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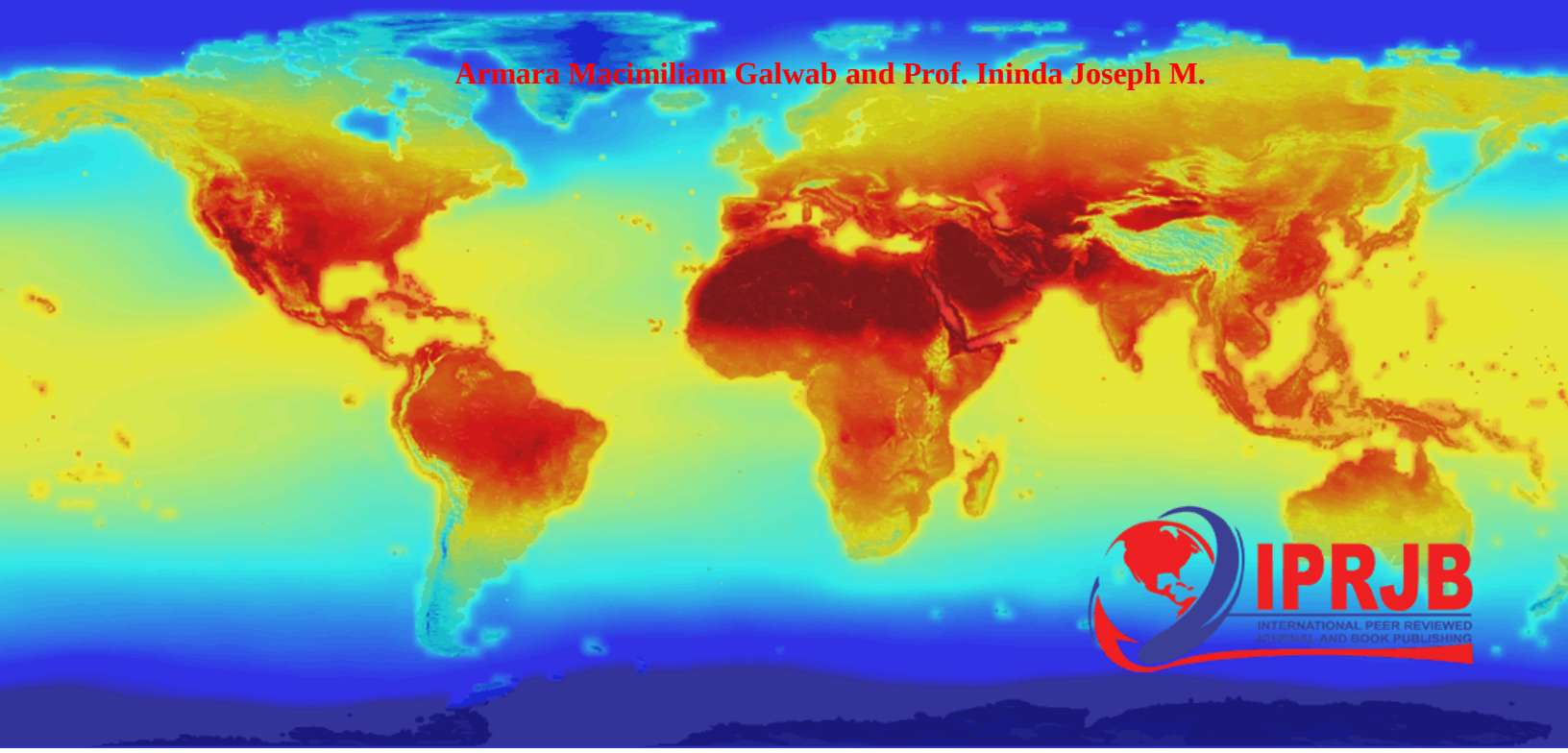

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# ASSESSING THE IMPACT OF CLIMATE CHANGE ON FOOD AND NUTRITION SECURITY AT HOUSEHOLD LEVEL IN GARBA TULLA SUB-COUNTY

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## Abstract

**Purpose**: To assess the Impact of climate change on food and nutrition security at household level in Garbatulla sub-county.

**Methodology**: The study was designed as a cross sectional survey.

**Findings:** The analysis of rainfall and temperatures over the region of study indicates that there has been decreasing trend of yearly rainfall and increasing temperatures. Result also revealed that the area is highly dependent on food aid which is an indication of food insecurity in Garbatulla. The analysis of nutritional status in the region remains between poor and serious, requiring adequate attention which is an indication of deterioration in nutrition. The study also found out that the respondents were using arrange of coping mechanism which are at border on survival rather than adequacy. Further, the study findings indicated a number of barriers hindering the community from consuming more nutritious foods such as fish, eggs and tubers.

**Unique contribution to theory, practice and policy:** The widespread occurrence of food insecurity, the severity of the consequences and insufficient progress in reducing the numbers of the food insecure all point to the need for further urgent action. The findings of this study will come in handy by showing the extent to which climate change affects food security and nutrition. Hence, decision-makers at all levels, such as the Ministry of Agriculture and Livestock and NGOs, will use the study findings design effective policies and programs. The findings will also contribute to the body of knowledge in the academia and may provide insights on food security gaps for further academic research.

**Keywords:** *Climate Change, Food, Nutrition, Security, Health*

## INTRODUCTION

### Background of the Study

Food security is a growing concern throughout the developing world, particularly for poor women and children CARE International (2011). In 2010, approximately 925 million individuals were undernourished. A recent study on the future of food and farming identified six drivers of change affecting the global food system: a growing global population; changing diets, notably an increase in demand for resource intensive meat products; food system governance, including globalization of markets, subsides and trade restrictions; competition for resources, particularly land, water and energy; consumer values and ethics, and impacts of climate change (CARE International, 2011). It is estimated that food production will need to increase by 50 percent by 2030 just to keep up with the demands of growing urban population. At the same time, climate change is projected to cause decreases in global cereal production of 1-7 percent by 2060, depending on the climate model used for the projection.

Reduced production leads to higher food prices and increased food insecurity, particularly for rural families in developing countries who are net buyers of food. A recent study by World Food Programme (WFP, 2009) found that without significant reductions in greenhouse gas emissions, climate change 'will greatly increase hunger, especially in the poorest parts of the world.' Assuming that current trends in population growth and inadequate distribution of wealth are maintained, WFP estimates that globally, 10-20 percent more people will be at risk of hunger by 2050 than would be without climate change. Of these, almost all will be in developing countries, with 65 percent expected to be in Africa. This has severe implications for nutrition, particularly for children. In sub-Saharan Africa, it is estimated that 10 million more children will be malnourished as a result of climate change (WFP, 2009). According to Anderson, Gundel and Vanni (2010), the risk of hunger from climate change is the result of both direct impacts on food systems, and of indirect impacts that affect the different dimensions of food security.

Climate change is already affecting food security. Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures; wide spread melting of snow and ice and rising global average sea level (IPCC, 2007a). Observational evidence from all continents and most oceans shows that many natural systems are being affected by regional climate changes, particularly temperature increases: the average temperature rose by about 0.3°C during the first half of the 20th century, and by another 0.5°C in the second half up to the beginning of the 21st century (IPCC, 2007a). Most of the observed increase in global average temperatures since the mid-20th century is *very likely* due to the observed increase in anthropogenic GHG concentrations (IPCC, 2007a).

Although climate change is a threat to all countries, developing countries are the most vulnerable. The World Bank (2009) estimates that they will have to shoulder some 75 to 80 percent of the costs of damages caused. A global 2°C warming above pre-industrial temperatures could result in permanent reductions in GDP of 4 to 5 percent for Africa. The African continent warmed by about 0.5°C last century. This century average annual temperatures are projected to rise by 3 to 4°C. Climate models concur that many arid areas will become drier and humid areas wetter.

According to the FAO estimates published in the State of the Food Insecurity (SOFI), around 13.4 million of Kenya's population is undernourished. A comparison of these estimates with the prevalence of food poverty that affects half the Kenyan population, approximately 15 million persons using the 1999 population census data, would at first sight show some correlation. The FAO national estimates of undernourishment, however, mask the regional disparities and other localized areas of high prevalence of under-nutrition in the country. There is a need to develop methodologies to capture sub-national levels of chronic under-nutrition.
It is estimated that, between 2008 and 2011, drought, a major climatic hazard in Kenya that is becoming more and more frequent, has caused losses in livestock and agriculture that amounted to KShs 699.3 billion (72.2% of total losses) and KShs 121.1 billion (12.5% of total), respectively. With the deteriorating climatic conditions, and primarily due to global warming, annual growth rate in agricultural "value added" has been on the decline (Government of Kenya, 2014).

**Problem Statement**

The food security situation in Kenya is continuously monitored by the KFSSG (Kenya Food Security Steering Group), a multi-agency task force that holds regular meetings and leads bi-annual assessments of both long and short rain seasons. These assessments are carried out by multidisciplinary and multi-agency teams from the Kenyan government, UN agencies (notably FAO, WFP, OCHA) and other NGOs based in the country. Understanding the specific impacts of climate change on food security is challenging because vulnerabilities are unevenly spread across the world and ultimately depend on the ability of communities and countries to cope with risks. In the context of food security, some regions of the world might experience gains under climate change, but developing countries are likely to be negatively affected (Rembold, 2014).

