four dimensions of food security: availability, access, utilization, and stability. This is echoed by UNICEF (2016) report which noted that Southern Sudan's conflict, which broke out in 2014, presents an enduring case of a food war, with estimates that over 7.7 million people are currently experiencing direct effects of the conflict. Sudan political analyst Alex de Waal (2004) describes the approach used by the government of Sudan in responding to the demands of rebellious groups as counter-insurgency on the cheap—famine and scorched earth their weapons of choice

USAID (2017) on its study that focused on conflict assessment framework and food security in developing countries in Asia and Middle East, peace, reconciliation and understanding influences the sustainability of food security programmes. According to the regression analysis that was carried out in this study, there was noted a very strong correlation between the peace and reconciliation indicators influencing food security and the whole process of sustainable food security. The study found out that conflict reduces the availability of food (Food availability, one of the four dimensions of food security, is affected by conflict, even when the duration of conflict is relatively short); conflict impairs the effective utilization of food (The effective utilization of food is a measure of how well food supplies accessible to consumers are used to promote their health and productivity); and Conflict Increases Uncertainty Regarding Food Availability, Access, and Utilization (Conflict by definition involves social, economic, and political instability. The impact of such instability on households varies, but there is evidence that the fourth dimension of food security—predictability, stability, certainty—is strongly affected by conflict. Conflict-related uncertainty affects the decisions made by farming and rural populations about whether to invest resources in future agricultural production and risk its loss or to flee with no assurance of future supplies).

In Ethiopia, USAID Ethiopia (2015) did a study and found out that; first, conflict disrupts production. Hostilities, especially armed hostilities, prevent normal farming, fishing, and herding operations from being carried out. For the millions of poor households whose principal source of income—and much of their food supply—is derived from agricultural production, conflict can inflict significant damage to livelihoods and food security. Second, conflict disrupts flows of food. Conflict reduces physical security, even for people not directly engaged as combatants or victims of violence. This insecurity disrupts normal commerce, directly reducing flows of food through market channels, as marketing agents face high risks of loss through theft and high costs if they try to protect their stocks. Further, international humanitarian organizations are only too aware that, since food is a valuable commodity in a resource-constrained environment, supplies of food readily become targets for competing parties, and food assistance pipelines are adjusted accordingly.

Similarly, Micheni (2015) did a study that focused on factors influencing household food security among the pastoral communities: the case of Pokot North District in Kenya and found out that peace, security and stable society influences food security programmes sustainability significantly. According to him, some of the negative effects of wars and instabilities in communities in relation to sustainable food security include: the pipeline of public and private investments in food production and marketing activities dries up. Governments, either intentionally or because conflict is threatened, divert funds from agricultural development to conflict-related expenditures (e.g., acquiring armaments and financing military operations); and conflict results in outright loss through the destruction of food and food-producing assets. Production equipment, animals, seed supplies, and food stocks are often casualties of conflict, deliberately destroyed by competing factions. Such destruction reduces food availability in the short term, but it also prevents a resumption of productive activities and recovery of livelihoods in post-conflict periods.

6.1.2 The Influence of Education on the implementation of Sustainable Food Security Programmes:

Role of education in improving farm efficiency and technology adoption has been well established. As agriculture transformed from subsistence to commercial level, farmers seek information on a wide range of issues to acquire knowledge or upgrade their skills and entrepreneurial ability. Literacy emerges as an important source of growth in adoption of technology and use of modern inputs like fertilizers and machines. An educated workforce makes it easier to train and acquire new skills and technologies required for productivity growth. Thus, contribution of literacy will be substantial on yield growth and domestic supply of food (Mohd, 2016).

Emmy (2017) argues that education is the sphere of all economic and sustainable development. It's more of the back bone of all the development agendas in the world. In agricultural sustainability, education makes the producers, distributors and users knowledgeable on what they need for the whole system to be sustainable. Education equips the farmers with the best farming methods, pests and diseases control, best storage methods, best distribution methods, best value addition methods and many others that lead to sustainable food production.

Roberto (2014) found out that education in food production, distribution and sustainability is very vital. According to his studies, education equips the relevant stakeholders on the best farming inputs, farming methods, breeds, channels of distribution and even the future trends in food production; leading to sustainability. The ERA-Net SUSFOOD (2018) adds that besides its role in enabling the farmers to become knowledgeable of the tools and farm inputs to use, education can help farmers to understand the climatic patterns of a place and clearly predict the best kind of farming to be practised during various sessions for better yields.

Kubai (2014) did a study and found that education has a very significant role in food security sustainability. He notes that education equips the producers with best production processes and relevant foods production, it equips the middlemen and value addition agencies with the best methods of value addition and best channels of food distribution, and it determines the trends of the consumers and gives the future projections and trends in food consumption. The WB (2017) has indicated that if sustainability in agriculture has to be achieved in Africa, education must be core. According to the report, education helps the farmers to understand the various ways of managing their water systems, use of adaptable crops and animals, use technology in pests and diseases control besides production, education will help them in understanding how to manage their environment for future production and many more.

