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Constraints Faced By Small Scale Farmers In Adapting To Climate Changein Kakamega County

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ABSTRACT:- Kakamega County is a rich agricultural area where various food and cash crops are grown. However, changes in climate coupled with declining soil fertility over the area have an impact on crop production, and hence affect food security especially among small scale farmers. On the basis of this scenario, this study sought to explore the existence and determine the characteristics of climate variability/change, assess its impact on small scale farmers and explain their resilience and adaptive strategies. The study also sought to examine any constraints of small scale farmers in trying to adapt to climate change. The study adopted a descriptive survey design. Data from both primary and secondary sources were used. The latter included data collected from meteorological stations and was mainly rainfall and temperature data for a period of 46 years (1968-2014) to establish any existence and characteristics of climate variability/change in the study area. Primary data included Focal Group Discussions (FGDs), questionnaires and interview schedules administered to farmers to gain information on trends on crop production and adaptation strategies to climate change if any. Regression analysis was used in the study to establish the rainfall and temperature trends. It was established that there were changes in rainfall amounts and temperature in the region. The rainfall amounts were having a negative trend of 3mm per annum, a sign of reduction over time, whereas temperatures had a positive trend of $0.04\ ^{0}$ C on yearly basis. Despite these changes in climate crop farmers had put in practice some adaptation strategies to cope with the changing trends, though they were faced with many challenges/ constraints in trying to implement these strategies.

Key Words: *Adaptation Strategies, Climatic changes, constraints, Small scale farmers.*

I. INTRODUCTION

In Kenya agriculture remains central to the economy and the growth of the sector is positively correlated to the growth of the overall economy, Agricultural Sector Development Strategy, (2009-2010). The agricultural sector contributes 24% of the National Gross Domestic Product (GDP) and employs about 70% of the population in both basic production and industry in Kenya (GOK 2009). Agriculture is thus a major contributor to the socio- economic framework of Kenya where majority of Kenyan population is involved in subsistence agriculture yet this is vulnerable to weather shocks especially due to the lack of adequate moisture. (Irungu *et al*.,2009). Agriculture in Kenya is mainly rainfed and is practiced by smallholders, who have noticed changes in weather patterns hence need for various coping mechanisms (Macharia*et al.,* 2010).Agriculture is at the forefront of shaping the concept of sustainable development for many developing countries, particularly Kenya. The renewed attention for the role of agriculture in development processes will have to take account of the vulnerabilities and risks posed by climate change.In Kenya the general observation is that impacts of climate change exist and may have affected some of the keysectors of the economy which are highly depended upon by the local communities. Agricultural production, environment, energy, forest, tourism, infrastructure and public health are bearing much of the impact. At the moment the country is facing severe drought that has resulted in extreme hunger among some parts of the population and the death of significant numbers of livestock, power rationing and increased conflicts over dwindling water resources.(Kuria,2009)Changes in climate and weather patterns particularly rainfall regimes are predicted to have severe negative impacts on crop production, food security and natural resources in East Africa. Without appropriate responses climate change, is likely to constrain economic development and poverty reduction efforts and exacerbate already pressing difficulties. Countries with economies rooted in climate sensitive sectors like agriculture, fisheries and forestry are expected to be hardest hit. (Woodhill and Terswichha, 2007). This is likely to affect livelihoods of people who are dependent on rain fed agriculture.Crop production is highly sensitive to climate variability and weather extremes, such as droughts, floods and severe storms. The forces that shape our climate are critical to farm productivity. Human activities have already changed atmospheric conditions such as temperature, rainfall, levels of carbon dioxide and ground level ozone (Thornton et. al., 2006).While food production may benefit from a

warmer climate in temperate regions (IPCC 2007) the increased potential for droughts, floods and heat waves will pose challenges for farmers. Additionally, the enduring changes in climate, water supply and soil moisture could make it less feasible to continue crop production in certain regions. Recent studies in Kenya indicate that increased frequency of heat stress, droughts and floods affect crop yields and livestock beyond the impacts of mean climate change, creating the possibility for surprises, with impacts that are larger and occurring earlier, than predicted using mean variables alone.(Kuria, 2009). This is especially the case for subsistence sectors of farming at low latitudes. On the basis of the aforesaid, the main objective of this study was to investigate climatic changes and their impact on small scale farmers, response adaptation strategies and constraints to adapting to climate change in KakamegaCounty. Specifically, the study sought to analyse patterns and trends of climate change in Kakamega County between 1968 and 2014 and assess coping strategies to such climate changes, constraints to adapting and how these impact on small scale farmers in Kakamega County in Western Kenya.