While some development and emergency programmes have undertaken several studies on vulnerability of pastoralists, they do this in an uncoordinated manner or with little collaboration with other local, national and international institutions. As a result, inadequate information on pastoralists' vulnerabilities, existing adaptive strategies and comprehensive modeled efforts in anticipation of climate change impacts are lacking. This study attempts to, determine the health profile and availability and distribution of food at household level, evaluate the level of nutritional and food security of households for women of reproductive age and children under 5 and assess existing coping strategies and identify barriers and opportunities for improving food and nutrition security at household and community level.

**General Objective**

- To determine the spatial and temporal variation in temperature and rainfall over the study area.
- To determine the health profile and availability and distribution of food at household level in the three wards of Garbatulla sub-county.
- To evaluate the level of nutritional and food security of households for women of reproductive age and children under five in Garbatulla Sub-County.

- To assess existing coping strategies and identify barriers and opportunities for improving food and nutrition security at household and community level in Garbatulla Sub-County.

## METHODOLOGY OF THE STUDY

The study was designed as a cross sectional survey which investigated households food and nutrition status in the midst of the climate change. The study aimed at collecting information from respondents on their current food and nutrition status and adaptation strategies. Children aged 6 to 59 months were chosen because they are more vulnerable and serve as a proxy to nutritional status. Data in the study was collected using a set of four questionnaires; all build on questionnaires that were used in data collection for Quantitative analysis of data from HFIAS (Household Food Insecurity Assess Questionnaire). This was performed by using analytical computer package SPSS version 20.0 and Microsoft Office Excel 2003, from which univariate variables were obtained and used to identify linear correlation to find out the relationship between effects of climate change on food and nutrition security.

## RESULTS OF THE STUDY

### Spatial and Temporal Variation in Temperature and Rainfall

### Results from Analysis of Temporal Patterns of Rainfall

The analysis of the 32-year rainfall record (1980–2012) demonstrated decreasing trend of yearly rainfall totals, seasonal rainfall totals and increasing yearly temperatures (Figure 1) in Marsabit County. The study also showed that the recovery of the long rains season was quite short, and that a general trend towards aridity continued after 1991, counteracting the narrative of rainfall recovering and providing a scenario opposite to the projections of the IPCC as regards the general rainfall pattern in eastern Africa.

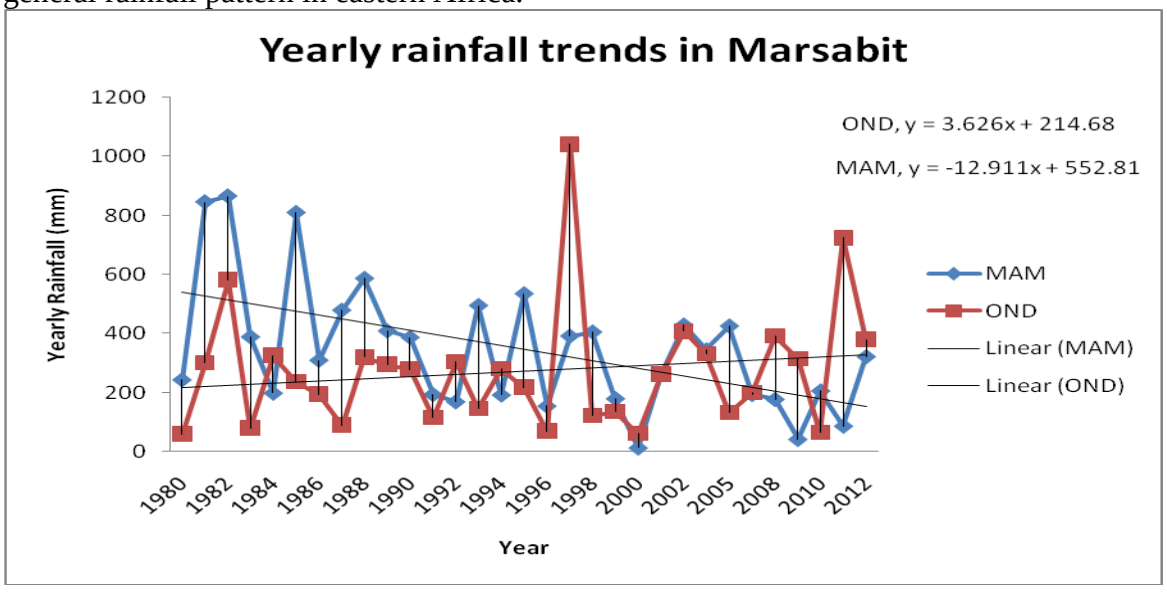
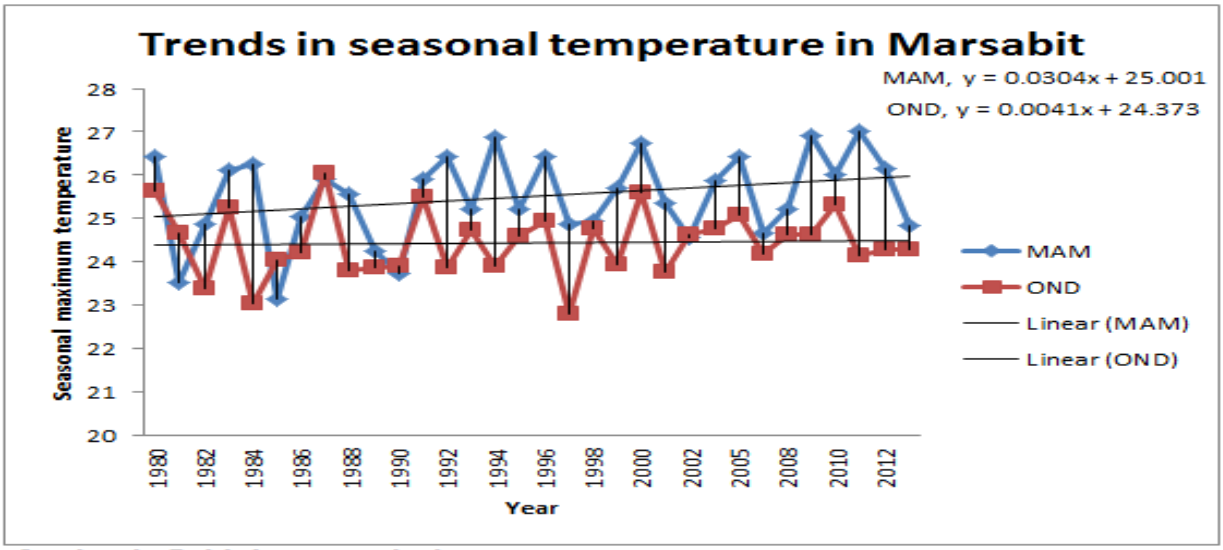



**Figure 1: Yearly rainfall trends MAM and OND in Marsabit County**

**Results from Analysis of Temporal patterns of temperature**

Figure 2 indicates a significant rise in temperature at several locations over the four counties under study. This is in line with IPCC prediction that temperatures will continue to increase as climate change impact is experienced across the globe.

**MAM and OND seasonal maximum temperature trends (1980 - 2012)**




**Author's field data analysis**

**Figure 2: MAM and OND maximum temperature seasonal trends for Marsabit 1980-2012**

**Response Rate**

All the sampled households successfully completed the interview giving a 100% response rate.

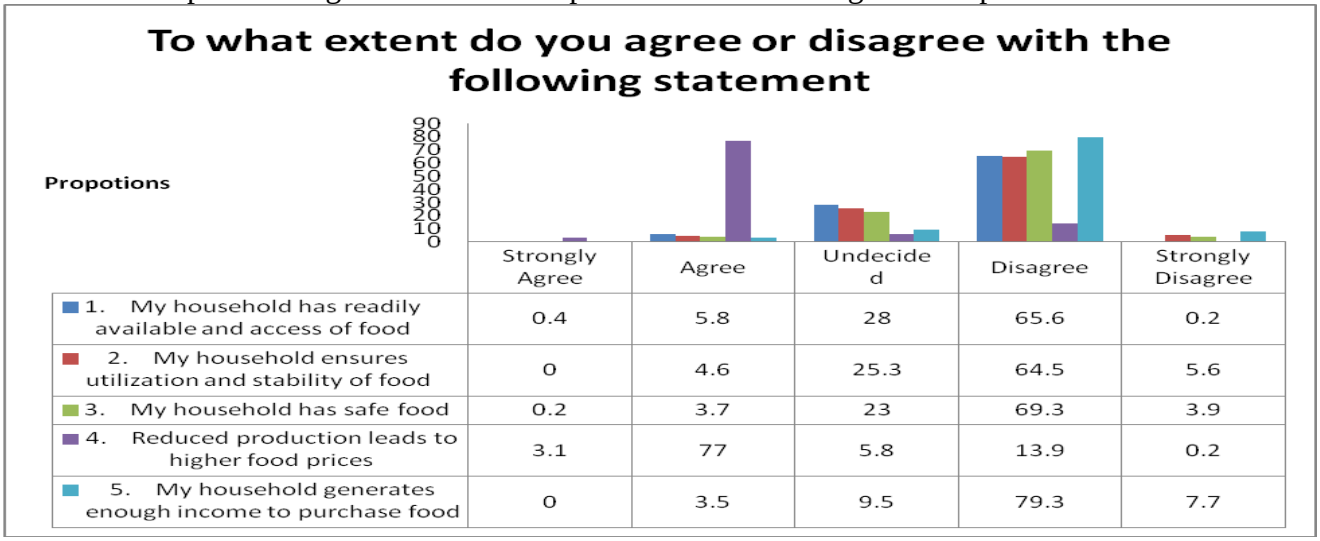
**Demographic Characteristics**

Results revealed that the biggest proportion 158 (30.5%) of the respondents was aged between 35 and 44 years. Only a small proportion of 9.5% was below the age of 34 years and further few 61(11.8%) were aged between 65 and 74 while 30(5.8%) were in the age category of between 75 and 84 years. Results on the gender of the respondents indicated that 191(36.9%) were males while 327(63.1%) were females. Majority 52.5% of the population interviewed were married and 41.1% mostly women while 21.4% were men who cannot read and write. Results on the level of education of the respondents indicated that 324 (62.5%) had non-formal education, 124 (23.9%) had primary education, 60 (11.6%) had secondary education while 9 (1.7%) were university graduates. The data shows that most of the people in the study had not received any formal education. Further, results on the marital status of the respondents indicated that 275 (54.6%) were married, 70 (13.9%) were single where 48 (9.5%) were divorced, with 39 (7.7%) and 72 (14.3%) being separated and widowed respectively. The data shows that majority of the respondents were married.

