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Assessment of Factors Influencing Food Security in Wenje Division, Tana River County – Kenya

Peter Ndegwa[1] Dr. Okeyo Benards[1] Prof. Dr. Halimu Suleiman Shauri[2]
1.Department of Environmental Studies, School of Agriculture and Environmental Sciences, Pwani University, Kenya
2.Department of Social Sciences, School of Humanities and Social Sciences, Pwani University, Kenya

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Abstract
Access to food is recognized as a right as stated in the Universal Declaration of Human Rights (1948). However, food security is still not universally treated as a basic human right. Despite the various progressive measures adopted by the Government of Kenya and Non-governmental organizations, the status of food security in Tana River County is appalling. This study was designed to assess the factors influencing food security in Wenje Division in Tana River County. The main purpose of the study was to assess the extent to which, climate change, governance, access to markets and land use affected food security. The study adopted a descriptive survey research design. Stratified random sampling was employed to select 390 (10%) out of a total population of 3,908 households. Data was collected using a questionnaire and Focus Group Discussions. Descriptive statistics and regression modeling were used to analyze quantitative data. Qualitative data was presented in narrative form. The key results from the study show that climate change (p=0.001) and land use (p=0.001) had a significant effect on food security. These factors were also found to have a negative influence on food security in the area. Further, statistical findings show a significant relationship between access to markets and food security, while governance was not found to have a significant influence on food security perhaps due to the solitary nature of the farming households. The study concluded that climate change, market access and land use have a significant influence on food security in Wenje Division, while governance was found not to have a significant influence on food security in the area. The study recommended that the government in partnership with other stakeholders should develop strategies to reduce reliance on rain fed agriculture to mitigate the effects of climate change on food security. The study also recommended land use training and planning to empower farmers with skills in the area to enhance food production. Finally, deliberate efforts should be made by the government and other development actors to enhance market access as this was also found to significantly influence food security in the area.

1.1 Introduction

Achievement of food security is a concern to both developed and developing countries (Mwaniki, 2012). The World Food Summit (1996) defined food security as a situation when all people at all times have access to sufficient, safe, nutritious food in order to maintain a healthy and active life. The Food Security Network (2013) adds that such food must be produced in an environmentally sustainable and socially just manner, and that people should be able to make informed decisions about their food choices. On the other hand, *Bickel et. al.* (2000) defines food insecurity as a situation of limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways.

According to WHO (2013), food security is built on three pillars namely; 1) food availability (sufficient quantities of food available on a consistent basis) 2) food access (having sufficient resources to obtain appropriate foods for a nutritious diet) and 3) food use (appropriate use based on knowledge of basic nutrition and care, as well as adequate water and sanitation). However, FAO (2009) added a fourth pillar of food security to include stability of the aforementioned three pillars. Accordingly, a healthy and sustainable food system therefore is one that focuses on environmental health, economic vitality, human health and social equity. Food Security also means that the people who produce our food are able to earn a decent living wage in the process of growing, catching, producing, processing, transporting, retailing, and serving food (FSN, 2013).

Apparently 925 million people worldwide are chronically hungry due to extreme poverty, while up to 2 billion people lack food security due to varying degrees of poverty (FAO, 2010). The reason why people are hungry is largely because of the fact that 2,700 calories produced and required per capita which have already been achieved according to United Nations are not all feeding human beings. More precisely, one third of these calories go to feed animals, 5% are used to produce biofuels, and about a third is wasted along the food chain (Bittman, 2013). The industrial food chain uses 70% of agricultural resources to provide 30% of the world's food, whereas small landholders produce the remaining 70% using only 30% percent of the resources (Bittman, 2013). Thus it is the small landholders that are feeding the majority of the world population.

Food security in Africa has worsened since 1970s and the proportion of the malnourished population

has remained within the 33 to 35% range in sub-Saharan Africa *(Rosegrant et al. 2005).* The prevalence of malnutrition within the continent varies by region. It is lowest (4%) in Northern Africa and highest (40%) in Central Africa (RoK, 2011). Currently over 10 million people in Kenya suffer from chronic food insecurity and poor nutrition, and between two and four million people require emergency food assistance at any given time. Nearly 30% of Kenya's children are classified as undernourished, and micronutrient deficiencies are widespread (RoK, 2011).

There are many challenges affecting availability and scarcity of food in the world. These include unstable social and political environments that preclude sustainable economic growth, war and civil strife, macroeconomic imbalances in trade, natural resource constraints, poor human resource base, gender inequality, inadequate education, poor health, and natural disasters, such as floods and locust infestation, and the absence of good governance. All these factors contribute to either insufficient national food availability or insufficient access to food by households and individuals (Mwaniki, 2012). The result is forced flight to cities, where the poor become poorly paid labourers, enter the cash market for food, and eat worse since they have lost both the ability to produce and to pay for food (Bittman, 2013).

Kenya lies between latitudes 5° N and 5° S and between longitudes 34° E and 42° E. It is almost bisected by the Equator. It has a population of about 45 million people with a density of 69 persons/km^2. (Mohajan H. K, 2014). The population distribution varies from 230 persons per km^2 in high potential areas to 3 persons per km^2 in arid areas (RoK, AU, 2013). The average population density in Tana River county is 6 with Tarasaa having the highest at 40 and Garsen the lowest at 3 (Tana River CIDP, 2013-2017). Life expectancy (at birth) of the total population in 2013 in Kenya was about 63.29 years (male 61.84 years and female 64.77 years) (RoK, AU, 2014). While in the Tana River County life expectancy is 53.8 years (Tana River CIDP, 2013-2017).

Food price instability is a major problem in Kenya, which is frequently identified as a major obstruction to smallholder productivity growth and food security (Mohajan, H. K, 2013). The agricultural sector as the backbone of Kenya's economy contributes 26% of the GDP directly annually, and another 25% indirectly. It supplies 65% of Kenya's total exports and provides more than 18% of formal employment. More than 40 million people live in Kenya, 80% of them live in rural areas and rely almost entirely on agriculture (GoK, 2010-2020). The country's food and nutrition insecurity is often associated with poor performance of the agricultural sector (RoK, NFNSP, 2011).

The area of Kenya is 580,400 km^2 but only 12% of the total area is considered high potential for farming and intensive livestock production. This potentially arable land is dominated by commercial agriculture with cropland occupying 31%, grazing land 30%, and forests 22% and the rest of the land is used for game parks, urban centers, markets, homesteads and infrastructure. A further 5.5%, which is classified as medium potential, mainly supports livestock (Mohajan H, 2014). Only 60% land of Kenyan high and medium potential land is devoted to crops, the rest is used for grazing and forests. More than 60% people of Kenya live below the poverty line (less than $1.25 a day or unable to afford to buy food providing a daily intake of 2,100 kilocalories) (Mohajan H.K, 2014). On the hand Tana River County has 76.9 per cent of the population living in absolute poverty (Tana River CIDP, 2013-2017).

About 84% of the total land in Kenya is classified as arid and semi-arid, mainly in the northern and eastern regions. It is estimated that the arid and semi-arid areas support about 25% of the nation's human population and slightly over 50% of its livestock (Mariara, J.K. and Karanja, F.K., 2006). The land in Tana River County is largely non-arable covering 31,798.7 km^2. The rest is either under forest 3,457 km^2, arable land covering 2,547 km^2 with the average farm size being 0.71 ha and 3,059.5 km^2 under national reserves. The total acreage of farms under food crop production is 7,527 ha while that under cash crop production is 7,063 ha. Though various minor irrigation schemes have been initiated in the county to boost agricultural production, only 6.25 percent of the land with potential for irrigation is utilized (Tana River CIDP, 2013-2017)

1.2 Statement of the Problem

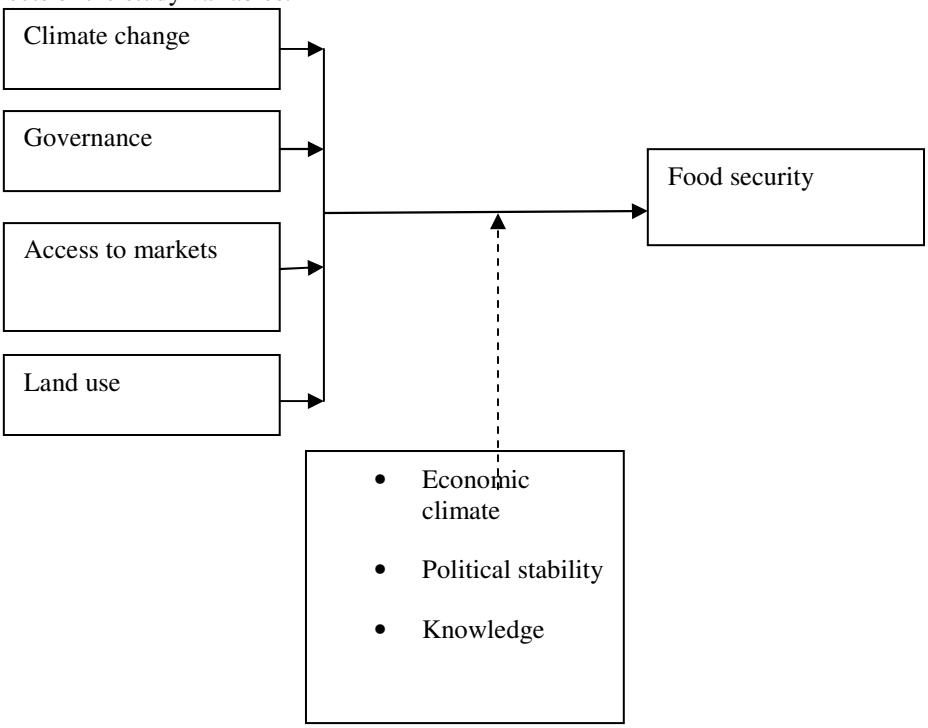
Apparently, the implementation of the National Agricultural Extension Policy (NAEP) and the Strategy for Revitalizing Agriculture (SRA, 2002-2004), complemented by other programmes in Kenya have not been a panacea to solving food insecurity problem. Household food insecurity has continued to be of national concern. The food insecurity situation in many parts of the country is blamed on various factors which include; the high prevalence of HIV/AIDS, poor governance; frequent drought and famine; and agricultural dependency on the climate and environment, land grabs and speculations and access to markets among others (RoK, 2009).