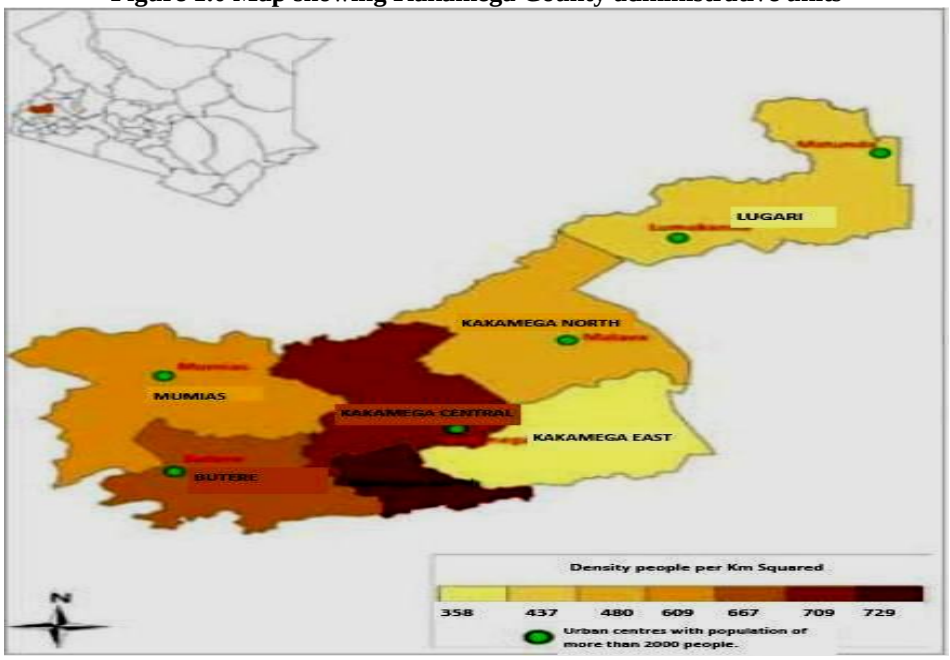
II. METHODOLOGY

The study adopted a descriptive survey design because of the large amount of data from the population regarding resilience to climate change impacts by small scale farmers in Kakamega county of Kenya.

2.1 Study Area

Kakamega County is located in the former Western Province of Kenya. Its capital is Kakamega and its largest town is Mumias. It has a population of 1,660,651 and an area of 3,224.8 km². It is located on coordinates: 0.283333°N 34.75°E and covers an area of 3224.9 KM^2.It is located at an altitude of 1520 – 1680 metres above sea level and has 12 sub counties namely Lugari, Ikolomani, Mumias, Likuyani, Malava, Shinyalu, Butere, Lurambi and Khwisero, as shown in Fig. 1 below.

Figure 1.0 Map showing Kakamega County administrative units



The soils are deficient in nitrogen and phosphorous though efforts are being made to address the declining soil fertility including the use of organic manure, fertilizers and terracing. However poorutilization of inorganic fertilizers in both amounts and types is evident (Nandwaet al,.2001).Kakamega County has various drainage features such as River Yala, and River Nzoia. The riversarepermanent due to heavy rains that occur in the area. Geomorphologic features determine thevegetation of the catchment area. There is an evergreen forest; Kakamega Forest, a preserve whichis a remnant of a rainforest that initially stretched west through Uganda.
Agriculture is the main economic activity with 62% of the population involved mainly in cropfarming of maize and beans for subsistence use, tea, in some parts of the county, on small scale,and sugarcane as a major agricultural activity, largely on large scale in areas around Mumias.Animal keeping of local breeds and dairy farming is also practised on small scale.The study area has a population of about 1,660,551 people according to the 2009 population andhousing census with ratios of 48% men and 52% women but the population has been increasingrapidly over the years. The population density is 515 per square kilometer and has the following

agedistribution (0-14 years at 46.6%) 15-64 years (49.7% while 65+ years is at 3.6%. There areapproximately 358,709 households (CBS 2009). Most of the population tends to settle around townsand trading centres and Kakamega municipality has about 1485 persons per square kilometer.Annual population growth is estimated at 2.12%. Rapid population growth has implications on landresources such as the depletion of water resources, cultivation of marginal lands, over cultivation leading to land degradation . This unsuitable land management practices have impacts on the longterm climatic trends of this area.