## Health Profile, Availability and Distribution of Food at Household level

### Availability and distribution of food at household level

Results in Figure 3 indicated that most of the respondents interviewed (65.6%) disagree that their household have readily available and access enough food, 64.5% disagreed that their households ensure utilization and stability of food their households, 69.3% disagreed that they have safe foods, 79.3% disagreed that their households generates enough income to purchase foods while 77% of the respondents agreed that reduced production leads to higher food prices.




| | Strongly Agree | Agree | Undecided | Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| 1. My household has readily available and access of food | 0.4 | 5.8 | 28 | 65.6 | 0.2 |
| 2. My household ensures utilization and stability of food | 0 | 4.6 | 25.3 | 64.5 | 5.6 |
| 3. My household has safe food | 0.2 | 3.7 | 23 | 69.3 | 3.9 |
| 4. Reduced production leads to higher food prices | 3.1 | 77 | 5.8 | 13.9 | 0.2 |
| 5. My household generates enough income to purchase food | 0 | 3.5 | 9.5 | 79.3 | 7.7 |

**Figure 3: Household food availability, access, utilization and stability**

### Level of Nutritional and Food Security assessment of Households with Women of Reproductive Age and Children Under 5 Years

### Distribution by Age and Sex

The anthropometric study involved 460 children of 6-59 month old; with 245 boys and 217 girls involved in the final anthropometric results. The distribution of the nutrition survey sample by sex and age group shows that the total boy/girl sex ratio of the survey was within the normal limits (0.8 - 1.2). Similarly, sex ratio within the age groups indicates a normal distribution as shown in Table 1.

**Table 1: Distribution of age and sex of sample**

| | Boys | | Girls | | Total | | Ratio |
|---|---|---|---|---|---|---|---|
| AGE (months) | no. | % | no. | % | no. | % | Boy: girl |
| 6-17 | 59 | 58.4 | 42 | 41.6 | 101 | 21.9 | 1.4 |
| 18-29 | 70 | 52.6 | 63 | 47.4 | 133 | 28.8 | 1.1 |
| 30-41 | 55 | 47.8 | 60 | 52.2 | 115 | 24.9 | 0.9 |
| 42-53 | 40 | 50.6 | 39 | 49.4 | 79 | 17.1 | 1.0 |
| 54-59 | 21 | 61.8 | 13 | 38.2 | 34 | 7.4 | 1.6 |
| Total | 245 | 53.0 | 217 | 47.0 | 462 | 100.0 | 1.1 |

### Nutritional Status of Children 6-59 Months

This study used the World Health Organization 2006 growth Standards (WHO-GS). The WHO standard establishes breastfeeding as the biological norm and the breastfed infant as the standard for growth and development. According to the study findings in Garbatulla sub-county, the prevalence of global acute malnutrition (z-scores <-2 standard deviations and/or Oedema) as per the WHO-GS was analyzed based on a sample of 460 children and recorded a GAM prevalence of 12.4% (9.7-15.7 95% CI) and a SAM prevalence of 1.1% (0.5- 2.5 95% CI) the GAM prevalence is at serious levels while the SAM prevalence is at acceptable levels (low) as shown in Table 2. There is no significant difference between the GAM and SAM levels for both boys and girls.

**Table 2: Prevalence of acute malnutrition based on weight-for-height z-scores (and/oroedema) and by sex**

| | **All n = 460** | **Boys n = 243** | **Girls n = 217** |
|---|---|---|---|
| Prevalence of global malnutrition (<-2 z-score and/or oedema) | (57) 12.4 % (9.7 - 15.7 95% C.I.) | (34) 14.0 % (10.2 - 18.9 95% C.I.) | (23) 10.6 % (7.2 - 15.4 95% C.I.) |
| Prevalence of moderate malnutrition (<-2 z-score and >=-3 z-score, no oedema) | (52) 11.3 % (8.7 - 14.5 95% C.I.) | (30) 12.3 % (8.8 - 17.1 95% C.I.) | (22) 10.1 % (6.8 - 14.9 95% C.I.) |
| Prevalence of severe malnutrition (<-3 z-score and/or oedema) | (5) 1.1 % (0.5 - 2.5 95% C.I.) | (4) 1.6 % (0.6 - 4.2 95% C.I.) | (1) 0.5 % (0.1 - 2.6 95% C.I.) |

Distribution of acute malnutrition and Oedema based on weight-for-height z-scores

There was no Oedema cases identified during the survey however, five children were classified as marasmic from Bula kati, Manyatta Kula, Darajani and Kambi ya Juu villages as shown in Table 3.

**Table 3: Distribution of acute malnutrition and oedema based on weight-for-height z-scores**

| | **<-3 z-score** | **>=-3 z-score** |
|---|---|---|
| Oedema present | Marasmic kwashiorkor No. 0 (0.0 %) | Kwashiorkor No. 0 (0.0 %) |
| Oedema absent | Marasmic No. 5 (1.1 %) | Not severely malnourished No. 457 (98.9 %) |

**Prevalence of Acute Malnutrition by MUAC**

MUAC is used as a good indicator to identify malnourished children with a high risk of death and hence in need of treatment. In Kenyan context, GAM is a MUAC measurement <125mm and/or presence of bilateral Oedema, with SAM being a MUAC measurement < 115mm and/or presence of bilateral Oedema. Those children with a MUAC measurement of <125mm and >= 115 mm are moderately malnourished. This study unveiled a GAM prevalence in Garbatulla sub-county of 3.9% (2.5 - 5.9 95% C.I.) and a SAM prevalence of 0.4 % (0.1 - 1.6 95% C.I.) on the basis on MUAC measurements as shown in Table 4.

**Table 4: Prevalence of acute malnutrition based on MUAC cut off's (and/or oedema) and by sex**

| | **All n = 462** | **Boys n = 245** | **Girls n = 217** |
|---|---|---|---|
| Prevalence of global malnutrition (< 125 mm and/or oedema) | (18) 3.9 % (2.5 - 6.1 95% C.I.) | (8) 3.3 % (1.7 - 6.3 95% C.I.) | (10) 4.6 % (2.5 - 8.3 95% C.I.) |
| Prevalence of moderate malnutrition (< 125 mm and >= 115 mm, no oedema) | (16) 3.5 % (2.1 - 5.6 95% C.I.) | (7) 2.9 % (1.4 - 5.8 95% C.I.) | (9) 4.1 % (2.2 - 7.7 95% C.I.) |
| Prevalence of severe malnutrition (< 115 mm and/or oedema) | (2) 0.4 % (0.1 - 1.6 95% C.I.) | (1) 0.4 % (0.1 - 2.3 95% C.I.) | (1) 0.5 % (0.1 - 2.6 95% C.I.) |

**Prevalence of Underweight by Weight-for-age (WFA) Z-scores (WHO-GS)**

Underweight is a proximate indicator of both acute and chronic malnutrition based on weight for age Z-scores (WAZ). The advantage of this index is that it reflects both past (chronic) and/or present under nutrition (although it is unable to distinguish between the two). Moderate malnutrition (underweight) is defined as a z-score between -2 and -3 and severe malnutrition as a z-score < -3. Results in Table 5 showed that the prevalence of underweight in the study was 19.4 % (16.1 - 23.3 95% C.I.) while SAM prevalence was 3.1% (1.8 - 5.1 95% C.I

**Table 5: Prevalence of underweight based on weight-for-age z-scores by sex**

| | **All n = 458** | **Boys n = 244** | **Girls n = 214** |
|---|---|---|---|
| Prevalence of underweight (<-2 z-score) | (89) 19.4 % (16.1 - 23.3 95% C.I.) | (49) 20.1 % (15.5 - 25.6 95% C.I.) | (40) 18.7 % (14.0 - 24.5 95% C.I.) |
| Prevalence of moderate underweight (<-2 z-score and >=-3 z-score) | (75) 16.4 % (13.3 - 20.0 95% C.I.) | (41) 16.8 % (12.6 - 22.0 95% C.I.) | (34) 15.9 % (11.6 - 21.4 95% C.I.) |
| Prevalence of severe underweight (<-3 z-score) | (14) 3.1 % (1.8 - 5.1 95% C.I.) | (8) 3.3 % (1.7 - 6.3 95% C.I.) | (6) 2.8 % (1.3 - 6.0 95% C.I.) |

**Prevalence of stunting based on height-for-age z-scores**

Stunting is an indicator used to access chronic malnutrition by comparing child's height to standard height of children in the same age. The study results in Table 6 indicated a stunting prevalence of 21.2% (17.7 - 25.2 95% CI) with severe stunting at 5.1% (3.4- 7.6 95% CI).