In Tana River County, where the study was conducted, there is prevalent food insecurity and worsening of factors supporting food production, including delayed rainfall, flash floods, infertile soils and lack of inputs. All these have made the state of food security deplorable despite the various progressive measures adopted by the Government and Non-governmental organizations. It was imperative therefore to undertake a study to understand why food insecurity has remained a serious problem in Wenje Division despite multiple interventions from the government and other development actors. More precisely, this study assessed how climate change,

governance, access to market and land use have influenced the attainment of food security in the study area.

1.3 Conceptual Framework

To understand the interaction of factors explaining the temporary flow of influence of climate change, governance, access to markets and land use, a conceptual diagram, Figure 1.0 is presented to simplify the interactive effects of the study variables.



The independent variables here represent the causes or the determinants of food security. It is these variables that are tested to see if they have a significant influence on food security. The factors are climate change, governance, access to market and land use. The dependent variable here is food security. There is also the presentation of extraneous variable or the moderating factors in the conceptual framework in Figure 1.0. The moderating factors presented in Figure 1.0 include economic status, political stability and knowledge.

The independent variables are measured using certain indicators as follows:

- Climate change: the indicators include weather changes and types of weather. These indicators are assessed to determine their effect on farms and livestock and on food security.
- Governance: the indicators are awareness of food security as human rights component, activities ensuring food security. These factors are tested on their influence to on food security.
- Access to market: the indicators are distance to the market and food prices. The effect of these variables on food security is also determined in the study.
- Land use: the indicators include size of land and land used for food production and land productivity. These indicators are tested to reveal their influence on food security, the study's dependent variable measured using the indicators of food availability, accessibility and productivity.

2.0 RESEARCH METHODOLOGY

2.1 Research Design

This study adopted a descriptive survey research design which involved collecting data in order to answer questions on current status of the households of the study. As recommended by Kothari (2004), descriptive survey design allows the researcher to describe, record, analyze and report conditions that exist or existed.

2.2 Study Area site

This study was conducted in Wenje Division of Tana River County in the following villages of Hara, Makere, Maroni, Kipendi, Wenje, Bula, Vukoni, Bububu, Majengo, Fanjua, Mkomani, Gafuru, Maweni, Bondeni and Hadampia. Tana River County is sub divided into eight administrative divisions with a total area of 22,452.9

Km^2. Trust land forms the bigger portion of the County land resource with over 90% of the land. Wenje division is 556.9 square Kilometers with 5 locations and 11 sub-locations. Wenje division has a population of about 17,910 people (3908 HH) which is about 7% of the total population of the whole County (Tana River DDP 2008-2012)

This area was chosen for the study because it is one of the areas struggling with food security. The county is divided into four agro- ecological zones namely: CL 3 Coconut – Cassava zone (non ASAL), CL4 Cashew nuts- Cassava zones where the main economic activity is peasantry mixed farming; CL5 Lowland Livestock zone and CL6 Lowland Ranching zones where the locals are involved in pastoral activities. The division as a whole falls within this area (CIDP, 2013-2017).

These zones are characterized by scarce rainfall ranging between 300m – 600mm per annum only. The rainfall is erratic and unreliable resulting in persistent moisture stress in the soil profile. The area is further characterized by a flood plain along the banks of river Tana prone to flooding whenever the river bursts its banks. Apart from river floods the area is also sometimes affected by floods from the hinterland through seasonal rivers.

The weather condition exhibits very high evaporation demand. From wood-head maps, the average evapo-transpiration during the dry and sunny months with a crop factor of 0.9, is 5.2mm/day (CIDP, 2013-2017). Average annual temperatures are about 30^0 C with the highest being 41^0 C around January-March and the lowest being 20.6^0 C around June-July.

The area is between 70 – 100m above sea level. Slopes are within the range of 0.05%-0.15% with local surface undulations. The soils range from sandy, dark clay and sandy loam to alluvial deposits. The soils are deep around the riverine environments but highly susceptible to erosion by water and wind. Soils in the hinterlands are shallow and have undergone seasons of trampling by livestock, thus are easily eroded during rainy seasons (CIDP, 2013-2017).

The vegetation ranges from scrubland to thorny thickets within the riverine area. Main crops grown are mangoes, bananas, maize, green grams, cowpeas, tomatoes, vegetables and melons while main livestock kept are cattle, sheep and goats.

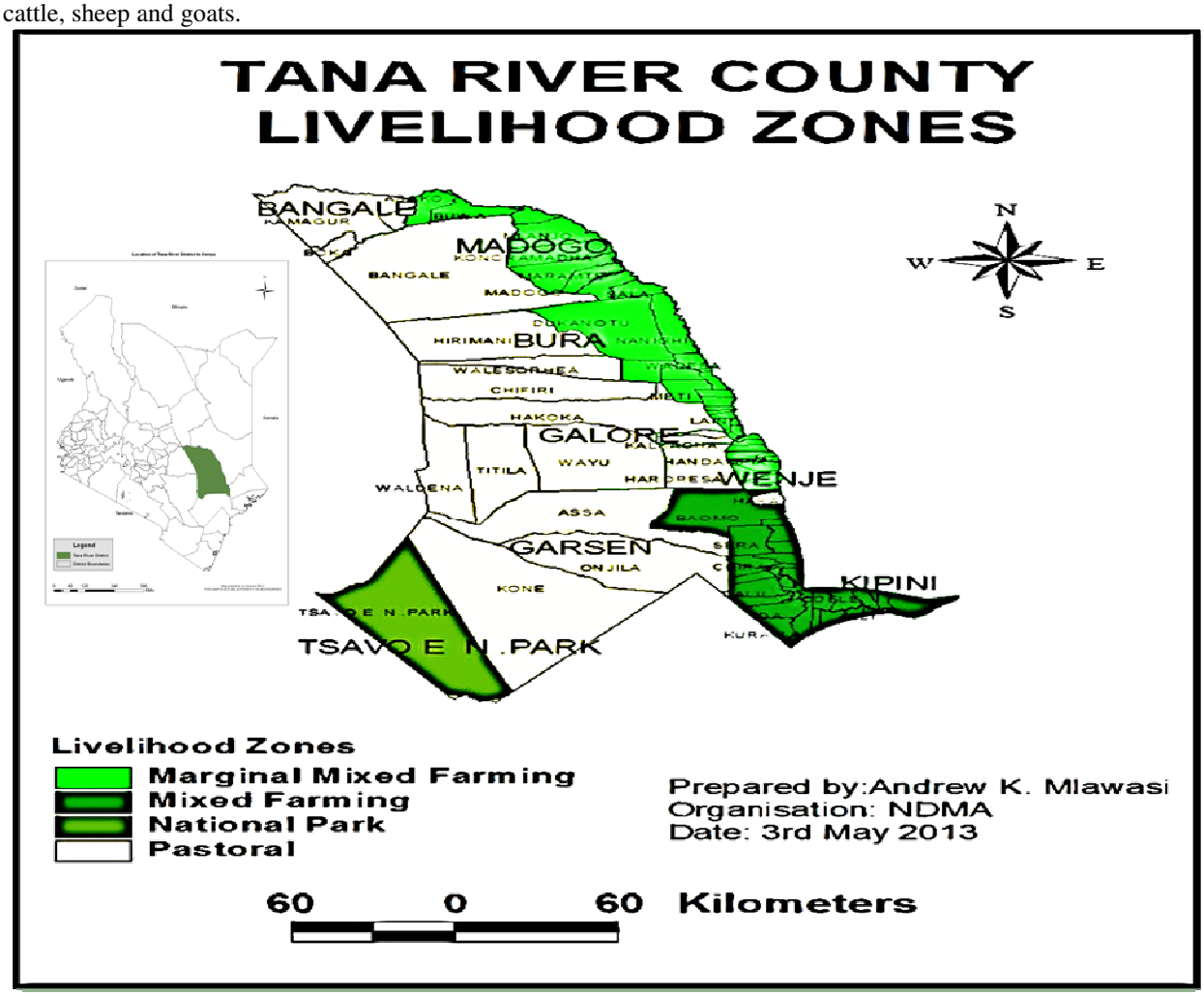


Figure 2.0 Wenje Division Map

2.3 Target Population and Sampling Procedure

This study was a household survey targeting stratified and randomly selected households within Wenje Division. This was done in two stages, the first stage sampling procedure was used to select 15 out of the 23 villages from the five strata which in this case were the five locations of Wenje Division. Stratified sampling technique is a method in which the researcher divides the entire target population into different sub-groups and then randomly selects the respondents proportionally from the sub-groups. The second stage sampling procedure that this study used was selection of the 390 households to represent the entire Wenje Division population. Here Mugenda and Mugenda (2010) suggest that 10% - 30% of the accessible population is adequate to serve as a study sample. According to the 2009 National housing and population census, Tana River County has 29,933 households. Wenje division has 3,908 households (Table 1.0). Therefore, taking 10% of the households from Wenje division, the sample size was calculated as follows.