2.2 Sampling procedure

Kakamega County consists of 9 sub counties which have various agro- ecological zones with variations in soils, rainfall amounts and even the type of crops grown. All the agro–ecological zones constituted the study sites targeted for sampling the study households. The study made use of the Morgan table and out of a population of 353,700 households a sample size of 387 households was derived. This was later randomly sampled in each of the nine sub-counties.In the next stage, stratified sampling was used to apportion the 387 households to the various agro-ecological zones and according to the number of households and thereafter a simple random sampling was used to choose the households and accordingly, sample size tabulation was obtained as shown in table1

Table 1: Sample size Tabulations

Sub county	No. of households	No. of Households randomly picked
Ikolomani	23,144	24
Shinyalu	34,177	36
Butere	23,220	24
Lurambi	65,121	69
Likuyani	30,476	32
Malava	40,635	43
Khwisero	30,121	32
Mumias	78,685	84
Lugari	29,121	43
Total	353,700	387

Source: Central Bureau of Statistics 2009 for household per sub-county

2.3 Methods of Data collection and Analysis

Both primary and secondary data was collected. Primary data included climate change adaptation strategies, crops grown, family sizes, education levels, gender, land tenure, farming experiences and farmers perceptions on climate change issues. This was collected using questionnaires administered to household heads who constituted the respondents. Interview schedules from key informants were used to gain information from agricultural officers and meteorological officers in various capacities in the county. Focal group discussions were used to collect extra data and validate the data that was collected from the other sources.

Secondary data collected included climatic data that was retrieved from the meteorological stations within the area of study. This was mainly from Kenya Meteorological Department but more specifically data fromKakamega Meteorological Station and Butere Meteorological Station.

The collected data was subjected to both quantitative and qualitative analyses using standard statistical packages to extract various information including household characteristics, climate change strategies and climate change trends of the area, status of livelihoods in the study area, constraints to livelihood improvements, and opportunities for poverty reduction as an incentive for forest conservation.

2.3.1 Rainfall and Temperature Analysis

To get the trends of rainfall over this period of study, monthly, seasonal, annual and decadal analysis were done. To get the actual representation and the structure of the monthly rainfall distribution for each month for the period (1968-2014), Regression analysis was used, to understand the changes over this period.

2.3.2 Analysis of Climate Change Adaptation Strategies

This research established the climate change strategies that are being used by farmers in the study area. The strategies were ranked accordingly to establish the most commonly used strategies for adaptation to climate change. The analysis was done thematically using the various themes that emerged from the data collected from the data collected and have several sub topics to evaluate on the various adaptation strategies. The findings were subjected to Spearman's rank correlation to establish if there were any correlations between certain variables and adaptation strategies.

III. RESULTS AND DISCUSSIONS

3.1Rainfall

Findings from this present study indicate that there was majorly a declining trend in the rainfall amounts over for the period under study. Though there were some months that had a positive coefficient, the general outlook was however that the rainfall amounts are declining. The equation which is:

$$y= a+ x_1+ x_2 + x_3\ldots\ldots\ldots x_n$$

Where Y is the dependent variable in this case the rainfall amounts over the period under study whereas X is the independent variable in this period of time under study which was 46 years.R^2 is the coefficient of determination for the variables, for this study period of time was the major variable that was taken into consideration, though they could be other variables that could have impacted on the rainfall trends in the area. These factors could be attributed to both human activities and natural factors that are likely to impact on the rainfall amounts of the area.