6.1.3 Crop Diversification and implementation of Sustainable Food Security Programmes:

Studies carried out by a number of bodies and scholars have a common agreement that diversification of crops and other agricultural produce will lead to food sufficiency in the world. In his study that focused on the 10 key steps towards sustainable food production in India, Mohd (2016) argues that, food availability is a necessary condition for food security. India is more or less self-sufficient in cereals but has deficit in pulses and oilseeds. Due to changes in consumption patterns, demand for fruits, vegetables, dairy, meat, poultry, and fishery products has been increasing. There is a need to increase crop diversification and improve allied activities to produce such crops and produces in which we are deficient.

According to the report published by FAO (2014) in Latin America, crop diversification is the only strategy that can be applied in the urban or the rural agricultural zones to ensure sustainable nutrition and diets. In Haiti, Peru and Venezuela for example, FAO's Plant Production and Protection Division (AGP) works to strengthen global food security by promoting sustainable crop production intensification (SCPI), which aims at producing more from the same area of land while conserving resources, reducing negative impacts on the environment and enhancing natural capital and the flow of ecosystem services. Besides, AGP also supports crop diversification for sustainable diets, nutritional health and income generation, and supports the global food economy through the implementation of international treaties.

Piñeiro, Bianchi and Trucco (2016) have noted that the food production in the world since 2008 has been on the declining trend at alarming rates despite the fact that the population of the world has been on the increasing trend; demanding for more food. In their study that was carried out in 5 countries from the Latin America, it was found out that policies like the introduction of variety crops and even animal species shall ensure food security in the region. According to them, food security policies and measures should ensure that farmers move from grains cultivation and integrate other foods like the horticultural foods, traditional foods and other crop species that are both resistant to pests, diseases and extreme weather conditions.

According to USAID Ethiopia (2015), Ethiopia is among the countries that have been facing famine and lack of food since the start of the millennium due to two major reasons. One of them is the poor policies that link urbanization and food production and two; overreliance in the cereals by both the local population and the urban population. Due to climate change, the cereals (rice) production has been shrinking each year as the population continues to grow; making the country very insecure in terms of food production. The country has been pushed by bodies like the USAID and WFP to adopt other types of crops and even animal species yield more and are adaptable to the changes in climate. For example, FAO (2016) has noted that, The Global Fruit and Vegetables for Health Initiative (GF&VH Initiative) and the “Kobe framework for action” were established by FAO and WHO in 2014 to guide the development of cost-effective and effective interventions for the promotion of adequate consumption of fruit and vegetables for health. These have led to a series of regional workshops today in Ethiopia to promote and support implementation of fruit and vegetable programmes at national or sub-national level in developing countries.

6.1.4 Integrated Water Management and its Influence on Sustainable Food Security Programme:

A study by Mohd (2016) has shown that India needs to produce more crops per unit of land and water resources. Alarming rates of groundwater depletions and increasing environmental and social problems pose acute threats to mankind. Improved management of irrigation water is essential in enhancing production and productivity, food security and poverty alleviation. Agriculture is the biggest user of water accounting for over 80 percent of the water withdrawals. There are pressures for diverting water from agriculture to other sectors. It has been projected that availability of water for agriculture use in India may be reduced by 21 percent by 2020, resulting in drop of yields, especially rice, leading to price rise and threat to food security of the poor. The needs of other sectors for water cannot be ignored. As a result, it is necessary that an integrated water use policy is formulated and judiciously implemented. Modern methods of irrigation like sprinkler, drip irrigation, fertigation, among other water efficient tools need to be adopted on larger scale.

According to Bindraa et al (2017) on their study on sustainable integrated water resources management for energy production and food security in Libya, water management influences sustainable food production leading to food security in the country. The study added that water planning, policies for water conservation, water recycling, water harvesting, technology use in water management and many other initiatives influence the water amounts that have a direct influence on sustainable food security. A similar study by the World Bank (2016) has shown that the country was better placed in terms of feeding its people before the uprising of the Arab spring wars. Some of the reasons why the country was doing well are its ability to manage both its underground and service waters well.

OECD (2017) has shown key policies measures among its member states that influence the sustainability of food security programmes and these are purely tied to effective use and management of its waters. The policies include; to Recognize the complexity and diversity of managing water resources in agriculture; Strengthen institutions and property rights for water management in agriculture; Ensure charges for water supplied to agriculture at least reflect full supply costs; Improve policy integration between agriculture, water, energy and environment policies; Address knowledge and information deficiencies to better guide water resource management; and Balance consumptive water uses across the economy with environmental needs.