Table 1.0 Sampling frame

Location	Number of households	Total Population	Sampled households (10*of total households)
Gwano Location	**956**	**4370**	**96**
Hara	322	1479	32
Maroni	229	1032	23
Wenje	405	1859	41
Jamhuri Location	**654**	**3004**	**65**
Bububu	654	3004	65
Kinakomba Location	**911**	**4185**	**91**
Majengo	614	2820	61
Fanjua/Masalani	297	1365	30
Mazuni Location	**543**	**2486**	**54**
Gafuru	256	1176	26
Mazuni	128	578	13
Mkomani	159	732	16
Ndura Location	**844**	**3866**	**84**
Bondeni	492	2260	49
Handampia	352	1606	35
Total	**3,908**	**17,911**	**390**

Source Tana River DDP (2008-2012)

A list of all the households was made with each household bearing a number starting from 1 to 3,908. The list was fed into a computer and using a table of random numbers, the researcher selected 390 households. It is the household heads of these households that participated in the survey. The response rate from the participants of this study was 98%.

2.4 Data Collection Instruments

2.4.1 Questionnaire

In order to generate the required information for this study two instruments of data collection were used. The first instrument of data collection was a questionnaire. Two assistants from the local area were selected to ensure local customs were respected. A rapport was created with the community during the ten years I had worked in the area through social development projects. This made access to accurate information easy. Having worked in the area enhanced the phenomenon of talking with community during discussions rather than talking to the community (Okeyo B., 2015).

Two weeks were taken to explain the objectives of the study to the community, adequate time was spent explaining the objectives and enough chance given to community for seeking clarification. To minimize biases information was filtered, notes taken and later used to enrich the questionnaire. The questionnaire used had specific questions with limited answers creating a possibility to get the quantitative data that could be analysed statistically.

Semi structured questions assisted in generating in-depth and explanatory qualitative information. This method allows flexibility, follow up to original questions and pursuing of new lines of questioning, two-way interaction and facilitates exchange of information between the interviewer and interviewee making the atmosphere more relaxed. The use of both questionnaires and semi-structured questions is necessary in order to get as much information as possible from the community members (Okeyo B., 2015).

2.4.2 Focus Group Discussions

The second instrument of data collection used in this study was focus group discussion. This was used to allow

probing. Focus Group Discussion was used as a qualitative research technique for mapping out systems and answer questions of "why" and "how", especially concerning the data collected in the questionnaire interview. Where information was not clear from the questionnaires the discussion clarified how the climate change affected the daily living of the community for instance. The discussants were in groups of 8 - 12. If more people attended not all spoke during the meetings. The meetings took between 3 - 4 hours and they were done in all the five locations with the permission of the area administrator (chief). Key informants interviews used with people with vast experience and knowledge who could provide extensive insight into bio-socio-cultural aspects of the community.

2.5 Validity and Reliability of Research Instrument

Content validity was used in this study. Content validity is the degree to which the instrument measures what the test is designed to measure. This was important in the establishment of accuracy and truthfulness of the research. Collecting data through face to face interviews with household heads, focus group discussions with community elders and field observation enabled the researcher to bring together diverse ideas about the same issue and in cross checking the results and consequently increased the validity and reliability of the findings (Bryman A., 2008).

To test the reliability of the instruments the study used test-retest technique. Test-retest reliability is measured by administering a test twice at two different points in time. Reliability is also checked by comparing informants' responses with those of other informants and sources (Okeyo B., 2015). Pre-test was used to improve the questionnaire, semi-structured questions and focus group interviews. A pilot study was carried out to test for reliability of the instruments. The questionnaires were administered to the respondents in the pilot households similar to those in the sample. Households that participated in the pilot study were not involved in the main study. Piloting was carried out for 39 households which make 10 percent of the total number of the 390 households involved in the study.

According to Orodho (2004) the number in the pre-test should be 10 percent of the entire sample. Cronbach's alpha was used to determine the internal consistency of items in the questionnaire to gauge its reliability. The analysis tested the internal consistency of the instruments by computing Cronbach's alpha to determine the reliability of the instrument. A Cronbach's alpha coefficient of 0.83 was taken as acceptable reliability. According to Cronbach (1957) a coefficient of between $0.7 \leq \alpha < 0.9$ is taken to be good while that of $\alpha \geq 0.9$ is taken to be excellent (George, 2003).

2.6 Data Collection Procedure

A clearance letter from Ethics Review Committee (ERC) of Pwani University was issued to facilitate the application of a research permit from the National Commission for Science, Technology and Innovation (NACOSTI). Then various locations were visited personally in order to get consent from the chiefs and village elders to administer the instruments. This enabled the researcher to familiarize with the respondents and establish rapport. Then the questionnaire was administered to the participants. The respondents were assured of strict confidentiality in dealing with the responses. An informed consent form was availed to the respondents which they duly signed after receiving explanation of the procedures adopted in the survey.

2.7 Data Analysis Methods

The collected data was organized according to its type as used in the study. The researcher organized the data to ensure that the raw data is edited to free it from inconsistencies and incompleteness. This involved the scrutiny of the completed instruments in order to detect and reduce as much as possible, errors, incompleteness, misclassification and gaps in the information obtained from the respondents. Descriptive methods such as frequency distribution, percentages, mean, were used to analyze quantitative data. Qualitative data generated from questions was organized into themes, categories and patterns pertinent to the study and presented by narration. Regression analysis was adopted to establish the relationships between the dependent and independent variables as described in the conceptual framework summarized below:

$Y = X + X_1 CC + X_2 G + X_3 AM + X_4 LU + e$

Where:

Y = Food security

X = Constant

X_1, X_2, X_3& X_4 = Co-efficients

CC = Climate change

G= Governance

AM = Access to markets

LU = Land use

e = residual error

3. RESULTS AND DISCUSSION

3.1 Demographic Characteristics of Participants

Under this section, background characteristics such as age of the respondents, gender, level of education, occupation, household size are presented.

3.1.1 Gender of Respondents

Findings in figure 3.0 show that over half (54%) of the respondents in this study were females. The large (54%) percentage of females and over one third (46%) of male gender representation in the sample is consistent with the findings of Ong'ayo and Akoten (2007) who state that farming among smallholder farmers is practiced by both sexes. They further say that women participate in agriculture because they are the custodians of the food stores and utilization. This makes women closely involved in agricultural activities to ensure that the family has enough food. Indeed, women are entrusted with catering for the family nutritional needs and thus engaged in production, budgeting, meal planning and preparation, which are directly influenced by the amount of food in the household store. Women are also involved in agricultural production because of their desire to help in shouldering the burden of maintaining the household. The findings also show women are more than men and this is consistent with the Tana River DDP (2008-2012) that the ratio of male to female is 49:51.

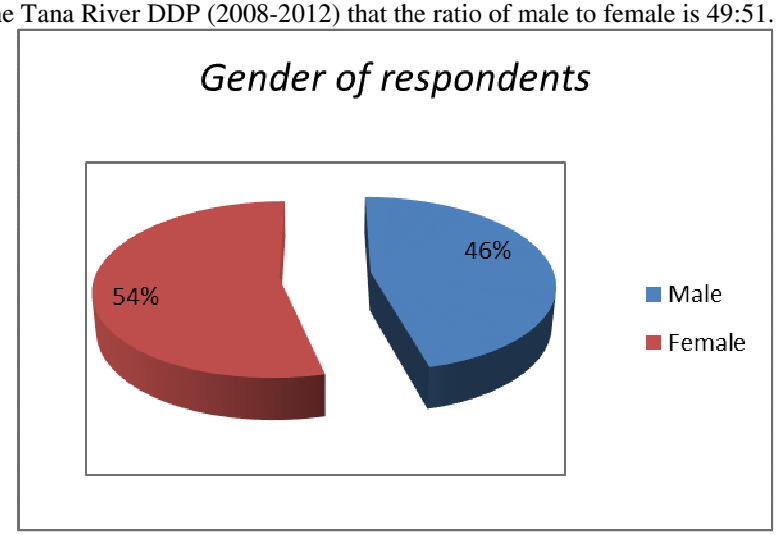


Figure 3.0Gender of respondents

3.1.2 Distribution of Respondents by Age

Findings of the study in Table 2.0 show that over half (53.8%) of the respondents were aged 40 years and below. This is an indication that most farmers are young people who have energy which, if well used, could bring positive change in agricultural production. It also depicted that life expectancy is low and therefore majority of the villagers were (perhaps) less than 60 years old.

Table 2.0 Distribution of Respondents by Age

Age (years)	Frequency	Percent
18-24	36	9
25-30	73	19
31-40	97	25
41-50	62	16
50-60	67	18
Over 60	48	13
Total	383	100

3.1.3 Distribution of Respondents by Level of Education

The respondents were asked to indicate their highest level of academic qualification. Findings in figure 4.0 show that over half (57.2%) of the participants had primary level of education. These findings show that many (57.2%) of the residents of Wenje Division were lowly educated. The implication of low levels of education is making training on food security difficult, especially in the use of technical concepts and language. More so, people with low education are more likely to be food insecure as they are open to limited livelihood opportunities. Indeed, according to Ong'ayo and Akoten (2007) having tertiary level of education is likely to make a farmer more food secure. Lack or inadequate level of formal education poses problems during training and implementation of skills in agricultural activities. This has important implication for the content of training courses and the approach to be used for delivery of training offered by the extension service providers or other stakeholders. These findings are also consistent with those of *Lockheed et al. (1980)* that education is crucial in increasing

agricultural production among farmers.