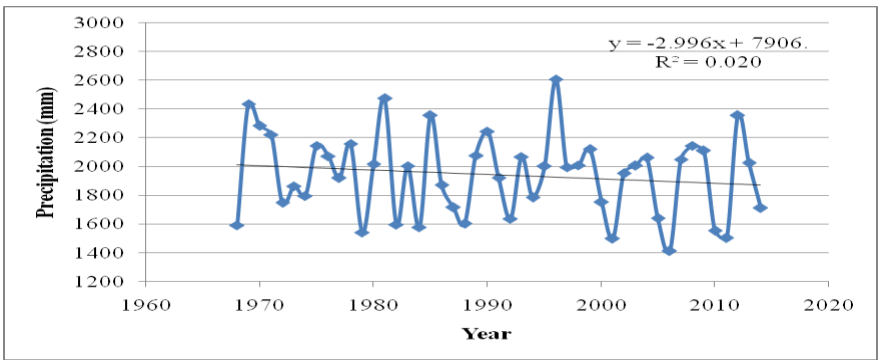


Figure 3.1: Annual Trend of Precipitation as from 1968 – 2014

Studies elsewhere are in consonance with the findings of this study and have indicated that farmers' perceptions on precipitation differ in different parts of sub-Sahara Africa. Farmers in southern Africa have generally reported a decrease in rainfall and a change in the rainfall pattern (Nyanga et al., 2011,Gbetibouo, 2009; Mandleni& Amin, 2011; De Wit, 2006; Gandure, 2012). Some farmers in South Africa reported delayed rainfall and early cessation (Gandure, 2012; Madleni&Anim, 2011; Gbetibuou, 2009) and others reported reduced precipitation during the crop growing season and abnormal intensive rainfall (Gandure, 2012). In West Africa, farmers also reported that they have experienced delayed rainfall and early cessation, and excessive rain and strong winds, which sometimes leads to flooding (Apata et al., 2009; Akponikpe et al., 2009; Acquah de Graft &Onumah, 2011; Mertz et al., 2009). Similar patterns are reported for Egypt in North Africa, Ethiopia and Kenya in East Africa (De Wit, 2006; Yesuf et al., 2008). Farmers in a particular state in Nigeria reported increased temperature and precipitation, and also confirmed changes in the rainfall pattern.

3.2 Main crops grown in the region

This study sought to establish the main crops that are grown by these small scale farmers. The main crops include Maize, beans, sugarcane vegetables, bananas, potatoes among others as shown in Table 2 below. .

Table 2: Main crops grown in the County

Crop	Percentage
Maize	31.1%
Beans	18.4%
Sugarcane	12.3%
Vegetables	8.3%
Bananas	5.7%
Potatoes	4.4%
Millet	4.4%
Sunflower	2.6%
Sorghum	1.8%
Groundnuts	1.8%
Tea	1.3%

Crop	**Percentage**
Cassava	1.3%
Peas	0.9%
Fruits	0.9%
Beetroot	0.9%
Marandas	0.4%
Coffee	0.4%
Pepper	0.4%
Egg plant	0.4%
Tomato	0.4%
Onion	0.4%
Cucumber	0.4%
Arrow roots	0.4%
Total	100.0%

In Kakamegacounty, the major subsistence crops grown were majorly maize and beans and therefore it was necessary to find out how the production had been over a period of time. Crop production in the County has had a downward trend in terms of the number of bags per hectare. Other factors held constant this could be attributed to the changes in climate which could have had an impact on the length of the growing season of these important food crops of the County. It is worth noting that the average bags of maize per hectare is 25 but there have been years where this amounts have gone to as low as 20 bags such in 1994, and 2013 and when this is correlated with rainfall amounts it is evident that there was less rain than expected during that time. The average number of bags of beans per hectare is 9 but there were occasions when this amounts went as low as 6 bags in 1996 and 1997. Noting from the farmers responses for their crop yield over the last 10 year most of them were of the opinion that the crops were declining and they attributed this to climate change. (See Figure 3.2)