Sirega (2017) notes that adoption of water irrigation efficient methods such as basin or Zypit and terraces promotes livelihoods and food production. Besides, sustainable best practices that include conservation of riparian land, construction of the rain water harvesting structures and local conservation techniques such as the construction of terraces help in increasing food production and livelihood of local communities. Equally, World Bank (2016) notes that, water scarcity has a huge impact on food production in most parts of Kenya like Kisumu, Siaya, Migori and parts of western Kenya. Without water people do not have a means of watering their crops and, therefore, to provide food for the fast-growing population. Agriculture is constantly competing with domestic, industrial and environmental uses for a scarce

water supply. The Government should purpose to supply all homes in the study areas and other affected areas with basic water requirement for preserving human survival and well-being.

6.2 Theoretical Framework:

This study shall be guided by two theories i.e. the development theory and the post development theory

6.2.1 Development Theory:

For one to understand the development theory, it is prudent to define development. Development means different things to different people in different places (OECD, 2107), and it represents an improvement of people's everyday lives. An improvement to something better than the current situation, either it is technological, social, cultural political and/or economic. By this, development means, "changing the world to the better" (WB, 2016), and is often changes that start at the bottom rather than the top of the bureaucracy. When development is used as a term in the study, the main approach is poverty reduction and increasing poor people's livelihoods.

According to Karplus (2014), for sustainable livelihoods and healthy families, the development theories were developed immediately after World War II. According to him, development theories are sets of propositions that are applied in the explanation of how development has taken place in the past and in the explanation of how to create development in the future. According to Chant and McIlwaine (2009), there is not just one single definition of development, and there is not just one theory trying to explain it. Development theory is a suggestion of what development should imply. Historically there have been several different theories trying to create and explain development. The two main meta- theories explaining the world are modernisation- and dependency theory. The former is a theory that believes development is an irreversible and positive process that eventually all societies will pass through. The intellectual roots lies in the nineteenth century sociologists such as Max Weber and Emilie Durkheim, who both drew on Darwin's evolution theory in their explanation of the transition of societies from 'traditional' to 'modern' economies. The latter grew forward as a critique to the modernization theory and the fact that Europe was used as a model on how to create development in developing countries.

The dependency theory argues that the widespread poverty in developing countries is a result of an exploitative attitude among industrialized countries. Scholars, such as Andre Gnder Frank and Paul Baran, who supports the depends its, argue that the growth of Europe and other developed countries was only possible because of active underdevelopment of developing countries through active exploitation. Today's developing countries have a different starting point for creating development than developed countries had (Chant and McIlwaine, 2009).

In the 1980s the neoliberal approach quickly became the most accepted approach towards development. The major institutions such the World Bank, the International Monetary Fund (IMF) and World Trade Organisation (WTO), all institutions with severe power in shaping the world, adopted the neoliberalism in one way or another. The principle of neoliberalism is deregulation of markets, comparative advantage and the promotion of free trade, which some would argue is partly the reason why the gap between developed and developing countries have become this large, due to the unequal power relationship (Chant and McIlwaine, 2009). As a reaction to the neoliberalism, the 15 post-development strategies grew forward, a critique to the standards assumptions about development and progress. This approach sees the perspective of developing regions, and argues against the modernization idea, supports a pro-poor growth, focusing on development from below and is approaching development on a more individualistic way, where the different countries' needs are set first, and it is not used a universal development strategy. This is a very recognized approach toady in the development debate and has in a larger extent been adopted by the major global policy actors in dealing with poverty; one of which is manifested in food insecurity.

6.2.2 Post Development Theory:

Post-development theory argues that development theory and the practice of Post-World War II development projects have failed because the entire concept of development is a Western, non-universal measure of progress. Indeed, examples of failed development interventions abound from around the world. While development experts argue amongst themselves about how best to deliver development interventions in order to minimize the failures of development, post-development theorists believe that no amount of tweaking will make the development agenda a success. They argue that the problem with development is not about how it is implemented, but rather that development itself is a flawed concept which should be eliminated from the discourse on human progress (Karplus, 2014).

The term development encompasses a broad range of ideas, services, and goals. One such development goal is food security. From a post-development perspective, problems of food security are not properly addressed by the current development discourse and practice. Post-development theorists have argued that studies of famine and poverty are incorrectly depoliticized by development organizations. They argue instead that food security is inherently political and that there is a distinct disarticulation between agencies delivering food aid and food security services and the politics of food in recipient countries. A post-development analysis of food security interventions can identify problems with the development agenda as well as offer alternatives to development as potential solutions to food insecurity. This paper will use a post-development perspective to answer the question; do development practices adequately address issues of food security (Karplus, 2014).