**Table 6: Prevalence of stunting based on height-for-age z-scores and by sex with 95% confidence interval (Cl)**

| | **All n = 448** | **Boys n = 238** | **Girls n = 210** |
|---|---|---|---|
| Prevalence of stunting (<-2 z-score) | (95) 21.2 % (17.7 - 25.2 95% C.I.) | (55) 23.1 % (18.2 - 28.9 95% C.I.) | (40) 19.0 % (14.3 - 24.9 95% C.I.) |
| Prevalence of moderate stunting (<-2 z-score and >=-3 z-score) | (72) 16.1 % (13.0 - 19.8 95% C.I.) | (42) 17.6 % (13.3 - 23.0 95% C.I.) | (30) 14.3 % (10.2 - 19.7 95% C.I.) |
| Prevalence of severe stunting (<-3 z-score) | (23) 5.1 % (3.4 - 7.6 95% C.I.) | (13) 5.5 % (3.2 - 9.1 95% C.I.) | (10) 4.8 % (2.6 - 8.5 95% C.I.) |

Further analysis was done on stunting per age category as shown in Table 7. The analysis shows that children aged between 18 and 29 months were the most stunted. This could be attributed to poor complementary feeding and owing to the fact that breastfeeding usually stops during this age

**Table 7: Prevalence of stunting by age based on height-for-age z-scores**

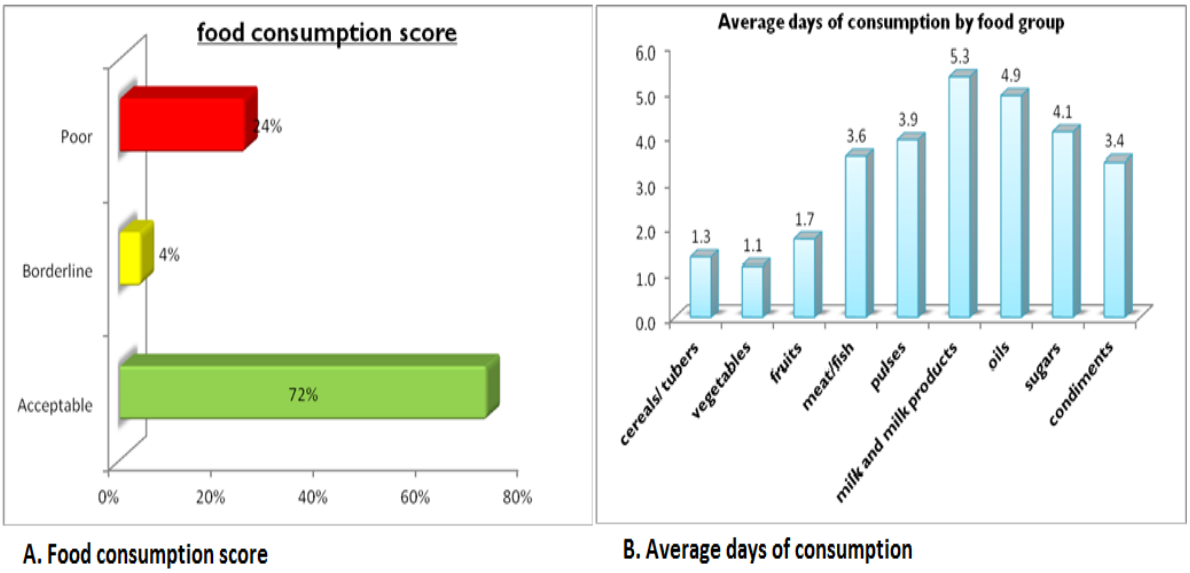
| | | **Severe stunting (<-3 z-score)** | | **Moderate stunting (>= -3 and <-2 z-score )** | | **Normal (> = -2 z score)** | |
|---|---|---|---|---|---|---|---|
| Age (mo) | Total no. | No. | % | No. | % | No. | % |
| 6-17 | 98 | 1 | 1.0 | 14 | 14.3 | 83 | 84.7 |
| 18-29 | 128 | 16 | 12.5 | 27 | 21.1 | 85 | 66.4 |
| 30-41 | 112 | 4 | 3.6 | 17 | 15.2 | 91 | 81.3 |
| 42-53 | 76 | 2 | 2.6 | 9 | 11.8 | 65 | 85.5 |
| 54-59 | 34 | 0 | 0.0 | 5 | 14.7 | 29 | 85.3 |
| Total | 448 | 23 | 5.1 | 72 | 16.1 | 353 | 78.8 |

**Food frequency and household dietary diversity**

**Food Consumption Score (FCS)**

Food consumption score (FCS) is a proxy indicator of household food security based on consumption of a particular food and its relative nutrition importance. FCS is measured at household level; it combines measurements of dietary diversity, the frequency with which different foods are consumed and the relative nutritional importance of various food groups. A 7

day recall period was used to obtain food consumption frequency of each food group then multiplied by an assigned weight based on nutrients content. The household food consumption score indicated that most households lied on the acceptable food consumption threshold (>35.5) 72% while 24% of the household are lying within poor food consumption score (0-21). Only a small 4% of the household were within borderline food consumption score (21.5-35) as shown in the Figure 9. This is attributed to daily consumption of pulses, milk & milk products, sugars and oils (Figure 4)




A. Food consumption score

B. Average days of consumption

**Figure 4: Food consumption score and average days of consumption**

**Household dietary diversity (HDD)**

An assessment of household dietary diversity was done using a 24-hour recall period. Majority of households had poor dietary diversity with high consumption of low nutrient dense foods. The study result revealed that cereals (91%), oils and fats (88%) and milk and milk products (72%) lead in consumption while other nutritionally significant foods such as fish (8%), nuts and seeds (16%), legumes (27%), eggs (28%), sweets (29%) and tubers (32%) were consumed in relatively small quantities by some households as shown in Figure 5. According to FGD discussants, factors hindering consumption include: cultural barriers/food taboos that limit consumption of certain foods, limited purchasing power and unavailability in the market.

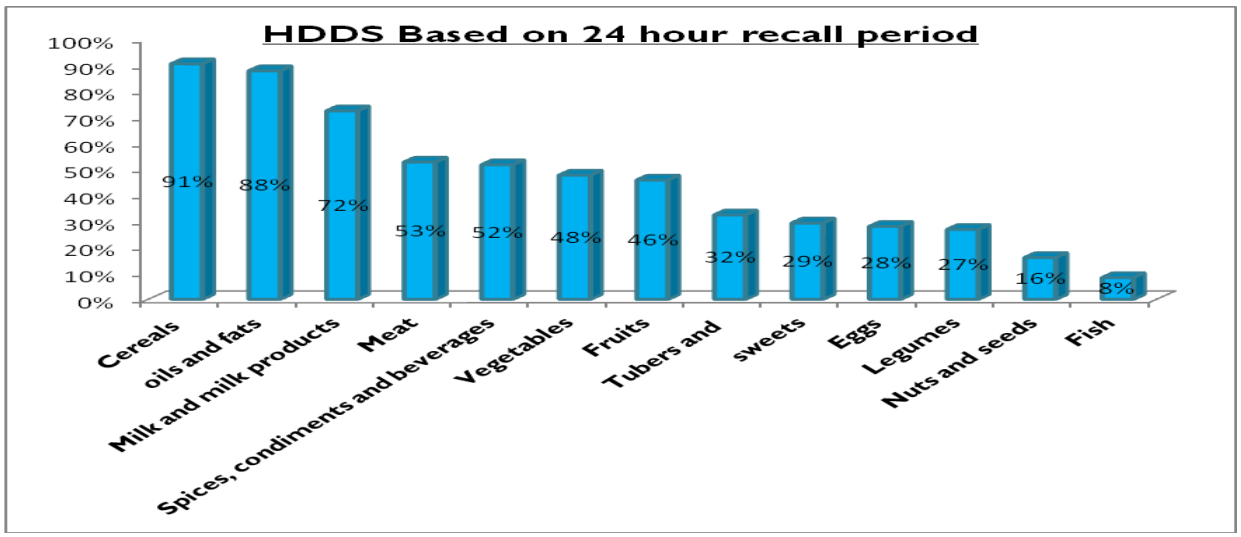



**Figure 5: Household Dietary Diversity**

## Household Income and Expenditure

### Income Sources

Respondents were asked to indicate their household's income sources in the 30 days preceding the study date. This reveals some diversity in income sources across the surveyed households, with food aid sales (14.0%), bush product sales and livestock sales accounting for largest numbers of households. Figure 6 represents both the percentage of households with each income source, along with the percentage of the total income to all respondents produced from each respective source. This demonstrates that food aid sales (14.0%) was the biggest single source of income overall, followed by bush products sales such as charcoal and fire wood (13.9%), livestock sales (12.7%) and remittances from family (10.2%). Since there is no blanket food distribution, some households in the rural village are getting more than enough of the relief food. They then sale the surplus to people who have not been targeted for relief or to the well up people in urban centres in order to get cash to buy other items not provided as relief food such as sugar, detergents, salts and fruits.