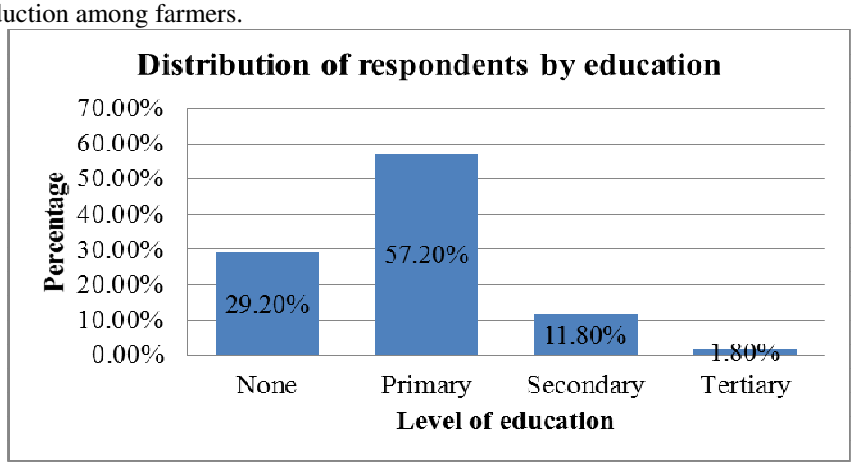


Figure 0.0 Distribution of Respondents by Level of Education

3.1.4 Distribution of Respondents by Occupation

The various occupational opportunities available for a community are critical for ensuring food security. The present study asked households to indicate their occupations. Findings of the study show that majority (92%) of the participants in the study were farmers as shown in Table 3.0.

Table 3.0 Distribution of Respondents by Occupation

Occupation	Frequency	Percent
Farmer	353	92
Teacher	1	1
Businessmen	10	3
Others	20	4
Total	384	100

Results of the study in Table 3.0 indicate that majority (92%) of the respondents were farmers. This places them in a suitable position to respond to most of the research questions on food security. The finding on majority (92%) of the respondents being farmers is consistent with the Tana River District Development Plan (2012) which shows that majority of the population in the age bracket 15 - 64 years are engaged in agriculture and livestock activities. More precisely, the report states further that about 83% of the labour force in the County is engaged in subsistence farming and livestock keeping. Accordingly, in order to absorb this labour force, investment in diverse sectors such as modern agricultural, agri-business, eco-tourism, and agro- based industries is required.

3.1.5 Distribution of Respondents by Household Income

Income levels are very important in a study of food security. The level of income of a household defines the degree of its food security based on the purchasing power. Respondents were asked to indicate their monthly income for the household. Results of the study are shown in Figure 5.0.

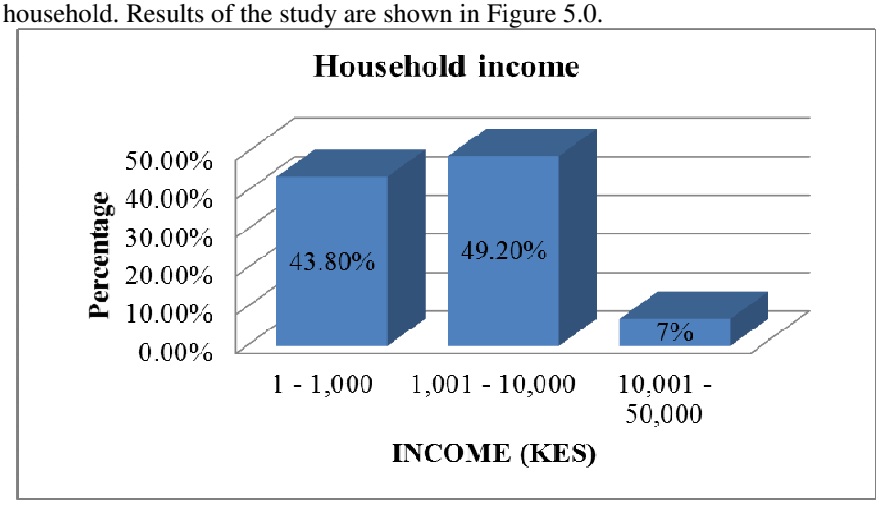


Figure 5.0Household income

Findings in figure 5.0 indicate that majority (93.0%) of the households had a monthly income of 10,000 Kenya shillings and below. This finding is in agreement with that of the Tana River County District Development Plan (2008-2012) which states that the income per capita in the study area is 9,126 Kenya

shillings. The finding of low levels of income in the study area makes the communities who hail from the area vulnerable to challenges of food insecurity.

3.1.6 Distribution of Respondents by Household Size

Household size is important in giving an indication of the amount of food needed. In fact, the food security situation of the household is to some extent determined by the household size. Study participants were asked to indicate the size of their households. Findings of the survey are captured in Table 4.0

Table 0.0 Household Size

Household size	Frequency	Percent
1	3	1
2	14	3
3	20	5
4	42	11
5	76	19
Over 5	239	61
Total	394	100

Findings of the study in Table 4.0 indicate that slightly over three fifths (60.7%) of the households in the study had over five members. This finding corresponds to that of the Tana River District Development Plan (2008-2012) which indicates the household size in the County is approximately 4.9 members. Importantly, the observed large (5 household members) size of households has implication for food security situation in the area.

3.2 Food Security

The researcher assessed food security in this study area by evaluating the number of meals and type of meals taken in the participating households. Also assessed was the source of the food as well as the yield in the last harvest before the study.

3.2.1 Number of Meals taken in a Day in the Household

Findings showed that over half (54.4%) of the respondents in the study took two (2) meals in a day (Figure 6.0). Field observation showed that these meals were mostly breakfast and supper. Field observation also shows that meal frequency usually varied over the course of the year depending on the prices of food and the size of the harvest that the household has. It is therefore important to build up a seasonal picture of meal frequency trends and compare them. Increasing food consumption, including the number of meals eaten per day and the types of foods eaten is often one of the first actions that households will take when their financial situation improves.

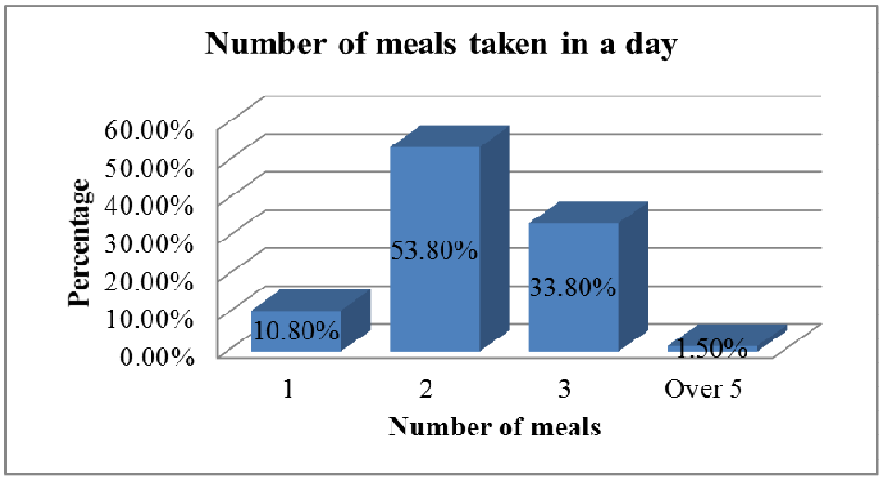


Figure 6.0 Number of meals taken in a day

3.2.2 Main Food Item Taken

The respondents were asked to indicate the type of food that they took most frequently. Findings in Table 5.0 show that maize (61.4%) was the most popular food in this study area, making it the staple food in the area. Other foods mentioned included rice and bananas, which are also grown by the households in the area.

Table 5.0 Main food taken

Food item	Frequency	Percent
Rice	57	15
Maize	273	72
Bananas	44	2
Others	7	11
Total	381	100

3.2.3 Sources of Food

The discussion of food security is not complete minus an interrogation of the sources of food. Where people get to meet their food intake requirements is critical for food security planning and strategizing. Findings of this study indicate that over three fifths (64.8%) of the households in Wenje Division got their food from farming activities as shown in Figure 7.0. The reliance on market or shops was low at slightly over one third (35.9%) a reflection of low purchasing power of the households in the area.

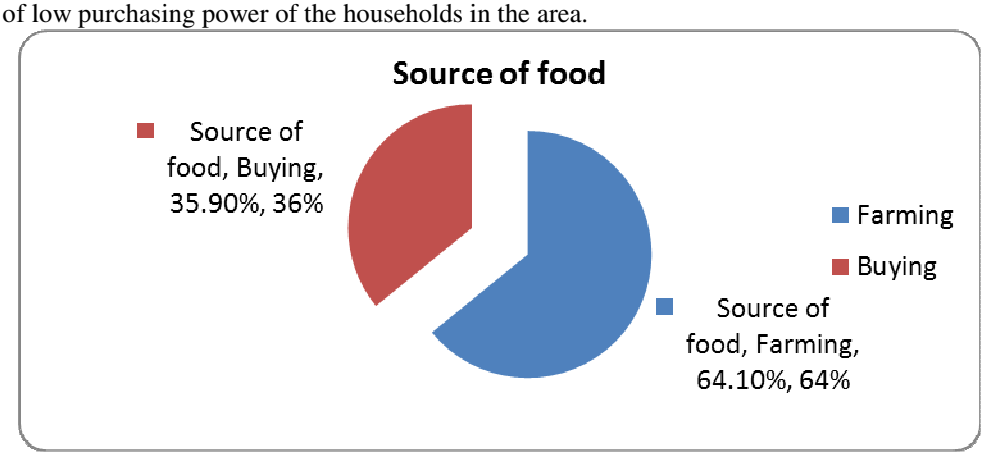


Figure 7.0 Source of food

3.2.4 Maize Yields

This researcher sought to find out the amount of maize households harvested in the most recent harvest prior to the study. Findings in figure 8.0 indicate that over half (55.4%) of the households had a yield of over 100 Kgs/per acre worth of maize. This is a low yield considering that an acre is projected to produce in excess of 270 Kgs of maize according to the information available at the local Ministry of Agriculture offices at Hola when using rain fed agriculture. Similarly, when using irrigation and with enough fertilizer an acre is projected to produce between 20 - 25 bags of 90 Kgs of maize per season. The finding on low (100 Kgs) maize yield per acre has implications for the state of food security among households in the study area. It means the low production is an indicator of food insecurity at the household level in the area.