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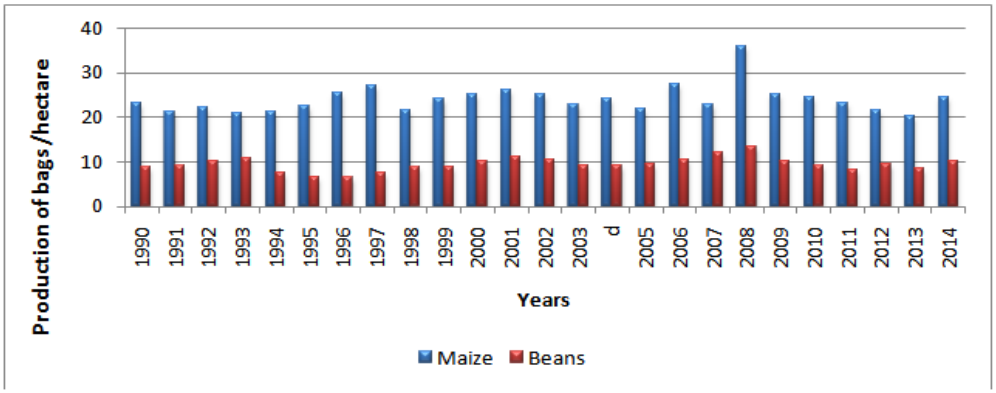

Figure 3.2: Crop production bags per hectare of maize and beans for the period of 1990-2014

3.3 Adaptation strategies to climate change by farmers

There was need to establish the adjustments made by the farmers on how they were coping with the increase in number of hot days and the findings are shown in Table 3below :

Table 3: Adaptation strategies made by farmers

Adjustments made	Percentage
Planting of drought tolerant crops	17..1%
Agroforestry	15.0%
Crop rotation	14.3%
Irrigation	12.1%
Planting early maturing crops	10.0%

Integrated farming practices	10.0%
Timely planting	2.9%
Integrated farming practices	9.3%
Rain water harvesting and storage	2.9%
Total	100.0%

It is worth noting that farmers in the study area have endeavored to put into practice most of these adaptation strategies. Infact in most instances some farmers practiced more than one of the adaptation strategies concurrently. For example, there are cases where you find a farmer practicing three at the same time such planting of drought tolerant crops, agroforestry and crop rotation.Similar studies done elsewhere have revealed similar findings to this study noting that adaptation strategies take on socio- economic levels and characteristics of farmers for example more literate farmers may take different adaptive measures than illiterate ones. More over family income, farm sizes, farming experiences and contact with extension services influence the farmer's use of adaptive measures. (Mohammed et.al., 2014). It is in this regard that this study endeavored to correlate the various variables which included age of respondents, gender, education levels, farming experiences, major crops cultivated with the adaptation strategies. This was mainly for purposes of finding out if the variables could be influencing on the way the farmers were adapting to climate change and if so do they have significant implications? Studies done in Bangladesh by Mohammed et.al.,(2014),Uganda, Tanzania and even Senegal(IFPRI 2015) have findings that are in consonance that the various variables such as education levels, farming experiences, gender and even Age of the farmers will have an influence on the way farmers adapt to the changing climate. Studies done in Burkina Faso by West et.al., in 2008 were in consonance with the others indicating that rural households varied agricultural practices for example by integrating different crop varieties in their agricultural activities and implementing of soil and water conservation practices in order to respond to drought.

3.3 1. Farmers' Access to Extension Services as coping strategy to climate change

This study sought to know if farmers had access to extension services as a way of being informed on the current issues on farming such as adaptation to climate change through various strategies. It is notable that a majority of 73.1% the respondents indicated that they were not accessing extension services while 26.9% had access to extension services. Extension services are an important component in agricultural production as this is where farmers are sensitized, educated or given advice on various issues in regard to farming which could include information on crop varieties, methods of crop production, timing of planting seasons. It was necessary to establish why extension services were not available to most farmers in the area and various reasons were put forward as to why this important component of agricultural activity was lacking in the study area. Some reasons included financial constraints, lack of information regarding need for extension services, unavailability of the services in the area. It is worth for agricultural production to yield maximally there is need for such services so that farmers can be able to know current and emerging issues in regard to agriculture and this would include issues of climate change. If these services would be availed to farmers then most of them would understand issues of the changing climate and probably put into consideration measures to adapt to it.

The findings of this study are similar with other studies done elsewhere majority of farmers in sub-Sahara Africa found extension education to be an important factor that motivates increased intensity of the use of specific soil and water conservation practices (Gbetibuou, 2007; Mandleni&Anim, 2011; Deressa et. al., 2009; Apata et al., 2009). Farmers expressed the view that among many of the sources of information, agricultural extension is the most important for analyzing the adoption decisions of adaptive measures.