6.3 Conceptual Framework:

In this study, a conceptual framework has been included to show the relationship between the dependent variables and the independent variable, as shown in the figure 1 below. Also included are the intervening variables (variables that have some influence on the dependent variable but have not been included in the study)

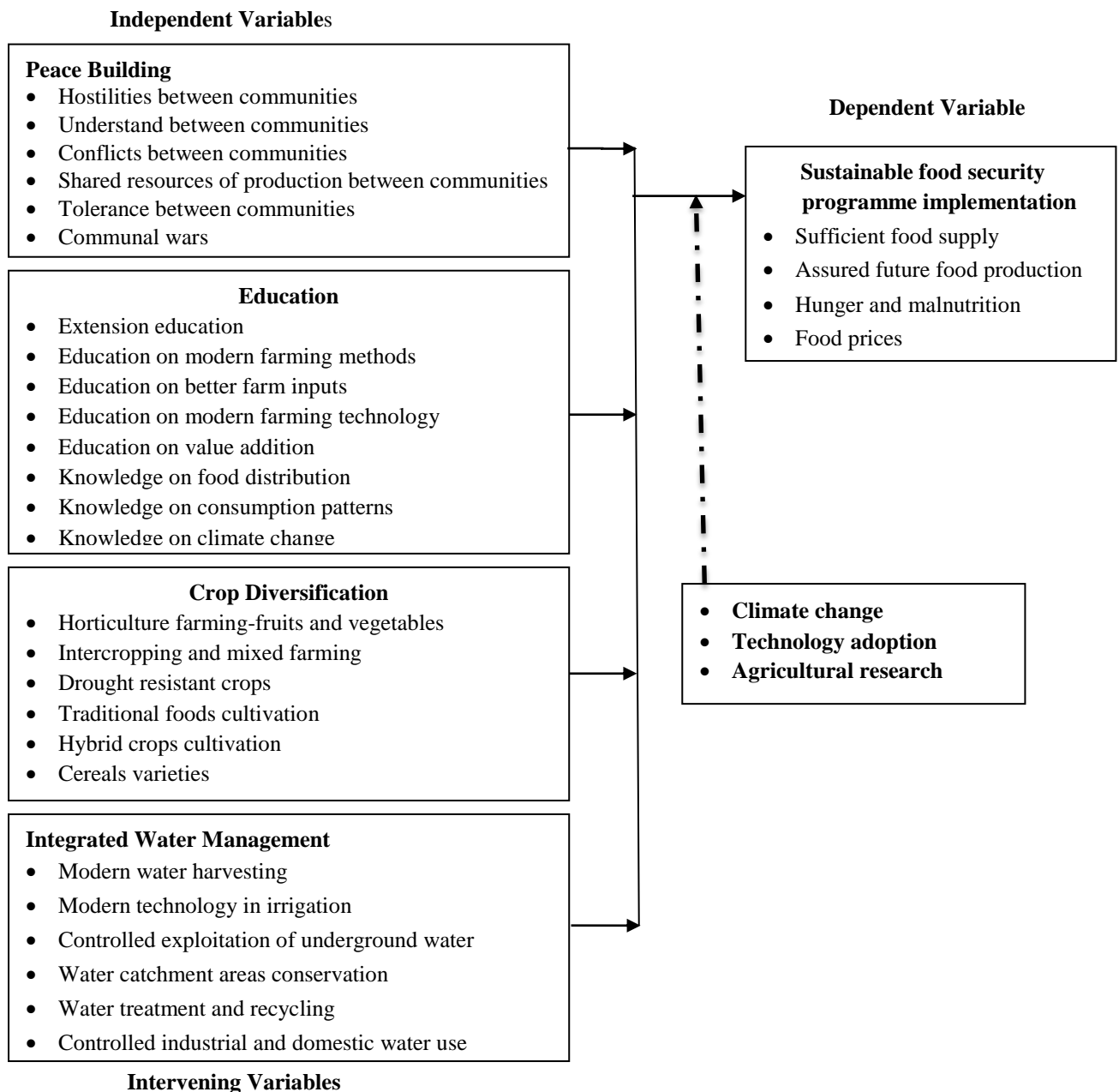


Figure 6.1: Conceptual Framework

7. RESEARCH METHODOLOGY

7.1 Research Design:

Orodho (2003) describes research design as the scheme, outline, or plan that is used to generate answers to a research problem. This study adopted a descriptive survey design. Descriptive survey design entails an in-depth empirical collection of facts and data about a certain phenomenon. It also describes actions as they are or as they happen rather than manipulation of variables and collects data from a wide/diverse category of respondents. Descriptive survey design was used by the researcher to explore the opinion of the household heads and other bodies dealing with food security on the determinants of sustainable food security in the Tana River County. Mugenda and Mugenda (2003) contend that the purpose of a descriptive research is to describe behaviors and characteristics as they are without interfering with anything.