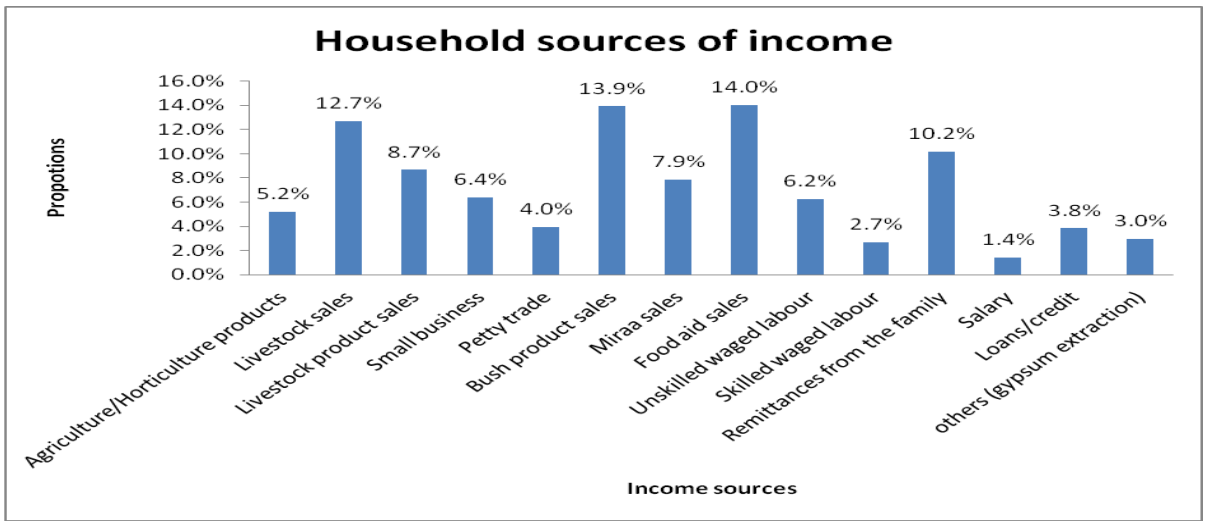



**Figure 6: Household Income Sources**

## Expenditure

According to the study survey findings 279 of the households spent money on food, accounting for 53.86% of total expenditure across the surveyed households. Medical expenses, water, fuel, clothing and mira were sources of expenditure for at least 23.74% of the households (Figure 7). However, other than food, each of the other reported types of expense account for relatively small percentages of the total expenditure. This indicates that households in the sub-county are vulnerable to increases in food prices as this would push up food expenditure even further relative to other items. This could potentially undermine household's ability to manage other important costs such as medical fees and education.

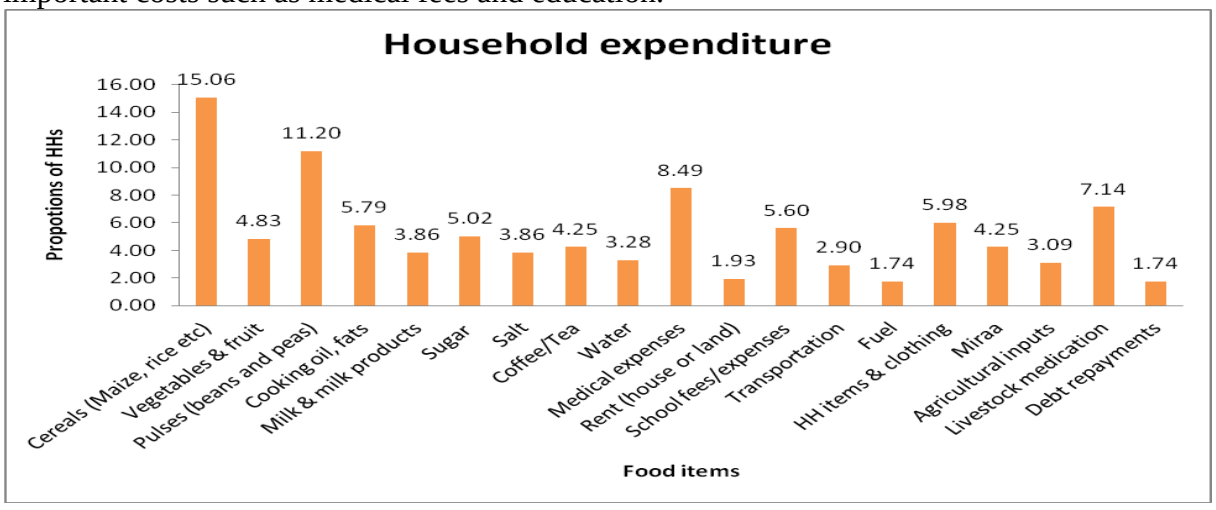



**Figure 7: Household Expenditure**

**Shocks, Trends, Seasonality And Disaster Risk Reduction**

During the assessment, the respondents were asked if in the last three (3) months their households have been affected by any shocks. Results in Figure 8 reveal that 72% of the respondents indicated yes while a small 28% said no. Insecurity and conflicts in parts of the region between neighboring communities also hinder inaccessibility to some pastures and markets in Eskot, Kinna and some parts of Kula mawe.

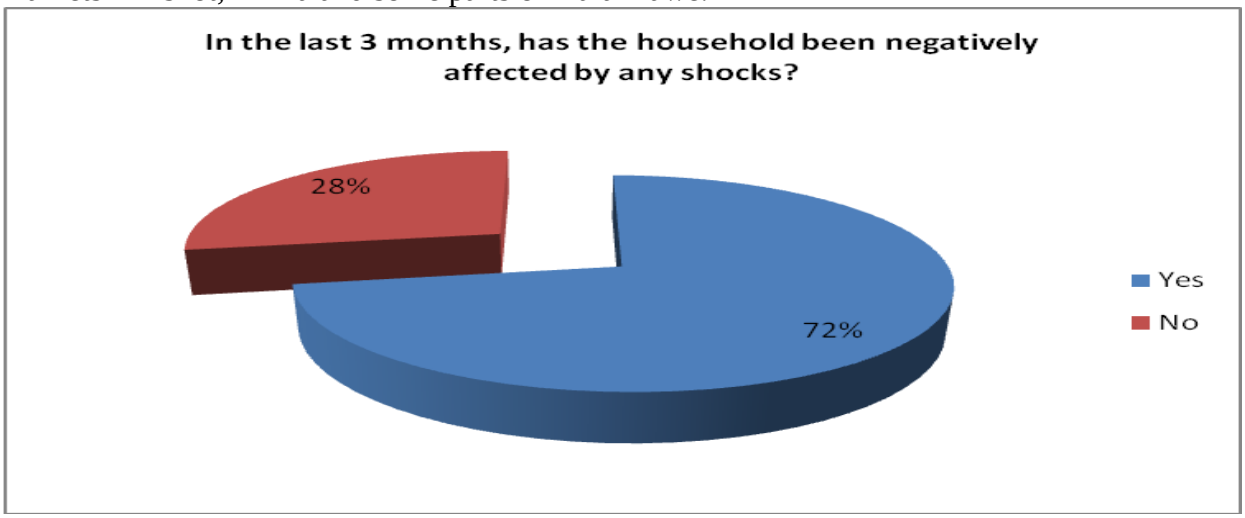



**Figure 8: Negative impact of shock at household level**

The respondents were also asked to identify the most frequent shocks affecting them according to their importance. According to the respondents, unusual high level of human disease/illness 113(27.9%) was ranked the highest followed by unusual high level of livestock deaths 91(26.1%) and unusual low prices of livestock 116 (28.6%) in the second and third position respectively (Table 7).

**Table 7: Household frequent shocks and trends**

| Rank the top three shocks affecting the households in order of importance | Highest | | Second highest | | Third highest | |
|---|---|---|---|---|---|---|
| | N | Percent of Cases | N | Percent of cases | N | Percent of Cases |
| Reduced water availability | 90 | 22.2% | 28 | 8.0% | 57 | 14.1% |
| Reduction of pasture/ forage | 28 | 6.9% | 83 | 23.8% | 31 | 7.7% |
| Unusually high level of livestock death | 1 | 0.2% | 91 | 26.1% | 115 | 28.4% |
| Unusually high prices for food | 85 | 21.0% | 31 | 8.9% | 28 | 6.9% |
| Unusually low prices for livestock | 1 | 0.2% | 29 | 8.3% | 116 | 28.6% |
| Unusually high level of human disease/illness | 113 | 27.9% | 30 | 8.6% | 85 | 21.0% |
| Reduced income | 86 | 21.2% | 28 | 8.0% | 1 | 0.2% |
| Insecurity/conflict/Raiding | 29 | 7.2% | | | | |
| Crop failure | | | 29 | 8.3% | | |

**Resource based conflicts in Garbatulla sub-county**

An interview with peace committees revealed that combination of factors has conspired to cause, trigger and fuel conflicts within the region. The following key issues could be considered as the key drivers and triggers of conflict in Garbatulla but not limited to climate change and drought, politics, culture/tradition of samburu morans, scare grazing resources as a result of unpredictable rainfall, small arms and light weapons and fencing of grazing areas by neighbouring community.