3.3.2 Farmers' Access to Climatic Information as coping strategy to climate change

There was need to find out if farmers in the area had access to climatic information because as already noted climate is a major component for all agricultural production systems. It is imperative that having access to climate information can be a form of coping to climate change as farmers will adequately prepare for any eventualities in their farming calendar so that they can minimize their losses. Access to climate information and technologies for adaptation is, therefore, essential to enable actors to anticipate long–term risks and make the appropriate adjustments to increase their resilience. See Table 4 below:

Table 4: Table showing the sources of climatic information to farmers

Sources of Climatic Information	**Percentages**
Radio	49.4%
Television	28.2%
Print media	11.8.%

Weather Station	3.5%
Seminars	3.5%.
Weather stations	3.5%
Agricultural extension officers	1.2%
Internet	1.2%
Total	100.0%

However, despite significant scientific gains in predicting the climate, often there is a lack of climate information available at the local level due to uncertainty in climate projections and seasonal forecasts, or due to lack of information on particular climate indicators, such as rainfall variability (Roncoli, Ingram, and Kirshen 2002; Hulme et al. 2005; Vogel and O'Brien 2006). Even when climate information is available, incorporation of scientific climate information into local decision making may not often occur because of the way such information is communicated and disseminated (Patt and Gwata 2002; Vogel and O'Brien 2006). Several studies have shown that there is a need to make climate information more accurate,accessible, and useful for rural communities (Roncoli, Ingram, and Kirshen 2002, Ziervogel et al. 2005, Vogel and O'Brien 2006; Hansen et al. 2007).

3.3.3 Access to Credit Facilities as coping strategy to climate change

The survey further established whether the respondents accessed credit facilities as mechanism towards cushioning them against adverse effects of climate change. Accessing credit facilities is an important component of agricultural production because when most farmers have capital they can be able to plan their agricultural calendar and incase of any eventualities they can also know how to adjust accordingly, but lack of capital makes most famers without options. This study sought to find out if farmers accessed credit facilities as this was one way in which they would improve their production and somehow cushion them from adverse changes in climate.Access to credit is another important factor affecting adoption of agricultural technologies. Access to affordable credit increases financial resources of farmers and their ability to meet transaction costs associated with various adaptation options they might want to adopt (Nhemachena& Hassan, 2008; ACCCA, 2010; Acquah de Graft &Onumah, 2011). Hence, access to credit is hypothesized to be a positive and significant factor affecting climate change adaptation measures.

Findings indicated that only18.2% of the respondents accessed credit facilities while a huge majority,81.8% of them were not access to credit facilities.Most of the respondents were not able to access credit facilities due to lack of information regarding those services. Those who seemed to have information in regard to credit facilities were suspicoius because they felt that the requirements for one to obtain loan had some hidden aspects, and hence this made many of the shy away from taking loans from saccos , banks and even agricultural cooperatives.It was necessary to establish the sources of credit facilities and the findings indicate that 45.5% of the respondents accessed credit facilities from Agricultural co-operatives while 18.2 of them accessed bank loans as credit facilities. At the same time, 27.3% of the respondents accessed credit facilities in terms of farm inputs while 9.1% of them got loans from Saccos.

3.3.4 Engagement in off farm activities as coping strategy to climate change.

There was need to establish if the respondents engaged in any off farm activities as a way of coping with the changing climate and the findings are shown table 5 below . It is evident that some farmers have opted in angaging in off farm activities as a strategy to coping to the changing climate..

Table 5: Engagement in off farm activities as climate coping strategy

Activities	**Percentage (%)**
Local business/ retail shops	41.6.%
Social activities(Video shops)	27.9.%
Dairy farming	9.5%
Sand harvesting	6.8 %
Brick making	5.8%
Transport Business	3.4%
Bee keeping	2.0%
Poultry Farming	2.0%
Real estate	0.7%
Fish farming	0.7%
Poultry keeping	2.0%
Total	100.0%

3.3.5 Farmers Access to Insurance Facilities as coping strategy to climate change

It was neccessary to esatablish if farmers in the area were aware of insurance as a coping strategy to the changing climate.Results indicate that only 10.1% of the respondents accessed insurance facilities while a huge majority, 89.9% of them had no access to insurance facilities. It was necessary for this study to establish the main reason why some of the farmers were accessing insurance services. Despite the fact that most farmers did have access to insurance it was necessary to find out that those who had insurance facilities what was it mainly intended for? It is clear 75.0% of the respondents accessed insurance to cover for projects while another 25.0% of them accessed insurance to cover for machinery but most of them was not for crop insurance against climate change.