7.2 Target Population:

Kothari (2004) defines a target population as a representation of the members of real set of people, objects or events the researcher or investigator opts to generalize results of the study. In this study, the target population involved the household heads of the families that had been documented by the county ministry of agriculture to have been actively participated in food production and the 11 employees of the county ministry of agriculture only. According to the report in the county headquarters, there were 46, 123 farmers who ranged from small scale to middle scale producers who fed the county (Tana River Department of Agriculture, 2018). The household heads from these farm categories made the target of study population together with the 11 employees in the department at the county level as shown below in table 7.1

Table 7.1: Target Population

Category	N(Population)
Household heads	46 123
County agriculture officers.	11
Total	46 134

Source (Tana River Department of Agriculture, 2018)

7.3 Sample Size and Sampling Procedure:

A sample can be defined as a representation of the real population of study with similar characteristics and expected responses (Kothari, 2004). According to Mugenda and Mugenda (2003) sampling therefore can be defined a methodical selection of demonstrative cases from the larger population, and its objective is to get precise experimental data at a portion of the cost that it would take to study all probable cases. In this study, the sample size was calculated by use of the Krejcie and Morgan table of 1970 attached as appendix. From the table, when N (target population) is 46 123 and 11, and s (sample size) is picked to be 381 and 10 respectively. This is shown in table 7.2 below:

Table 7.2: Sample Size

Category	N(Population)	s (sample size)
Household heads	46 123	381
County agriculture officers.	11	10
Total	46 134	391

Sample size source (Krejcie and Morgan Table of 1970)

Therefore, a total sample size of 391 respondents was picked for the study. The sampling procedure involved two categories whereby stratified sampling was applied to group the respondents to their stratum and later on simple random sampling was applied to pick the exact number of respondents as guided by the Krejcie and Morgan sampling table of 1970.

7.4 Data Collection Instruments:

Secondary data for this study shall be obtained from the journals, books, website materials, periodicals and other documented literature sources. The primary data from the field shall be obtained by use of a questionnaire. According to Dawson (2002), questionnaires are the best instruments of data collection since they are easy to construct, easy to

administer and easy to collect. Also, questionnaires are preferred in social sciences since they are able to exactly extract the required information, attitudes, beliefs and feeling of the various respondents in relation to a given subject of study. The questionnaire shall have two sections with the first one requiring the respondents to give their background information while the second section shall require the respondents to answer various questions in relation to the study objectives. The questions in the questionnaires are structured in relation to the objectives of the study only.

7.5 Data Collection Procedure:

The researcher defended the research proposal and when he was allowed to go to the field, he obtained a letter of transmittal from the University of Nairobi’s postgraduate department for the research. The researcher also obtained a letter of introduction to the households from the Agriculture department in the County and also one from the county commissioner in charge of security due to the security situation in the county. The researcher then trained 4 research assistants who helped in distributing and translating the instrument of research. These research assistants were picked from the local community so that they could easily translate anything not well understood. The researcher together with the research assistants booked appointments with the respondents, dropped the questionnaires and requested for the respondents to answer them so that they could be picked immediately to avoid non-respondents. The exercise was distributed as per the sub counties and took place in two weeks. The county officers were allowed to fill theirs and be picked later.

7.6 Data Analysis Techniques:

The completed questionnaires were sorted out, edited for consistency and completeness before processing responses. After data cleaning, data shall be coded, entered into the computer for analysis. Data was analyzed using Statistical Package for Social Sciences (SPSS). The data was analyzed and presented using descriptive statistics such as means and percentages, frequency counts, and standard deviations. The hypothesis (relationship between the various variables) was obtained by use of the Chi-Square.

8. RESEARCH FINDINGS AND DATA ANALYSIS

8.1 How Peace Building Influences Sustainable Food Security Programme Implementation in Arid and Semi-Arid Kenya:

Table 8.1: Effect of Peace Building on Sustainable Food Security Programme Implementation in Arid and Semi-Arid Kenya

	N	Mean	Standard Deviation
Hostilities between communities’ influence food production and availability in the county significantly.	300	4.42	0.663
Understand between communities is closely linked to food stability, availability and the general food security in the county	300	4.52	0.767
Conflicts between communities influence the availability, production and the trends of food security in the county	300	4.23	0.987
Peaceful and equally shared resources of production between communities influences sustainable implementation of food security in the county	300	4.67	0.999
Tolerance between communities influences sustainable implementation of food security in the county	300	3.98	1.01
Communal wars influence sustainable implementation of food security in the county significantly	300	4.67	1.09

These are descriptive results which indicate that majority of the respondents agreed with the following factors in consideration in the following ways. They agreed that: hostilities between communities m=4.42; Conflicts between communities m=4.23; and Tolerance between communities m=3.98 influences sustainable implementation of food security in the county. They strongly agreed that: Understand between communities m=4.52; Peaceful and equally shared resources of production between communities m=4.67; and Communal wars m=4.67 influence sustainable implementation of food security programme in the county significantly. Generally, the results indicate the respondents agreed that peace building influences the implementation of sustainable food security programme in the county.