According to FGDs discussant, climate-related effects of this nature have been reported resulting in violent conflicts in Maua, Kinna, Kula mawe, Eskot, Modogashe and Gottu of Garba Tulla sub-county, with its history of ethnic, natural resource and interclan conflicts, is seen as being particularly vulnerable to this new climate-induced security threat. Climate change's impact on natural resources can also affect the livelihoods of many who earn an income from freshwater, agricultural, forest and ocean resources, potentially leading to protests and unrest.

Results in Figure 9 revealed that Garbatulla community experiences both intra and inters community conflicts as narrated by the participants during assessmen. Inter conflicts arises from boundaries, grazing areas, water points and sometimes livestock theft and is between, Borana, Meru, Somalis and Samburus. The impacts of climate change put additional pressures on social, economic, and political systems and may be the catalyst for conflict. Climate change-related events can lower agricultural food productivity, which in turn can affect food security and increase food prices. Intra-conflicts manifested within the community are inter-clan rivalry in form of political inclinations amongst the clans, clan competitions on local and external resources allocations. Results also showed that 75.5% of the respondents reported that frequency of conflict in the area has been increasing compared to the previous 10 years while 68.1% of the respondents agreed that climate change is the cause of conflict as a result of scare resources. Community identified Council of elders, chiefs, common religion, peace declarations, peace committees, common culture as their local capacity for peace. Currently within the area intra-community conflicts have been managed as result of peace declaration among the communities and Government effort to devolve services to the local level.

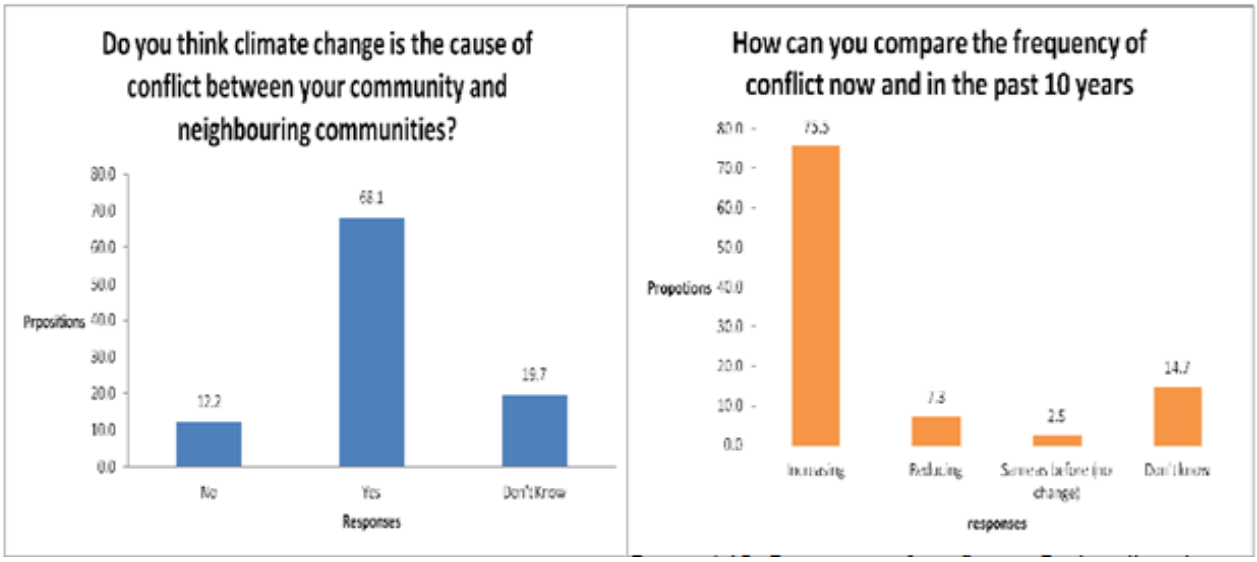



**Figure 9: Climate change as a cause of conflict and its frequency**

Results in Figure 10 show that the conflict is as a result of scare resources; fight over water and pasture (21.7%) and historical land fights. Political influences also play a greater role of fuelling conflict within the region (12.5%). Environmental degradation (9.2%), unreliable rainfall (8.7%) and high livestock population (4.6%) play a significant role in sustaining conflict in the region.

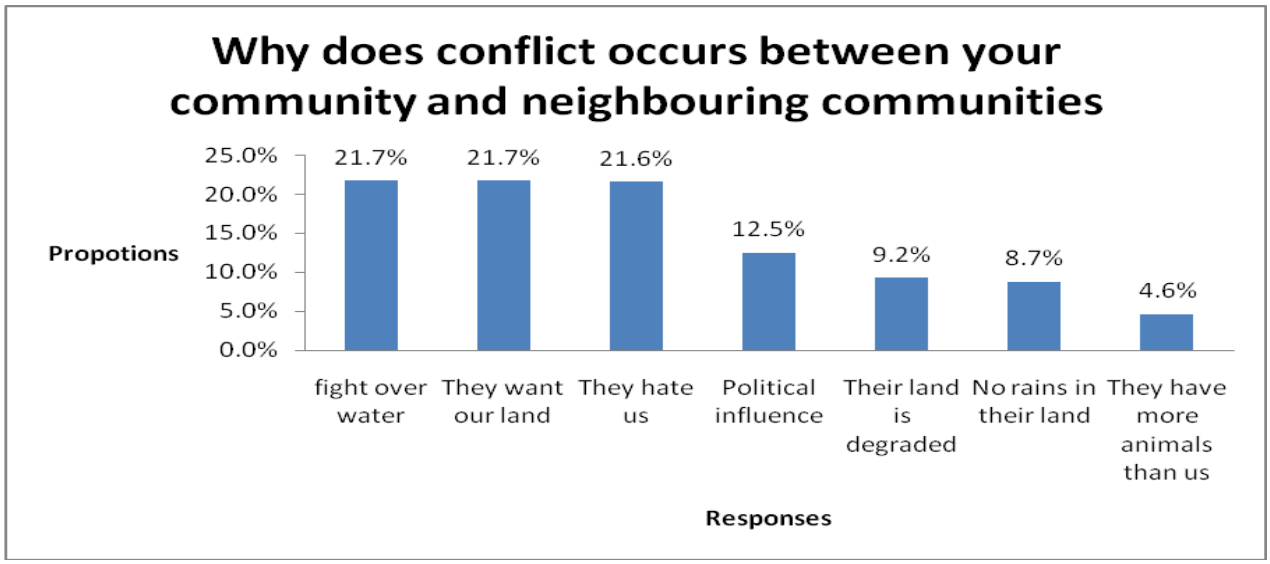



**Figure 10: Climate change as a cause of conflict and its frequency**

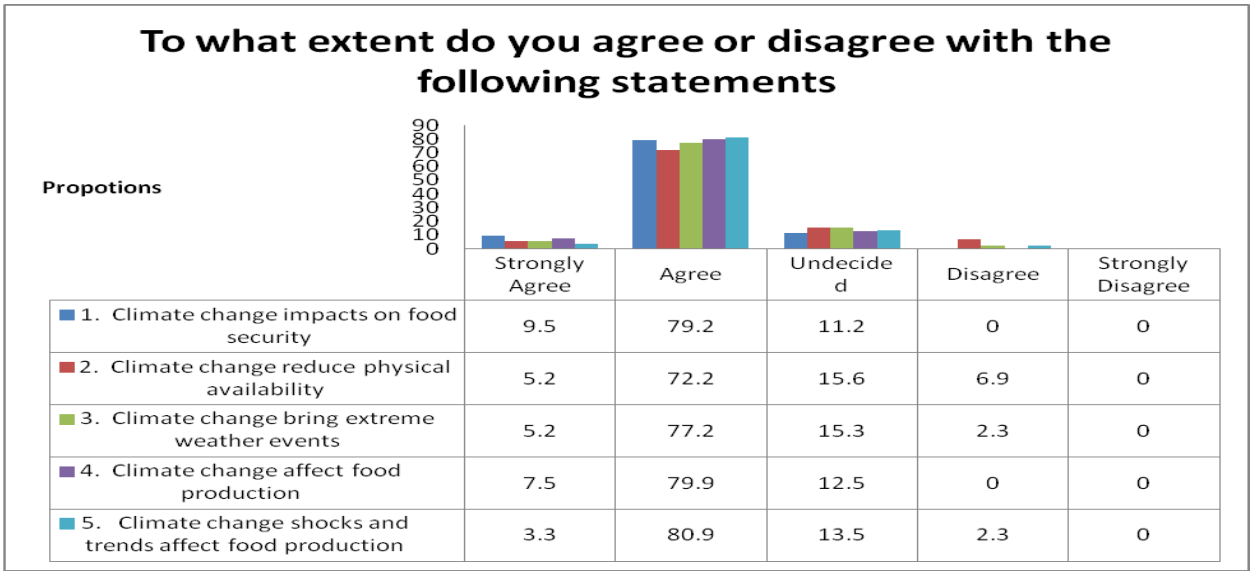
## Climate Change Impacts And Household Vulnerability

### Community's perception of climate change impact

The researcher used participatory methods to explore the extent of awareness and perception at community level about climate change impact. The field study revealed that the community has already realized that climate variations and changes are taking place. These changes also began to affect their livelihood, the long-standing coping strategies which they used over decades as of their continuous adaptation to the harsh environment and ecosystem. These strategies have been stretched, because of various reasons including the identified changes in climate variability among other things. From the focus group discussions (FGDs), it is evident that the population perceives the climate change as persistent trends of increasing seasonal and annual temperatures, more hot and warm days during the year, reduced volume and frequency of precipitation. People no longer perceive these trends as usual climatic fluctuations of temperature. Nevertheless, communities are not as much concerned about temperature changes, as they are with the risks of frequent and severe droughts and water shortages (the most recent one occurred in 2007- 2008), both of which resulted in loss of cattle, deterioration of soil, partial tear down of irrigation and severe food insecurity in Garbatulla sub-county.