3.4 Constraints of farmers to adapting to changing climate

From the findings it was noted that lack of adequate funds was the major constraint to most farmers adapting to changes in climate accounting for 40.7% whereas lack of information in regard to climate change adaptation strategies followed closely at 20.3%. On the other hand 11.6%of the respondents reported that they faced shortage as labour to enable them adjust to the changing climate. 9.3% of the respondents revealed that climatic change made them not to adapt to the changing farming frequencies while another 4.7% of them said that they faced pest and diseases as the main constraint. 2.9% of them reported that they failed to adapt to the changing farming frequencies due to lack of transport facilities/charges, while another 1.7% of the respondents revealed that lack of extension services made them not to adapt to the changing farming frequencis while another 3.5% of them said that they faced lack of land as the main constraint. In addition, 2.3% of the respondents reported that culture was the main constraint to them while another 2.9% reporting that the faced soil fertility deteroriation as the main constraint.

It was notable that farmers in the region were facing certain constraints in regard to adapting to climate change. In this regard it was therefore important to establish the main reasons as to why certain adaption methods were not being utilized effectively. These included change of crop variety, Building of water harvesting schemes, implementation of soil conservation, Buying of insurances, Carrying out irrigation, Shift from crop farming to livestock, engagement in off farm activities and leasing of land.

Most farmers were not changing their crop vareities to cope with the changing climate,31.1% of the farmers indicated that there was no change of crop variety due to lack of finances while another 22.2% of them indicated that the lack of change of crop variety was due to lack of information. At the same time, 2.2% of the farmers indicated that the lack of change of crop variety was due to shortage of labour while another 44.4% of them indicated that they were not even conversant with the fact that climate was changing.

Water harvesting is an important component to coping with climate change but in the area of study the findings indicate that 67.3% of the farmers did not build a water harvesting scheme due to lack of finances, 2.0% of them indicated that they failed to build a water harvesting scheme due to lack of information; 6.1% of the respondents indicated that they did not build a water harvesting scheme due to shortage of labour while another 24.5% of them were not able to give any reasons as to why they could not build a water harvesting scheme due to other reasons.

Implementation of soil conservation techniques has been widely used to cope with the adverse effect of climate change. 29.2% of the respondents did not implement soil conservation due to lack of finances while another 29.2% of them indicated that they failed to implement soil conservation due to lack of information. At the same time, 12.5% of the respondents indicated that they did not implement soil conservation technique due to shortage of labour while another 29.2% of them indicated that they could not implement soil conservation techniques due to other reasons.

Crop and livestock insurances have been used elsewher to cushion farmers from effects of climate change. In the study area 37.3% of the respondents indicated that they did not buy insurance due to lack of finances, while another 29.4% of them indicated that they failed to buy insurance due to lack of information. At the same time, 3.9% of the respondents indicated that they did not buy insurance due to shortage of products within their reach, while another 29.4%of them indicated that they could not buy insurance due to limited knowlegde and awareness of existence of such products as climate change coping tool.

Carrying out more irrigation to ease the burden of changing climate in the area was not being widely practiced with findings indicating that 24.0% 6,0 % 24% and 48 % of the respondents indicated that they did not carry out more irrigation due to lack of finances, lack of information, lack of labour and lack of knowledge respectively.

Most famers are unaware that changing from crop cultivation to rearing animals is a way of adapting to climate change.Farmesr in th e area with a notable 55.1% of the respondents did not change from crop to livestock due to lack of information while another 6.1% of them indicated that they did not change from crop to livestock due to lack of finances and, similarly 4.1% of the respondents indicated that they did not change from

crop to livestock due to shortage of labour while another 34.7% of them indicated that they could not change from crop to livestock due to limited knowledge on livestock rearing.