Since the direction of influence is not determined as the alternative hypotheses are non-directional, this calls for a single sample two-tailed test computed by use of SPSS. Because the population mean is unknown, the *t*-test with *n*-1 degrees of freedom is the most appropriate test. The study assumed a 0.05 level of confidence. As the sample size was larger than 40 and based on the central limit theorem, the sampling distribution of the mean will be approximately normal (after Privitera). Computing the *value*:

Table 8.2: Hypothesis Results as per Objective One

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	10.060 ^a	1	.111		
Continuity Correction ^b	.807	1	.321		
Likelihood Ratio	2.515	1	.061		
Fisher's Exact Test				.306	.105
Linear-by-Linear Association	2.431	1	.164		
N of Valid Cases	300				

Results: *p*-value=0.306

Accept H_1 Peace building has a significant influence on the implementation of sustainable food security programmes in arid and semi-arid regions of Kenya.

Reject H_0 Peace building has no significant influence on the implementation of sustainable food security programmes in arid and semi-arid regions of Kenya.

Since the calculated *p* value of 0.306 was less than 0.5 ($p < 0.5$), at 0.05 confidence level, the alternative hypothesis was accepted, and null rejected. Thus, peace building has a significant influence on the implementation of sustainable food security programmes in arid and semi-arid regions of Kenya.

8.2 Influence of Education on Sustainable Food Security Programme Implementation:

Table 8.3: Effect of Education on Sustainable Food Security Programme Implementation in Arid and Semi-Arid Kenya

	N	Mean	Standard Deviation
Level of knowledge (expertise) and education influences sustainable food security implementation in Tana River County.	300	4.55	0.701
Education on modern farming methods influences sustainable food security implementation in Tana River County.	300	4.65	0.777
Education on better farm inputs influences sustainable food security implementation in Tana River County.	300	4.51	0.992
Education on modern farming technology influences sustainable food security implementation in Tana River County.	300	4.71	0.679
Education on value addition influences sustainable food security implementation in Tana River County.	300	4.21	0.781
Knowledge on food distribution influences sustainable food security implementation in Tana River County.	300	4.22	1.21
Knowledge on consumption patterns influences sustainable food security implementation in Tana River County.	300	3.78	0.872
Knowledge on climate change influences sustainable food security implementation in Tana River County.	300	3.56	1.821

These are descriptive results which indicate that majority of the respondents agreed with the following factors in consideration in the following ways. They strongly agreed that: Level of knowledge (expertise) and education $m=4.55$; Education on modern farming methods $m=4.65$; Education on better farm inputs $m=4.51$; and Education on modern farming technology $m=4.71$ influences sustainable implementation of food security in the county. They agreed that: Education on value addition $m=4.21$; Knowledge on food distribution $m=4.22$; Knowledge on consumption patterns $m=3.78$; and Knowledge on climate change $m=3.56$ influence sustainable implementation of food security programme in the county significantly. Generally, the results indicate the respondents agreed that education influences sustainable implementation of food security programme in the county.

Since the direction of influence is not determined as the alternative hypotheses are non-directional, this calls for a single sample two-tailed test computed by use of SPSS. Because the population mean is unknown, the *t*-test with n-1 degrees of freedom is the most appropriate test. The study assumed a 0.05 level of confidence. As the sample size was larger than 40 and based on the central limit theorem, the sampling distribution of the mean will be approximately normal (after Privitera). Computing the *value*:

Table 8.4: Hypothesis Results as per Objective Two

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	19.120 ^a	1	.021		
Continuity Correction ^b	.907	1	.181		
Likelihood Ratio	3.515	1	.071		
Fisher's Exact Test				.216	.225
Linear-by-Linear Association	4.401	1	.194		
N of Valid Cases	300				

Results: *p-value*=0.216

Accept H_1 Education has a significant influence on the implementation of sustainable food security programme in arid and semi-arid regions of Kenya.

Reject H_0 Education has no significant influence on the implementation of sustainable food security programme in arid and semi-arid regions of Kenya.

Since the calculated *p* value of 0.216 was less than 0.5 ($p < 0.5$), at 0.05 confidence level, the alternative hypothesis was accepted, and null rejected. Thus, education has a significant influence on the implementation of sustainable food security programme in arid and semi-arid regions of Kenya.

8.3 Effect of Crop Diversification on Sustainable Food Security Programme Implementation in Arid and Semi-Arid Kenya:

In a non-rated question, the researcher asked respondents whether they supported the argument that crop diversification influences sustainable food security programme implementation in Arid and Semi-Arid Kenya. In the responses, the respondents were asked to give three reasons for their support and the results were as shown in Table 8.5 below

These are descriptive results which indicate that a higher percentage of the respondents %=80 supported the idea that crop diversification influences sustainable food security programme implementation in Arid and Semi-Arid Kenya. The same percentage (80%) of respondents on average agreed that growing a variety of crops, growing drought resistant crops, intercropping and inclusion of hybrid crops influences the implementation of the food security programme in the county. Also, the researcher required the respondents to rate a number of ideas that were cutting across crop diversification and its influence on sustainable food security programme implementation in Arid and Semi-Arid Kenya. The results were interpreted by use of the mean and the standard deviation as shown in table 4.10 below