### Impact Of Climate Change On Household Food Production

The respondents were asked the extent to which they agree or disagree with statements on the impacts of climate change on food security domains. Results in Figure 11 revealed that 79.2% of the respondents agreed that climate change affects all the components of food security 72.2% agreed that climate change reduce physical food availability, 77.2% agreed that climate change bring extreme weather events, 79.9% agreed that climate change affects food production while 80.9% agreed that climate change shocks and trends affects food production.




| | Strongly Agree | Agree | Undecided | Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| 1. Climate change impacts on food security | 9.5 | 79.2 | 11.2 | 0 | 0 |
| 2. Climate change reduce physical availability | 5.2 | 72.2 | 15.6 | 6.9 | 0 |
| 3. Climate change bring extreme weather events | 5.2 | 77.2 | 15.3 | 2.3 | 0 |
| 4. Climate change affect food production | 7.5 | 79.9 | 12.5 | 0 | 0 |
| 5. Climate change shocks and trends affect food production | 3.3 | 80.9 | 13.5 | 2.3 | 0 |

**Figure 11: Impact of climate change on food security domains**

Results also revealed that all the respondents are aware that climate change is a global issue which affects every sphere of livelihoods. Figure 12 shows that 76% of them acknowledge that weather pattern is change and a small 15% were unaware whether climate pattern is changing. 56% of the respondents also admit that climate change is affecting them.

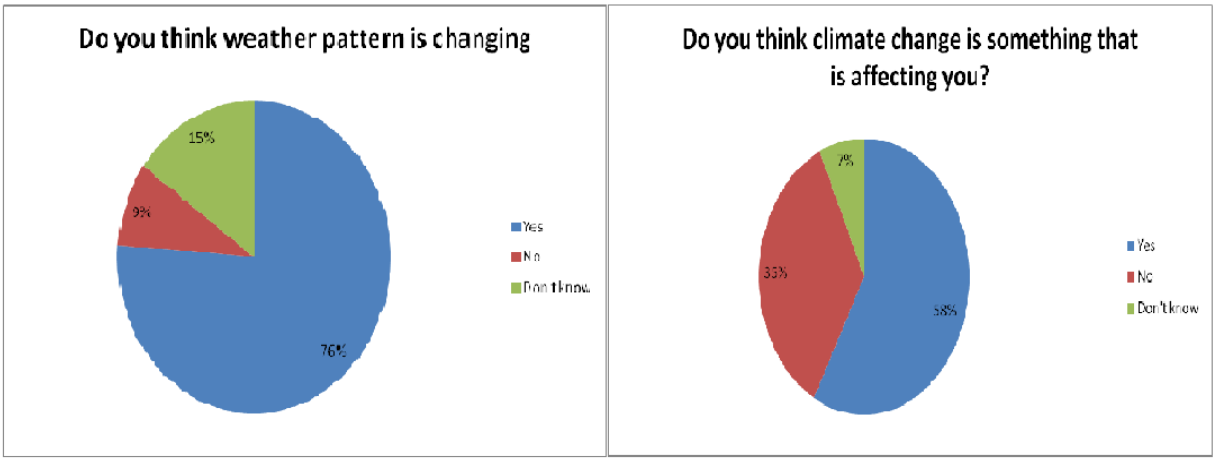



**Figure 12: Pattern and effect of climate change at household levels**

Results in Figure 13 show that an overwhelming 59% of the respondents admit to know what to be done to tackle climate change.

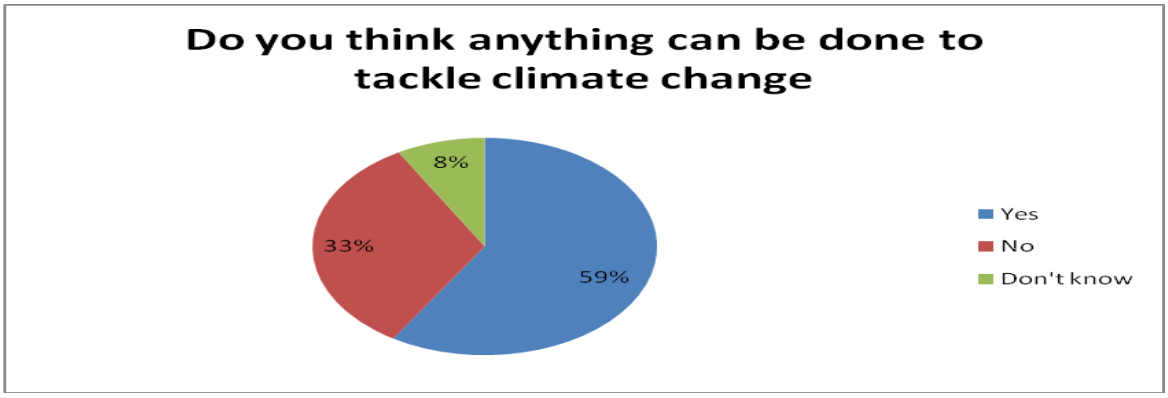



**Figure 13: Solutions to climate change**

**Main livelihood sources**

Results in Figure 14 show that up to 52% of the respondents indicated that livestock keeping was their main source of livelihood, 15% of the respondents depended on employment (Salaried), while 14% of the respondents depended on small business (petty trade), 10% depended on farm/own labour (crop farmers), 7% of the respondents relied on daily labour/waged labour and 2% relied on others.

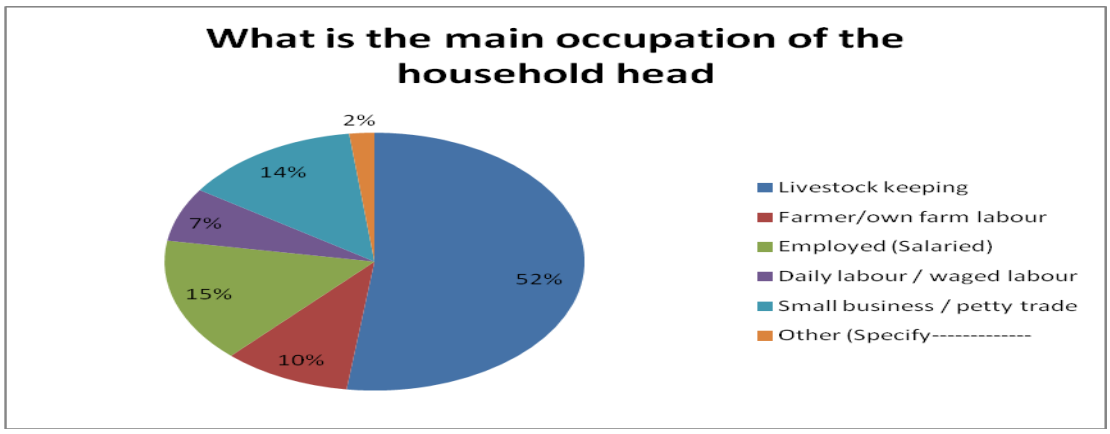



**Figure 14: Household main sources of income**

## Coping Strategies, Barriers and Opportunities for Improving Food and Nutrition Security at Household and Community Level

### Coping Strategy Index

The coping strategy index assesses how a household copes in times of food shortage or lack of food. Household were assessed based on six strategies which were then weighted based on their severity. A number of coping mechanisms were reported to have been applied by 518 of the sampled households in order to deal with food shortage for the past 2 months prior to the study (Figure 15) period. Most household relied on less preferred and less expensive food, and restricted consumption of food by adults for young children to eat. This was attributed to increased food prices affecting household access to food since most of the households are highly dependent on purchases.

Households were asked to report which coping strategies they had utilized during the previous thirty days, excluding the Ramadan month; practices during Ramadan would not give a true picture of household status and coping. The results show that various coping strategies were being widely practiced. Results also showed that 77.4% of those surveyed reported eating less preferred foods. Over 95.9% of the households also reported reducing meal sizes and borrowing money from relatives, whilst 73.2% had restricted adult food intake to allow children to eat.