Engagement in off farm activities as a means of cushioning them against climate change impacts though practiced in the area it was not satisfactory. Findings revealed that 21.7% did not find off–farm jobs due to lack of finances while another 26.1% of them indicated that they did not find off–farm jobs due to lack of information. At the same time, 19.6% of the respondents indicated that they did not find off–farm jobs due to shortage of labour while another 32.6% of them indicated that they could not find off–farm jobs due to lack of knowledge and awareness of it as coping tool to climate change.

Studies done elsewhere indicate that as much as small scale farmers would wish to adapt to climate change there are barriers/ and or constraints that limit their efforts and these include : Institutional factors: the institutional factors that influence adoption of new technologies are access to information via extension services (climate information and production technologies) and access to credit (Nhemachena& Hassan, 2008; Maddison, 2006; Acquah-de Graft &Onumah, 2011; (Deressa et al., 2008; Kurukulasuriya& Mendelson, 2006; Sofoluwe et al., 2011). The findings of this study are similar with other studies done elsewhere majority of farmers in sub-Sahara Africa found extension education to be an important factor that motivates increased intensity of the use of specific soil and water conservation practices (Gbetibuou, 2007; Mandleni&Anim, 2011; Deressa et. al., 2009; Apata et al., 2009). Farmers expressed the view that among many of the sources of information, agricultural extension is the most important for analyzing the adoption decisions of adaptive measures. Accordingly, it is hypothesized that farmers who have significant extension contacts have better chances of being aware of uses in responses to the changes in these conditions (Deressa et al., 2009; Gbetibuou, 2007). Access to credit is another important factor affecting adoption of agricultural technologies. Access to affordable credit increases financial resources of farmers and their ability to meet transaction costs associated with various adaptation options they might want to adopt (Nhemachena& Hassan, 2008; ACCCA, 2010; Acquah de Graft &Onumah, 2011). Hence, access to credit is hypothesized to be a positive and significant factor affecting climate change adaptation measures. Other barriers to climate change adaptation technologies include; high cost of adaptation measures, insecure property rights (Mandleni&Anim, 2011; De Wit, 2006; Mengistu, 2009; Nyanga et al.,2006), and land disputes and land fragmentation due to population growth in parts of Africa where land is inherited (De Wit, 2006; Deressa et al., 2009).Ishaya and Abaje(2008) in their studies found out that lack of awareness and knowledge about climate change adaptation strategies, lack of capital, lack of water for irrigation were major constraints in hindering adaptation in Nigeria. Similarly Gbetibuo in 2009 in his studies in Limpopo in South Africa realized that major factor hindering climate change adaptation is lack of credit facilities. This study also emphasized the need for farmers education levels, farming experiences and engagement in off farm activities as a major factor that could promote adaptive levels of farmers. Byrantet.al., 2009 insist that climate change adaptation can only be realized if farmers had a better understanding of issues if climate change and hence need to emphasize climate knowledge.

Nziadibeet. al,. 2011 also pointed out that the major factors hindering adaptation to climate change was mainly inadequate information, limited awareness and knowledge in regard to adaptation strategies and poor government policies to climate change phenomena.

IV. CONCLUSION AND RECOMMENDATIONS

From the study, it is noted that Kakamega County is generally experiencing changes in its rainfall amounts. The rainfall amounts are declining. This implies that as the years went by, the annual precipitation reduced and for every additional year, the precipitation reduced by 3.00mm. This prediction shows that there is likely to be a reduction in the precipitation in the future years. In addition, it was established that, just like most parts of the world are experiencing increase in temperature, Kakamega County is no exception. It has an upward trend of about $0.04\ ^{0}$ c yearly.In order to overcome the effects of the aforesaid climatic changes, most small scale farmers in the county have embraced various coping mechanisms. Most common strategies employed include: Involvement in off farm activities, changing form purely crop farming to keeping of livestock and poultry, Taking insurance covers to cushion them from the severe crop losses, soil conservation practices such as mulching; use of animal manure/compost, crop diversification and even growing of drought tolerant and fast maturing crops, accessing credit facilities, and leasing of land among others.

Despite all the effort and measures put in place by these small scale farmers there are several barriers that are slowing them from appropriately adapting to the changing climate. These include mainly lack of finances, lack of climate information, lack of expertise in implementation of some of the methods, lack of extension services, and even culture.

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