Table 8.5: Effect of Crop Diversification on Sustainable Food Security Programme Implementation in Arid and Semi-Arid Kenya

	N	Mean	Standard Deviation
Horticulture farming (fruits and vegetables) has an influence on sustainable food security in the county.	300	3.55	0.811
Intercropping and mixed farming has an influence on food availability, stability; leading to food security	300	3.99	0.997
Drought resistant crops influences food availability and sustainability in the county	300	4.61	0.872
Traditional foods cultivation influences sustainable food security implementation in the county.	300	4.51	0.771
Hybrid crops cultivation influences food security in the county	300	4.55	0.651

These are descriptive results which indicate that majority of the respondents agreed with the following factors in consideration in the following ways. They strongly agreed that: Drought resistant crops $m=4.61$; Traditional foods cultivation $m=4.5$; and Hybrid crops cultivation $m=3.55$ influences sustainable implementation of food security programme in the county. They agreed that: Horticulture farming (fruits and vegetables) $m=3.55$; and Intercropping and mixed farming $m=3.99$ influence sustainable implementation of food security programme in the county significantly. Generally, the results indicate the respondents agreed that crop diversification influences sustainable implementation of food security in the county.

Since the direction of influence is not determined as the alternative hypotheses are non-directional, this calls for a single sample two-tailed test computed by use of SPSS. Because the population mean is unknown, the t -test with $n-1$ degrees of freedom is the most appropriate test. The study assumed a 0.05 level of confidence. As the sample size was larger than 40 and based on the central limit theorem, the sampling distribution of the mean will be approximately normal (after Privitera). Computing the *value*:

Table 8.6: Hypothesis Results as per Objective Three

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	15.001 ^a	1	.001		
Continuity Correction ^b	.607	1	.121		
Likelihood Ratio	1.011	1	.051		
Fisher's Exact Test				.006	.201
Linear-by-Linear Association	2.001	1	.154		
N of Valid Cases	300				

Results: p -value=0.006

Accept H_1 Crop diversification influences the implementation of sustainable food security programmes in arid and semi-arid regions of Kenya significantly.

Reject H_0 Crop diversification doesn't influence the implementation of sustainable food security programmes in arid and semi-arid regions of Kenya significantly.

Since the calculated p value of 0.006 was less than 0.5 ($p < 0.5$), at 0.05 confidence level, the alternative hypothesis was accepted, and null rejected. Thus, crop diversification influences the implementation of sustainable food security programmes in arid and semi-arid regions of Kenya significantly.

8.4 Influence of Integrated Water Management on Sustainable Food Security Programme Implementation:

Table 8.7: Effect of Integrated Water Management on Sustainable Food Security Programme Implementation in Arid and Semi-Arid Kenya

	N	Mean	Standard Deviation
Modern water harvesting has an influence on sustainable food security implementation when effectively utilized	300	4.50	0.511
Modern technology in irrigation influences food security and food production	300	4.65	0.767
Controlled exploitation of underground water is linked to sustainable food security implementation in the county	300	4.51	0.772
Water catchment areas conservation has an influence on sustainable food security implementation	300	4.56	0.765
Water treatment and recycling influences sustainable food security implementation in the county	300	3.75	0.551
Controlled industrial and domestic water use influences food security programme implementation in the county	300	3.52	0.662

These are descriptive results which indicate that majority of the respondents agreed with the following factors in consideration in the following ways. They strongly agreed that: Modern water harvesting $m=4.50$; Modern technology in irrigation $m=4.65$; Controlled exploitation of underground water $m=4.51$; and Water catchment areas conservation $m=4.56$ influences sustainable implementation of food security programme in the county. They agreed that: Water treatment and recycling $m=4.21$; Knowledge on food distribution $m=4.22$; Knowledge on consumption patterns $m=3.75$; and Controlled industrial and domestic water use $m=3.52$ influence sustainable implementation of food security programme in the county significantly. Generally, the results indicate the respondents agreed that integrated water management influences sustainable implementation of food security programme in the county. Since the direction of influence is not determined as the alternative hypotheses are non-directional, this calls for a single sample two-tailed test computed by use of SPSS. Because the population mean is unknown, the t -test with $n-1$ degrees of freedom is the most appropriate test. The study assumed a 0.05 level of confidence. As the sample size was larger than 40 and based on the central limit theorem, the sampling distribution of the mean will be approximately normal (after Privitera). Computing the value:

Table 8.8: Hypothesis Results as per Objective Four

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	14.531 ^a	1	.099		
Continuity Correction ^b	.547	1	.199		
Likelihood Ratio	1.331	1	.098		
Fisher's Exact Test				.095	.401
Linear-by-Linear Association	3.031	1	.166		
N of Valid Cases	300				

Results: p -value=0.095

Accept H_1 Integrated water management has a significant influence on the implementation of sustainable food security programmes in arid and semi-arid regions of Kenya, &

Reject H_0 Integrated water management has no significant influence on the implementation of sustainable food security programmes in arid and semi-arid regions of Kenya.