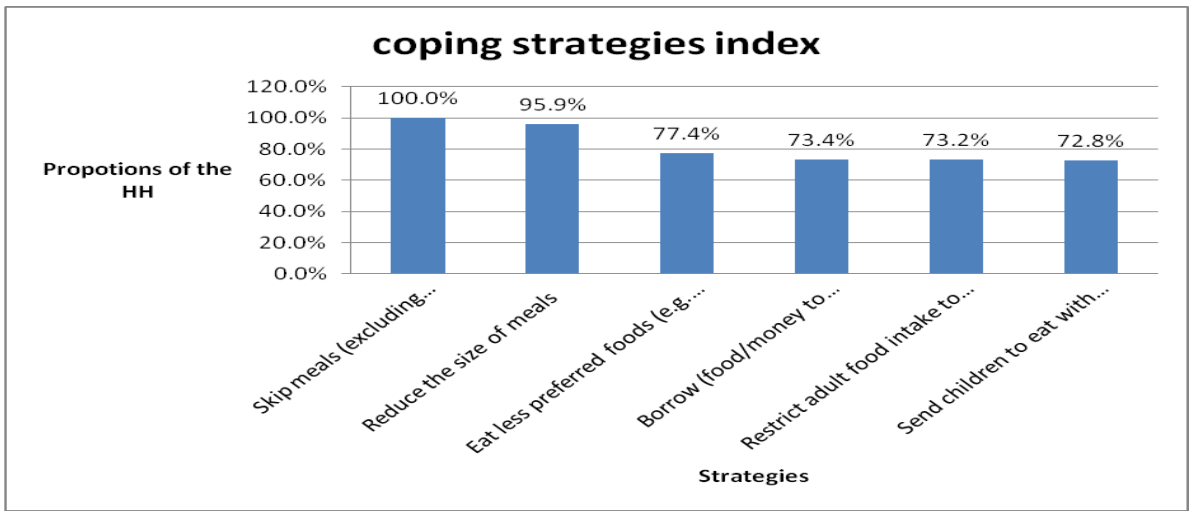


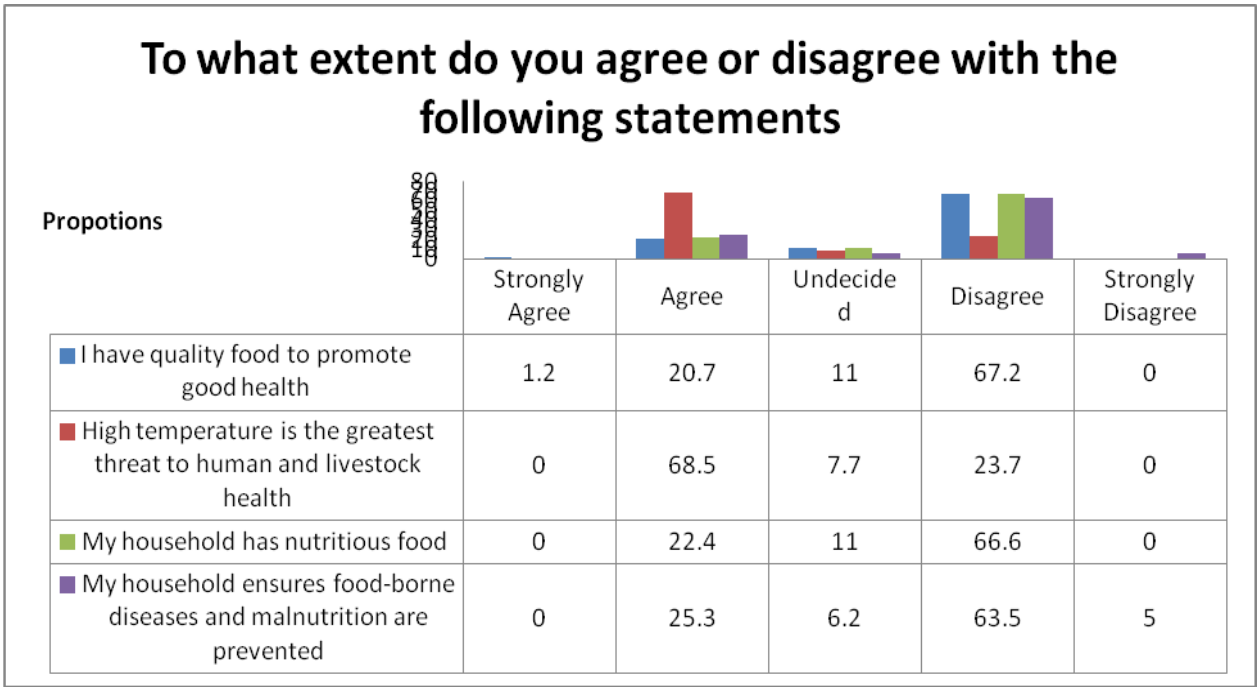

**Figure 15: Coping strategies index**

## Barriers and Opportunities for Improving Food and Nutrition Security

Some of the barriers for improving food and nutrition security included poor climatic conditions; this has greatly affected the household food and nutrition security across the sub-county hence resulting to increased levels of malnutrition and minimal recovery of the affected populations. According to the key informant interview (KII) with the department of health personnel, plans to scale up human resource gap in the county are underway hence necessitating capacity building initiatives for the recruited nutrition officers. The exercise was geared towards enhancing improved quality service delivery of nutrition interventions.

Inadequate funding to health and nutrition services; the allocations for the health and nutrition services at the county mainly goes to recurrent costs giving little to the developmental strategies. This has resulted to delayed implementation and lack of support to key interventions to nutrition. Improving nutritional status and reducing vitamin and mineral deficiencies are integral to achieving Kenya's Vision 2030 and Sustainable Development Goals (SDCs). These, and meaningful economic development will not happen without an urgent improvement in nutrition through enhanced advocacy.

In Garbatulla sub-county there exists weak advocacy mechanisms and this calls for scale up of nutrition advocacy both at the county government and community level in order to move nutrition agenda forward. Results in Figure 16 show that 67.2% of the respondents disagreed tht they have quality food to promote good health while 68.5% agreed that high temperature is the greatest threat to human and livestock health. Results also showed that 66.6% of the respondents disagree with their households have nutritious food while 63.5% disagree that their households ensure food-borne diseases and malnutrition are presented.




| | Strongly Agree | Agree | Undecided | Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| I have quality food to promote good health | 1.2 | 20.7 | 11 | 67.2 | 0 |
| High temperature is the greatest threat to human and livestock health | 0 | 68.5 | 7.7 | 23.7 | 0 |
| My household has nutritious food | 0 | 22.4 | 11 | 66.6 | 0 |
| My household ensures food-borne diseases and malnutrition are prevented | 0 | 25.3 | 6.2 | 63.5 | 5 |

**Figure 16: Barriers and Opportunities affecting Food and Nutrition Security**

## CONCLUSIONS

The study concluded that the rainfall and temperatures over the region of study has been decreasing trend of yearly rainfall and increasing temperatures. The observed trends have implications on local livelihoods and enhance aridity. The decline in rainfall reduces yields in rain-fed agriculture, vegetation cover and affects food production unless adaptation measures are identified and promoted.

According to the study findings, the area is highly dependent on food aid which is an indication of food insecurity in Garbatulla. Levels of food aid distribution in the region are high, with the majority of households receiving assistance. The analysis of nutritional status in the region remains between poor and serious, requiring adequate attention which is an indication of deterioration in nutrition. These serious levels of malnutrition can be attributed to; Poor dietary diversity with many household consuming less of the most nutrient dense food and household food insecurity with many of the household practicing one or more of the coping strategy.

The study also found out that the respondents were using arrange of coping mechanism which are at border on survival rather than adequacy. The extent to which coping strategies such as purchase on credit, reduction in meal size, borrowing from relatives and selling of productive assets are being utilized indicates that many households in Garbatulla are experiencing increasing food insecurity. The study findings also indicated a number of barriers hindering the community from consuming more nutritious foods such as fish, eggs and tubers. The major barriers were selective on culture that limits the range of food staff that the community can consume.

## RECOMMENDATIONS

In order to improve the health, nutrition and food security status of the population in general and children under five years of age in particular from adverse effects of climate change, the following are recommendations based on the study findings. In view of the decreasing rainfall and increasing temperatures there should be enhanced efforts to use non-rain-fed agricultural technologies such as greenhouse, shade nets, agro-nets and on-farm water harvesting structures to increase diversification and food production. With regard to health and nutrition the study recommended the up scaling the Integrated Management of Acute Malnutrition (IMAM) programs by health sector through mass screening, active case finding and also having a working surveillance mechanism of the whole population on Monthly basis in collaboration with non-state actors working in the region. Additionally, the study recommended that nutrition education and sensitization on the importance of more diversified foods should be emphasized so as to address the issue of limited diet diversity. This can be done in collaboration with the ministry of Agriculture and Livestock and other actors (Health, Social services) providing this services within the sub-county.

With regard to food security, the study recommended that there should be close monitoring and analysis of the food security situation in Garbatulla sub-county. For instance, since comprehensive analyses of observed and predicted climate change-related vulnerabilities and food and nutrition security are lacking in the region. It is essential to develop such analyses and the required tools in rural areas, and in different representative ecosystems and socio-economic contexts. The analysis should target which regions and populations which are particularly vulnerable to climate-related hazards focusing on climate-related shocks; seasonality; trends and gradual changes and clearly stating local coping and adaptation strategies are appropriate.

The study also recommended that there should be reduction of community and household susceptibility to the impacts of hazards through disaster risk management (DRM) in the face of changing climate by providing training and support for the creation and implementation of community and sub-county DRM and community disaster preparedness plans or contingency plans. The study also recommended that household resilience should be increased through livelihoods diversification, increased income generating capacity and improved access to financial support. Further, the study recommended that synergy opportunity and the threats of climate change mitigation measures on food and nutrition security should be analyzed and monitored.

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