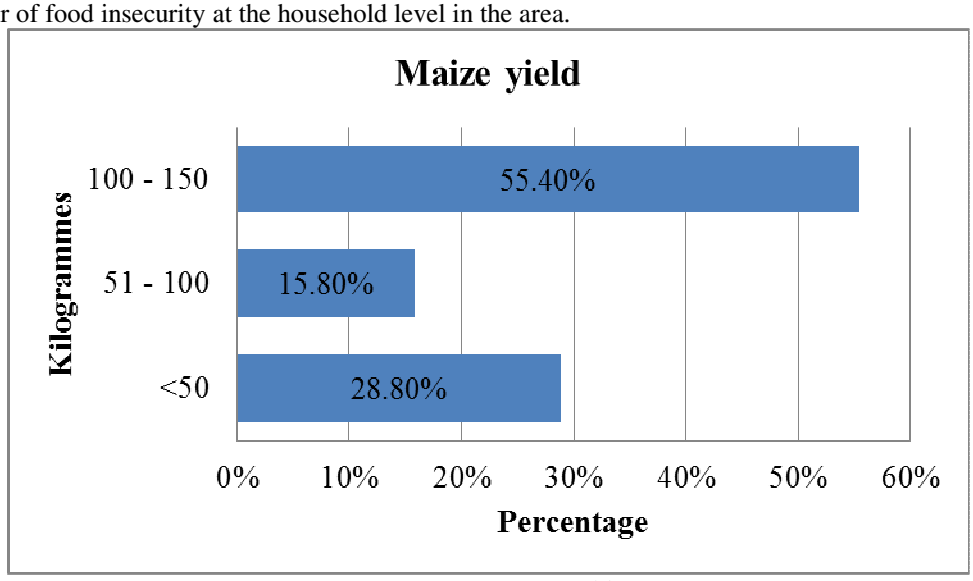


Figure 8.0 Maize yield

3.2.5 Difficulty of accessing food

Owing to the poor state of maize harvest as shown in figure 8.0, this study probed the respondents further to ascertain the level of difficulty in accessing food in the area. Results of this study in Table 6.0 show that majority

(93.8%) of the respondents reported that getting food at the time was difficult, with 64.2% indicating that it was very difficult. The higher (93.8%) percentage of those reporting difficulties in accessing food, coupled with the over three fifths (64.2%) saying it is very difficult is a clear indication of the state of food insecurity in the area. Field observation has also shown that the community has heavy reliance of food aid.

Table 6.0 Difficulty of accessing food

Access to food	Frequency	Percent
Very difficult	247	64
Difficult	114	29
Neutral	14	4
Easy	4	1
Very easy	6	2
Total	385	100

3.3. Climate Change and Food Security

The first objective of the study sought to assess the effects of climate change on food security in Wenje Division. The variable climate change was measured by various indicators and the findings of this study are presented next.

3.3.1 Weather Changes

The researcher sought to find out from the respondents whether the respondents had noticed extreme weather changes in the area over time. Weather change is a critical indicator of climate change. Findings of this study in Table 7.0 indicate that majority (95.3%) of the participants agreed that they had experienced weather changes in the area over the last 30 years. The finding on experience of weather change in the area is an indicator that there are variations in the climatic conditions of the area. These changes, inter alia, have implications for food security, which was observed to be a challenge in the area.

Table 7.0 Weather Changes

Food item	Frequency	Percent
Strongly agree	192	50
Agree	176	46
Neutral	11	3
Disagree	7	1
Total	386	100

3.3.2 Type of Weather Changes Experienced

The findings on weather changes in the study area as revealed in Table 7.0 prompted the need to probe further and establish the type of weather changes that are experienced in the area. Findings of this study in Figure 9.0 indicate that drought (74.9%) was the most experienced phenomenon of weather changes in the area. This observation is crucial and forms the base for any adaptation responses or strategies to climate change as Burke, M., & Lobello, D. (2010) suggest that the nature of farmers' responses to climate change will depend on their recognition that climate is changing. Among the essential things that were noted by the majority of farmers were that there is an increase in the frequency, intensity and duration of dry spells and droughts. The findings also indicate that the majority of farmers noted that there is a decline in the amount of rainfall received compared to the past. The timing or onset of rains had also changed and this has resulted to a shift in the farming season. This is similar to what was also observed by Dhaka, B., Chayal, K., & Poonia, M. (2010) in their findings that variability in climate disturbs the farming calendar since it results to either an early or delayed onset of rains.

The finding implies low rainfall leading to poor crop yield. The findings (74.9%) on drought are consistent with a government report which projected that the frequency of droughts and flash floods is expected to increase both in intensity and spread as a result of climate change (RoK, 2011). More so, drought is a critical indicator for weather changes that has implications for the state of food availability in an area (Shauri 2011).

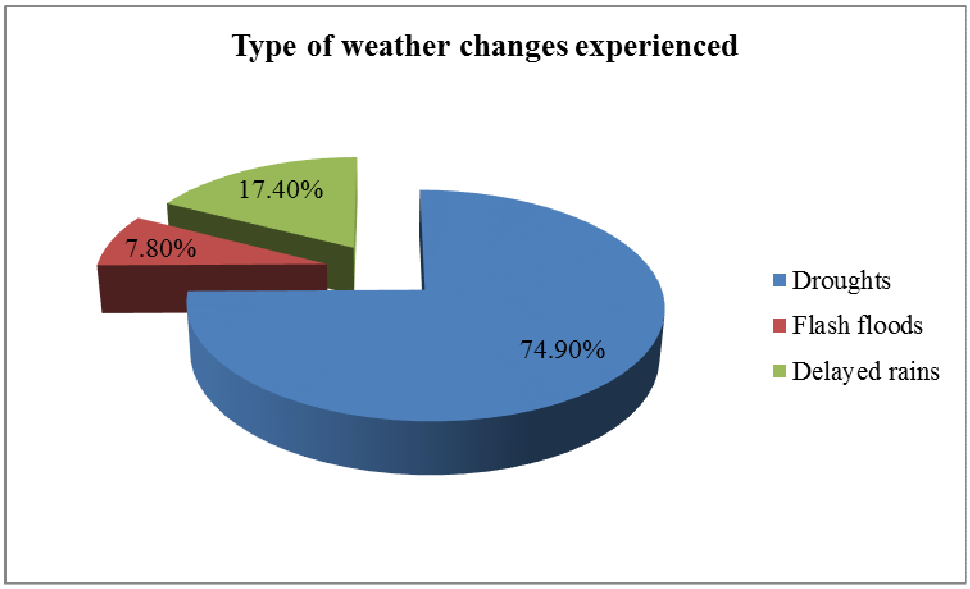


Figure 9.0 Type of weather changes experienced

3.3.3 Effect on Farming and Livestock

The researcher sought to find out whether the weather changes identified in section 3.3.2 of this study had any effect on farming and livestock. Findings in Table 8.0 indicate that over four fifths (81.3%) of the respondents reported that climate change had an effect on food security. Changes in weather make farmers change the assets they use in food production, and this in turn changes food production activities which influences food security.

Table 8.0 Effect on farming and livestock

	Frequency	Percent
Strongly agree	188	49
Agree	124	32
Neutral	62	16
Disagree	9	2
Strongly agree	1	1
Total	384	100

3.3.4 Extent to which Climate Change Affects Food Security

This study also sought to find out the extent to which climate change affects food security in the area. Results of the survey show that majority (95.8%) of the respondents indicated that climate change affected food security to a large extent (8/12 months), with over two fifths (45.7%) saying this was to a very large extent (11/12 months). Rainfall variability came out of focus group discussion as a great challenge to farmers. It makes rainfall highly unpredictable and tends to confuse farmers. This then makes it essential to assess how farmers perceive climate change and variability especially in terms of rainfall since agriculture is highly sensitive to rainfall variability (IPCC., 2007) and that rainfall is a critical factor on which farmers base their decisions on what to grow and when to grow it (Tunde, A. & Ojeleyo, D.,2007) hence perception becomes important.