Since the calculated p value of 0.095 was less than 0.5 ($p < 0.5$), at 0.05 confidence level, the alternative hypothesis was accepted, and null rejected. Thus, integrated water management influences the implementation of sustainable food security programmes in arid and semi-arid regions of Kenya significantly.

9. DISCUSSION OF KEY FINDINGS

The first objective of the study was to examine the extent to which peace building influences the implementation of sustainable food security programmes. A higher percentage of the respondents $\%=98$ supported the idea that peace building influences sustainable food security programme implementation in Arid and Semi-Arid Kenya. On average $\%=95$ agreed that when there is peace, equally shared resources and better channels of resolving conflict, community members participate more in production leading to food security in the county. In his work, Emmy (2017) has shown that peace and stability is a cornerstone of sustainable food security. In this study that was carried out in 3 countries (Syria, Somalia and Southern Sudan), food availability and distribution greatly depend on the availability of peace. She has indicated further that, conflict negatively affects all four dimensions of food security: availability, access, utilization, and stability.

The second objective was to determine the influence of Education on the implementation of sustainable food security programmes in arid and semi-arid Regions of Kenya. A higher percentage of the respondents $\%=90$ supported the idea that education influences sustainable food security programme implementation in Arid and Semi-Arid Kenya. The same percentage of respondents on average agreed that levels of knowledge on modern farming inputs and methods, education on modern technology in farming and farm management influences the implementation of the food security programme in the county. These findings agree with a number of scholars' findings in the literature reviewed. For example, Roberto (2014) found out that education in food production, distribution and sustainability is very vital. According to his studies, education equips the relevant stakeholders on the best farming inputs, farming methods, breeds, channels of distribution and even the future trends in food production; leading to sustainability.

The third objective was to establish the extent to which crop diversification influences the implementation of sustainable food security programmes in arid and semi-arid Regions of Kenya. A higher percentage of the respondents %=80 supported the idea that crop diversification influences sustainable food security programme implementation in Arid and Semi-Arid Kenya. The same percentage (80%) of respondents on average agreed that growing a variety of crops, growing drought resistant crops, intercropping and inclusion of hybrid crops influences the implementation of the food security programme in the county. According to the report published by FAO (2014) in Latin America, crop diversification is the only strategy that can be applied in the urban or the rural agricultural zones to ensure sustainable nutrition and diets. This means that crop diversification is a sure way of ensuring food security. Also, Stefania (2015) also argues that there is a positive and significant effect of crop diversification on long-term food security and child nutritional status, in particular for very young children and children living in households with limited market access. She has also concluded that crop diversification is important since it ensures food security, nutrition and health in Tanzania; it secures source of income, employment and high value products; and it resilience of farming systems and environmental services.

The final objective was to assess the extent to which integrated water management influences the implementation of sustainable food security programmes in arid and semi-arid Regions of Kenya. A higher percentage of the respondents %=95 supported the idea that integrated water management influences sustainable food security programme implementation in Arid and Semi-Arid Kenya. Over 90 percentage of the respondents on average argued that modern technology use in irrigation, controlled use of the waters and harvesting the rain water influences the implementation of the food security programme in the county. Bindraa et al (2017) have similar opinion. In their study on sustainable integrated water resources management for energy production and food security in Libya, water management influences sustainable food production leading to food security in the country. The study added that water planning, policies for water conservation, water recycling, water harvesting, technology use in water management and many other initiatives influence the water amounts that have a direct influence on sustainable food security.

10. CONCLUSIONS AND RECOMMENDATIONS

The research concludes that peace building significantly influences the availability, distribution and production of food thus enhancing food security. When there is peace, communities are engaged in productive activities that can lead to food production thus sustainability of the food security programme. Education is another major factor influencing food security in the county. Well educated individuals are able to use modern methods of food production, add value and use technology which in turn leads to sustainable food security. Crop diversification influences the sustainability of food security programme in the county significantly. This includes growing a variety of crops, intercropping, adoption of hybrid crops and moving to horticultural agriculture. Finally, integrated water management influences the sustainability of food security programme. This includes harvesting water during the rain seasons, using modern technology in irrigation, exploring underground waters and preservation of water catchment areas.

The community members should be sensitized on the importance of peace and harmonious living since this is the first step towards food security in any given part of the world. They should also have exposed to both formal and non-formal education through various programmes that aim at equipping them with information that can help them achieve food security. The various agencies should invest in advising the farmers on the importance of crop diversification and non-reliance on one type of food crop (maize). The agencies should also invest very much in research and extension so as to come up with a variety of crops that are adapted to the environment and the harsh climate in the region. Finally, the researcher recommends that the water in the region must be managed properly through well laid policies of water use and preservation. The water catchment areas should be conserved, and modern technology should be used to ensure that water is harvested during the rain seasons.

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