Table 9.0 Effect of climate change on food security

	Frequency	Percent
Very large extent	176	46
Large extent	193	50
Neutral	11	3
Small extent	5	1
Total	384	100

To obtain a detailed account of climate change in the area, Focus Group Discussions (FGDs) were conducted. Through the FGDs the researcher learnt that floods used to be very useful in the past and they used to come twice a year. Farmers used to do “floods recession farming”. It was however observed during the study that five (5) Hydro Electric Dams have been built upstream on the River Tana, Kenya’s longest river covering about 500Km (Tana River CIDP 2013-2017). Since the completion of the last dam in 1989, the regular floods have greatly reduced and floods that come are mostly polluted and this water has now turned out to be more of a problem instead of being a solution to food security of the farmers downstream. When the power generation company releases water in the middle of the season when farmers have planted, all the food crops are swept away by the floods causing hunger and food insecurity. No consultation with the community in the study area was done at the time of the construction of the dams according to the respondents. It was further observed that

the community has no say in the releasing of the floods water which is controlled by the power investor. Floods water brings diseases like Panama that affect the bananas and in fact the entire banana crop has died several times and people had to plant new bananas completely. In fact, in an FGD it was reported that: *"Farmers are only told to move to higher grounds to save their lives but not to save their livelihoods and they are left food insecure"*

3.3.5 Correlation of climate change and food security

Findings in table 10.0 show that climate change has a strong negative correlation (r=-0.65, df =135, p<0.05) with Food Security. This means that the more climate changes take place, the less food security there is in the study area to a great extent.

Table 10.0 Correlation of climate change and food security

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	-.650	.070	-8.295	.000[c]
Ordinal by Ordinal	Spearman Correlation	-.585	.073	-6.994	.000[c]
N of Valid Cases		135			

3.4 Governance and Food Security

The second objective of the study was to investigate the extent to which governance affects food security in Wenje Division. The study asked participants to indicate their opinion on governance issues and how they impact on food security in the study area.

3.4.1 Awareness that Food Security is a Human Right Issue

Respondents were asked whether they were aware that food security is a human rights issue. Over half (56%) of the respondents were not aware that food security was a human right issue. More specifically, study results in Figure 10.0 show that only over two fifths (44%) were aware that food security is a human right. This may be interpreted within the community way of life where when people have no food they go to their neighbours or relatives to eat. Such social relation may have diffused the understanding and perception of food insecurity as a human rights problem. In fact, some households were reported to have a habit of sending their children to relatives or to extended family when there is hunger. This has the negative effect that may not give the government enough information that there is a looming hunger because the community has concealed the information by transferring or postponing the problem. If the community is aware that this is their right then early warning will be given on time and proper arrangement for an intervention can be done. Well, this is debatable – the community had designed ways of coping with food insecurity and have not left it at the whims of the government to assist with early warning systems or food aid. In fact, the food aid is given as a last resort by the government and other agencies more at their own volition and not with a gun on their heads by the community. This might also say something about the community-government trust – it could very well be that the community does not trust so much the government with their fate.

Apparently, the findings are in agreement with Mwaniki (2012) who found that despite the recognition of access to food as a right by Article 25 of the Universal Declaration of Human Rights (1948), food security is still not universally treated as a basic human right.

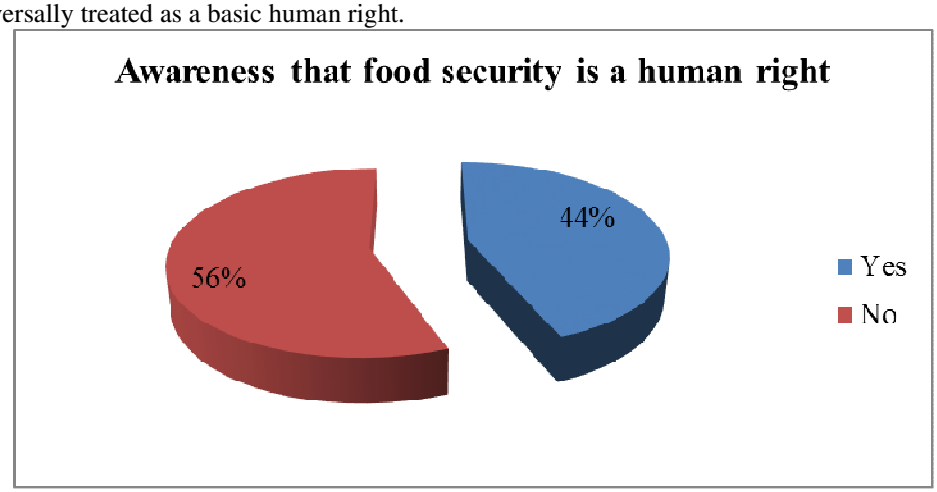


Figure 10.0 Awareness that food security is a human right

3.4.2 Governance Activities in Ensuring Food Security

To assess how governance affects food security in Wenje Division, the researcher inquired from the residents whether the government carried out various activities to increase food security. Findings indicated that over four

fifths (85.2%), over half (54.1%) and over two fifths (47.6%) disagreed that the government had facilitated households to have adequate food, advised farmers on good farming practices or provide seeds respectively. This shows that government activities in ensuring food security were poorly implemented. These findings are in agreement with Masson (2005) who finds that the root cause of Africa's ongoing food insecurity is the lack of investment in agricultural production.

Table 10.1 Government activities in ensuring food security

Statement	Response		
	Agree	Neutral	Disagree
Government officials ensure households have adequate food	9.6%	5.2%	85.2%
Ministry of Agriculture officers advice farmers on good farming practices	38.7%	7.3%	54.1%
Provision of seeds by government	40.4%	11.4%	47.6%

3.4.3 Effect of Governance on Food Security

With regard to effects of governance on food security results showed that over four fifths (88.1%) of the respondents felt that governance affected food security to a large extent. This shows that policies such as those that are meant to ensure that farmers have farm inputs on time and activities such as distribution of drought resistant seeds carried out by government on food security were not effectively done in the study area.

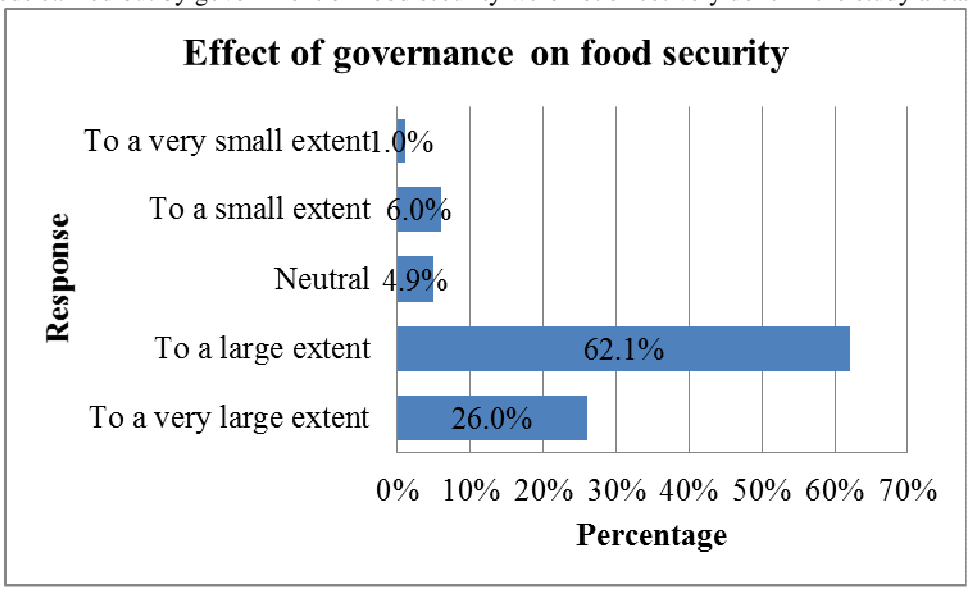


Figure 10.1 Effect of governance on food security

Some community members during the FGDs observed that the dams upstream are the ones bringing hunger to them and causing food insecurity because they block the water and release too much at once and this just causes all food in the farms to be swept away and to die because of the polluted water. Then Government brings very little relief in the households. For example in a household of 9 members they give 2 Kgs of maize per month and this is not consistent it could take three or five months to get another relief food distributed. The participants also explained that government does not ensure that all people have food in their household. If one has no food at home they turn to neighbors or seek help from donors.

There are some non-governmental institutions that have carried out advocacy activities in the division for many years like Action Aid. Wenje Catholic Parish has also done food for work projects for over ten years. This food for work projects enable the vulnerable communities to recover from the frequent disasters of drought and floods. These projects also enable the community to create assets like goats through restocking the pastoralists that have lost all their livestock during droughts. They also help the farmers to work on their farms and harvest and get out of the relief and handout dependency for the next dry season. These interventions could have contributed to lack of a significant relationship between governance and food security in Wenje Division.

3.4.4 Correlation of governance with food security

Findings in Table 10.2 show that governance had a weak positive correlation ($r = 0.383$, $df = 132$, $p > 0.05$) with food security. This means enhancement of governance promotes food security but this is only to a small extent.

Table 10.2 Correlation of governance with food security

		Value	Asymp. Error[a]	Std.Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.383	.103	4.066	.060[c]
Ordinal by Ordinal	Spearman Correlation	.543	.071	6.337	.054[c]
N of Valid Cases		132			

3.5 Access to Markets and Food Security

The third objective of the study was to determine the effect of access to markets on food security in Wenje Division. The findings are presented in this section.

3.5.1 Distance to Food Market

The researcher sought to find out the distance which the respondents had to travel to a place where they could buy or sell food. Findings indicate that over four fifths (84.7%) of the respondents had to travel between 10 - 20 Kilometres as shown in Table 10.3. For example, from Makere village to Masalani Town is about 30 Kms while from Duwayu village to Hola Town is over 15 Kms, one way. This is a long distance considering the poor road infrastructure and insecurity in the study area. These findings are in agreement with Mwaniki (2012) who indicated that poor infrastructure literally limits the markets to which farmers can profitably take their produce by increasing the cost of transportation, and hence also acts as a barrier to market penetration.

The findings are also in agreement with the Ministry of Agriculture (RoK, 2009) which states that poor infrastructure also make it difficult for extension service providers to work effectively. There needs to be good infrastructure to facilitate the movement of commodities so that farmers can send their perishable outputs to the markets with minimum losses.

Table 10.3 Distance to food market

Distance (Kilometers)	Frequency	Percent
<1	63	17
1-5	69	18
6-10	82	22
10-20	108	28
>20	58	15
Total	384	100

3.5.2 Food Prices in the Local Market

The researcher sought to find out about the food prices in the market. Findings indicate that many (73%) of the respondents as shown in Figure 10.2 felt that the food prices were too high. For example, 1 Kg of maize which would cost Kshs. 25.00 in Masalani Town costs Kshs. 40.00 in Wenje Centre, 1Kg of sugar which would cost Kshs. 80.0 in Hola Town, costs Kshs. 120.00 in Wenje Centre, while maize flour which would cost Kshs. 60.00 in Hola Town, costs Kshs. 80.00 in Wenje Centre. This is a limitation to food security because if the food is unaffordable, people cannot manage to take 3 meals per day and for those who can take their choices are limited in terms of variety of food.

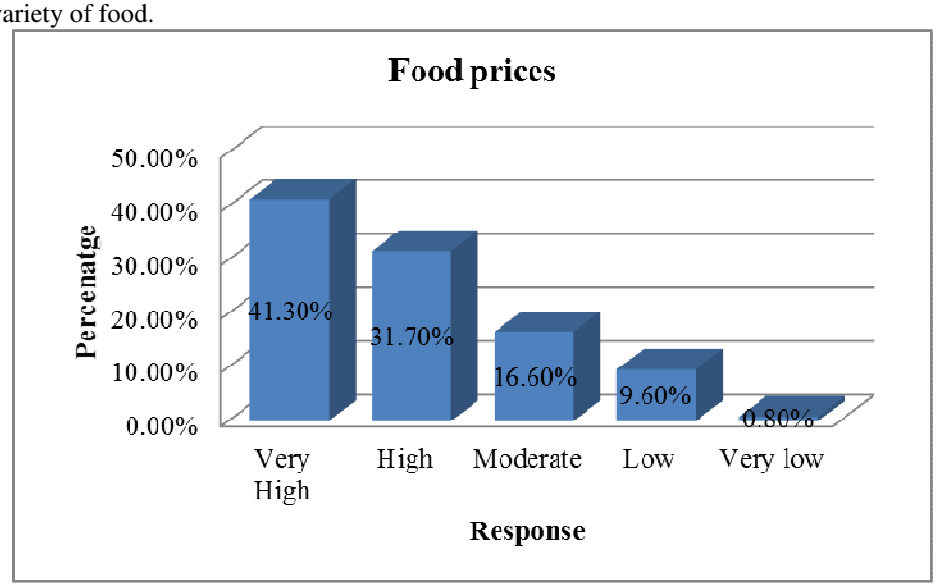


Figure 10.2 Food prices

3.5.3 Effect of Access to Markets on Food Security

Access to market is a critical variable in the food security discourse. However, the discourse revolves around the effects of access to market on food security. The study posed a question to the respondents on the effects of access to market on food security. Findings of the study show that over four fifths (87.2%) of the respondents felt that access to markets affected food security to a large extent as captured in Table 10.4

Table10.4 Effect of access to markets on food security

Food item	Frequency	Percent
Very large extent	106	28
Large extent	229	60
Neutral	21	5
Small extent	23	6
Very small extent	5	1
Total	384	100

Results from FGDs, show the explanation of farmers that there are brokers during harvest time that come and buy the products very cheaply. These brokers conspire with the rich who buy the end product. For example, if a farmer decides to take mangoes to the factory, the factory owner in Mombasa will first pay the transporter and tell the farmer to wait until his/her mangoes have been processed.

Farmers go to sale their produce but come back with debts instead of profits. When the farmer transports 40,000 pieces of mangoes, the transport charged for that is Kshs. 50,000. After paying this transport the farmer could be given Kshs. 10,000 or less and he/she has to pay loaders, and those who fell the mangoes from the trees. So the farmers would rather sell a package of 3 pieces of mangoes at Kshs. 2.00 each to a broker and remain in their farms. This way the farmers feel they are not making a loss but instead the broker will sell each piece of mango at Kshs. 10.00 to 20.00 or even higher. Indeed, the market access problem was cited in the FGDs as a nightmare to the community within the study area and a big contributor to food insecurity. Transportation costs just make a bad situation worse since there are forbiddingly high.

3.5.4 Correlation of access to markets and food security

Findings in Table 10.5 show that access to markets has a strong positive correlation ($r=0.68$, $df=130$, $p<0.05$ with food security. This means that the more accessible markets are the higher the food security in the study area to a great extent.

Table 10.5 Correlation of access to markets and food security

		Value	Asymp. Error[a]	Std.Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.684	.085	5.386	.001[c]
Ordinal by Ordinal	Spearman Correlation	.765	.071	6.667	.001[c]
N of Valid Cases		130			

3.6 Land Use and Food Security

The fourth objective of the study was to find out how accumulation and fragmentation of land affects food security in Wenje Division. The findings are presented in this section.

3.6.1 Size of Land Owned

Findings in Figure 10.3 indicate that majority (94.5%) of the participants owned less than 10 acres. This is a small acreage considering the big households (more than 5 members) observed in the study area.

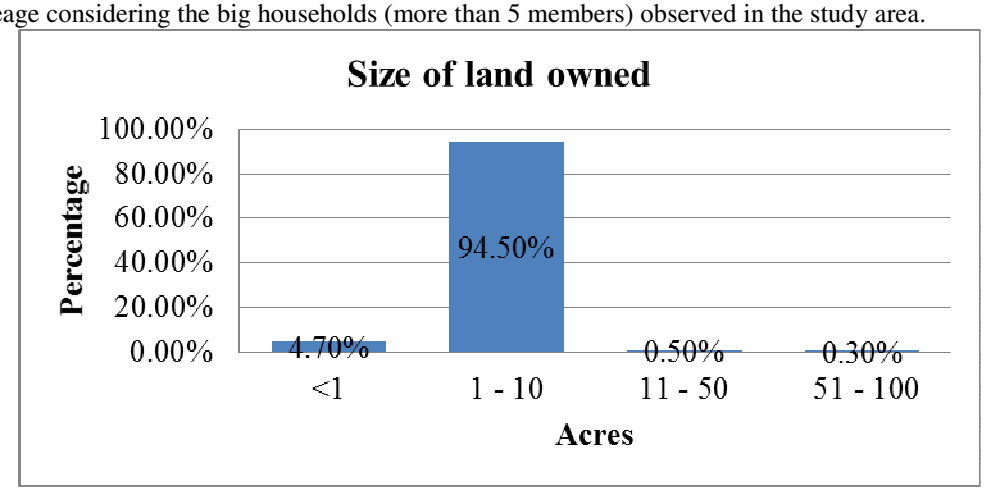


Figure 10.3 Size of land owned

3.6.2 Amount of Land Used for Producing Food

Results of the study in Table 10.6 show that over half (55.4%) of the participants indicated that they used at least half of their land for food production. The study findings further show that over two fifths (41.7%) used over three quarters (75%) of their land for food production.

Table 10.6 Amount of land used for producing food

Percentage of land used for food production	Frequency	Percent
Less than 25%	29	8
26% - 50%	141	37
51% - 75%	52	13
Over 75%	159	42
Total	384	100

3.6.3 Productivity of Land

Findings of the study show that slightly over two fifths (40.2%) of the respondents indicated that their land was fairly productive. This fairly rated productivity of land may be attributed to poor farming skills, lack of farm inputs like seeds and fertilizers and perennial drought. This is an indication that a farmer who attains training and those who participate in agricultural activities implemented by extension service providers (ESPs) have a chance of being food secure. When they are trained and provided with farm inputs their harvest will improve since the land will produce more food. Drought is the primary constraint to land productivity in the study area and it acts as a serious disincentive to putting more land under cultivation.

From the FDG with the community it emerged that they believe that the land outside the river bank is infertile and therefore not cultivatable. This belief has contributed to the community abandoning the vast land mass that could have changed their fortunes irreversibly. This limits their choices of farming area and narrows it to the river bank strip.

Table 10.7 Productivity of land

Land productivity	Frequency	Percent
Very high	34	9
High	83	22
Moderate	154	40
Low	92	24
Very low	20	5
Total	383	100

3.6.4 Effect of Land Use on Food Security

Over four fifths (88%) of the participants of the study felt that land use impacted on food security to a large extent. From the FGDs, the respondents explained that all land is trust land and cannot be used to get loans. Land continues to be limited because of sub-divisions due to population increase. People identify their clan land but no one has right over it to sell but only to settle. The participants reported that they had no tools to till the land; no equipment for irrigation. Hiring farm equipment was reported to be very expensive. Land is fertile along the river bank; the rest of the land in the hinterland is infertile and dry. The area is a semi-arid and arid, only Mangoes survive along the river bank even after floods.

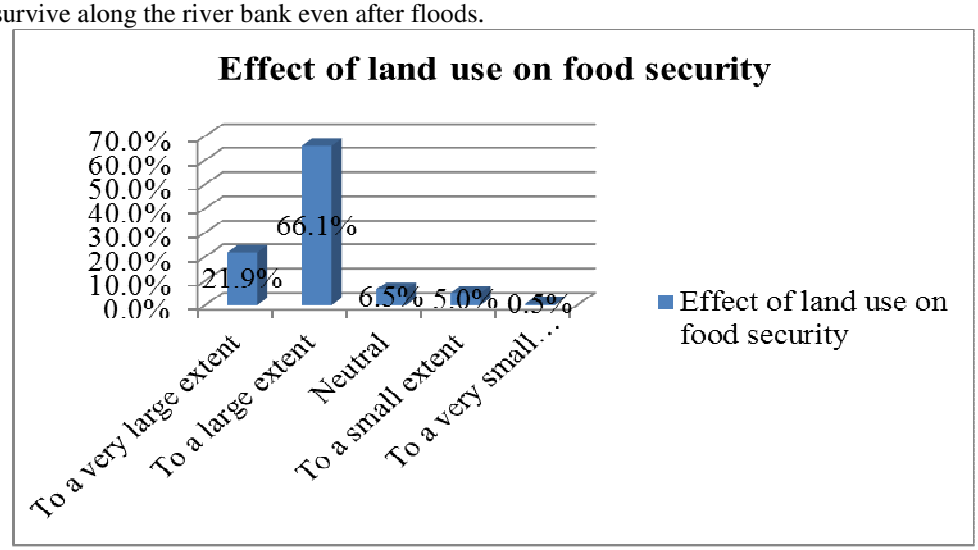


Figure 10.4 Effect of land use on food security

3.6.5 Correlation of land use and food security

Findings in table 10.8 show that land use has a strong positive correlation (r=0.66, df=133, p<0.05) with food security. In other words the more land that is used for food production the higher the food security of a household to a great extent.

Table 10.8 Correlation of land use and food security

		Value	Asymp. Error[a]	Std.Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.662	.071	8.430	.001[c]
Ordinal by Ordinal	Spearman Correlation	.647	.064	8.092	.001[c]
N of Valid Cases		133			

3.7 Regression Analysis

Multiple-regression analysis was used to measure the nature of the relationship between climate change, governance, and access to markets and land use on food security. The analysis was done using SPSS version 20 at a 95% confidence level. Results of the modeling are presented in Table 10.9 showing the model summary and Table 10.10, showing the coefficient.

Table 10.9 Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.447[a]	.200	.192	.682

Table 10.9 presents summary findings which indicate that climate change, governance, access to markets and land use could explain 19.2% of food security in Wenje Division. This means that there are other factors apart from climate change, governance, access to markets and land use that can explain the remaining 80.8% of the variations in food security in the area. The implication of this finding is that more studies are needed to adequately explain this phenomenon of food security in Wenje division of Tana River County.

From the summarized findings in the model as captured in Table 10.9, it is important to assess the effect of each of the predictors included in the regression equation. Importantly, the coefficients of determination both at the unstandardised and standardised level have to be analysed to shade light on the individual residual effect of the dependent variable (food security). The analysis on the effects of the coefficients on the dependent variable are presented in Table 10.10

Table 10.10 Co-efficients

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	.389	.124		3.123	.002**
	Climate change	-.388	.064	.315	6.066	.001**
	Governance	-.074	.053	-.078	-1.404	.161
	Access to markets	.113	.052	.122	2.158	.032*
	Land use	.191	.057	.183	3.320	.001**

(*) means significant at 0.05, while (**) means significant at both 0.05 and 0.01

Findings in Table 10.10 indicate that climate change (p=0.001) and land use (p=0.001) had a significant influence on food security. Substituting the ***Beta*** values, the regression model is as follows:

Food security = Constant (38.9) - Climate change (38.8) governance – (7.4) + access to markets (11.3) land use+ (19.1) + error term/residue (12.4)

The values in the model indicate that a unit change in climate change results in reduction of food security by 38.8 units, while a unit change in land use will increase food security by 19.1 units. These findings are in tandem with *(Boxall et al. (2009)* who indicated that climate change may alter the seasonal patterns and abundance of pests and diseases, which may affect pesticide use, including herbicides and fungicides. According to RoK (2010) the projected increase in temperatures and rainfall variability will negatively impact on crop and livestock enterprises in most areas. These findings are also in agreement with *Jayne at. al. (2012)* who found a tendency of declining mean farm size over time within densely populated smallholder farming areas; great disparities in landholding size within smallholder farming areas, leading to highly concentrated and skewed patterns of farm production and marketed surplus.

4.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

4.1 Summary of Findings

Several findings were generated from this study based on the objectives and research questions of this dissertation. With regard to the influence of climate change on food security, the study found out that majority

(95.3%) of the participants agreed that they had experienced weather changes in the area. Drought (74.9%) was the most experienced phenomenon describing the extent of the weather changes in the study area. Over four fifths (81.3%) of the respondents agreed that weather changes affected farming and rearing of livestock. Majority (95.8%) of the respondents indicated that climate change affected food security to a large extent, with 45.7% saying this was to a very large extent. Climate change has a strong negative correlation ($r = - 0.65$), and the regression analysis showed that it significantly influence food security at the study's 95% ($df=135$, $p<0.05$) confidence level.

With regard to the effect of governance on food security, over half (56%) of the respondents were not aware that food security was a human right issue. Findings of the study indicated that over four fifths (85.2%), over half (54.1%) and over two fifths (47.6%) of the respondents disagreed that the government facilitated households to have adequate food, advised farmers on good farming practices or provided seeds respectively. Over four fifths (88.1%) of the respondents felt that governance affected food security to a large extent. Governance had a weak positive correlation ($r =0.383$), and is also shown to have no significant influence ($df=132$, $p>0.05$) on food security based on the results of the regression analysis. However, the ***Beta*** weight shows that a unit change in governance reduces food insecurity by 7.40 units.

This study also assessed the effect of access to markets on food security. It was found out that over four fifths (84.7%) of the respondents had to travel between 10 to 20 Kilometres to access markets. Field observations also showed that majority (73%) of the respondents felt that the food prices were too high. Over four fifths (87.2%) of the participants felt that access to markets affected food security to a large extent. Access to markets has a strong positive correlation ($r=0.68$) and is shown through regression analysis to have a significant ($df=130$, $p<0.05$) influence on food security. The ***Beta*** weight show that an increase in access to market leads to an increase in food security by 11.3 units.

Finally, this study also looked at the effect of land use on food security. Results of the study reveal that majority (94.5%) of the participants owned less than 10 acres of land. Over half (55.4%) of the participants indicated that they used at least half of their land for food production. Findings also show that over two fifths (41.7%) used over 75% of their land for food production. Further, slightly over two fifths (40.2%) of the respondents indicated that their land was fairly productive, while over four fifths (88%) felt that land use impacted on food security to a large extent. Land use has a strong positive correlation ($r=0.66$) and was found to significantly ($df=133$, $p<0.05$) influence food security in the study area. Indeed, the Regression Analysis indicated that land use ($p=0.01$) had a significant effect on food security both at the 95% and 99% level of confidence. The ***Beta*** weight shows that a unit increase in land use leads to an increase in food security by 19.1 units.

4.2 Conclusions

This study concludes that climate change, access to market and land use are important determinants of food security in Wenje Division although they are not the only ones as shown by the multiple regression analysis results. It is important to undertake other studies to identify and quantify the impact of these other factors in food security of Wenje. Climate change has had a significant impact on food production in the study area since the residents live along the river for their farming. This greatly limits the size of land considering the increasing population and privatization of land. Land segmentation leads to poor and reduced food production. Further, findings of the regression analysis indicated that governance was not a critical determinant of food security. However, the ***Beta*** weight showed that a unit increase in governance leads to a reduction (- .074) of food security by 7.4 units. This may mean that governance is not enough in explaining food security as they may be other factors such as climate change in this study that can still hinder the realization of food security in the area. Further, field observations revealed that the government allowed a power generating company to build dams which affected the flood waters without consulting the residents downstream. This in itself contributes majorly to food insecurity in the area as alluded by many FGD participants during the study. In addition, the local Ministry of Agriculture officials in the area were reported not to be active in promoting expansion of agricultural based alternative livelihood strategies to cushion residents to the vagaries of food insecurity. It emerged strongly in FGDs that residents were not provided with much needed seeds or education which could improve food production and hence food security in the division.

This work has made original contribution to knowledge in terms of establishing the determinants of food security in Wenje Division, Tana River County. The findings reveal that climate change and land as a resource play a very small percentage in determining food security in Tana River County and that there is need for further research to establish the main determinants of food security.

4.3 Recommendations

From the findings of the study, the following recommendations for policy and practice are made:

(i) The government in partnership with other private and civil society organizations should develop strategies

to reduce reliance on rain fed agriculture by encouraging and promoting irrigation farming to mitigate the effects of climate change on food security in Wenje division of Tana River County.

(ii) The government should empower the Ministry of Agriculture to assist farmers in Wenje Division to increase access to markets as this was found to significantly influence food security. In fact, the Ministry of Agriculture should make deliberate efforts to innovatively expand market access both locally and internationally through the use of Information, Communication Technology (ICT) to enable farmers to participate even in e-markets to sale their produce.

(iii) The community should be trained on the process of land acquisition and be able to convert community land as their own individual land. This will empower them to use land as a factor of production, especially as collateral for financial institutions to invest in modern agricultural equipments or venture into nonagricultural livelihood strategies through loans.

Recommendations for Further Research

(i) As the world moves from the Millennium Development Goals in 2015 to Sustainable Development Goals, more research needs to be done on how to ensure sustainable consumption and production patterns for sustainable food security among the vulnerable communities in Kenya.

(ii) More research needs to be done on adaptation to climate change effects on food production in an ecological and ethical manner while promoting good practices among the crop and livestock small holder farmers.

(iii) Further research needs to be done to assess other factors determining food security in the Division of Wenje, Tana River County to fully exhaust the remaining percentages as shown in the regression analysis of this study.

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