



# People's perception on climate change and its effects on livelihood in Kitui County

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## Abstract

This paper examines people's perception on climate change and the effect of the changing climate on their livelihood in Kitui County. Kitui County is a semi-arid region which experiences long dry spells that make a large section of the land almost unutilized most of the year. Majority of the farmers practice small scale farming with a large percentage owning less than five acres of land. The size of the farm is one of the factors that determines the amount of food produced which subsequently affects their livelihood. Food production can be improved by increasing the land under crop cultivation which will eventually increase food production and availability. Normally, for subsistence agriculture, farm holding size plays a major role in determining a household's food production and security. In this study, a total of 400 small scale farmers were interviewed on their perception of the changing climate with a view of gauging its effect on their livelihood. Structured questionnaires, oral interview, Focus Group Discussion (FGD) and direct observation were employed in data collection. The results indicate that the changing climate has led to higher temperatures and more frequent and longer droughts which have resulted in less food production which negatively affects their livelihood. In this study, many of the farmers owned small farms and relied on rainfall for their agricultural activities. The over reliance on rainfall made it difficult for the farmers to put their farms into productive use all year round especially during the dry season due to the unpredictability of the rainfall.

**Keywords:** Climate Change, People's Perception, Livelihood, Food Production

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## 1. Introduction

Inadequacy of food has been a major global problem which has persisted for a long time and which has resulted *to* food insecurity in many households globally. It is perceived that the food insecurity is brought about by the over reliance on rain fed agriculture which makes the production vulnerable to changing weather patterns. Zinyowero et al. (1996) observe that vulnerability to climate change depends not only on physical and biological response but also on socio economic characteristics. Low income populations who depend on agricultural in the arid and semi arid regions, are particularly vulnerable to hunger and severe hardships. Since the beginning of the industrial revolution, the earth's population has increased dramatically, with accompanying large-scale burning of fossil fuels. The manufacture of cement, and intensive cultivation of lands not previously used for crops or livestock production has also intensified.

Reddy and Hodges (2000) report that the largest population in human history will occur during the 21st century and therefore there is need for increased effort in addressing the consequences of the changing climate whose effect is expected to be great and drastic. The same sentiments are expressed by (FAO, 2008) who argue that the livelihoods of the population in the low-income developing countries of Asia and Africa will be put at risk which will negatively affect a large number of the rural poor who will be put at risk and their vulnerability to food insecurity increased if agricultural production is adversely affected by climate change. Lobell and Burke, (2010) observe that climate change which has been brought about by global warming is a threat to food security and is feared that it may thwart the efforts that have been made to reduce hunger and poverty. It is considered as one of the most serious threats to sustainable development globally.

Roughly a billion people around the world live in chronic hunger, and humanity's inability to offer them sustained livelihood improvements has been one of its most obdurate shortcomings (Lobell and Burke, 2010). Food security according to Gregory et al. (2005) is concerned not only with food availability but also with access to and utilization. Studies which focus only on crop production provide merely a partial assessment of food security-climate change relationships. This means that studies on food security should not only focus on the effect of climate change on food production but also on accessibility to the available food by households and the utilization of the same food so as to result in a healthy and active life.

FAO (2008) reports that climate change may have an impact on food production for rural people who produce a substantial part of their own food. Such populations may be forced to reduce the available food to the point that allocation choices have to be made within the household. It further reports that a family might reduce the daily amount of food consumed equally among all household members, or allocate food preferentially to certain members, often the able-bodied male adults. This is because these households are assumed to need it the most to stay fit and continue working to maintain the family. Preparation of the land also has an effect on the yields that are harvested. This study sought to investigate the farmers' perception on climate change and how the changing climate has influenced their household food availability and accessibility.

### 1.1. Scope of the Study

The study was carried out in Kitui County which is among the semi-arid counties in Kenya. The purpose of the study was to investigate the small-scale farmers’ perception towards the changing climate and explore its effect on their livelihood. The study appreciated the fact that small scale farmers’ livelihood depended mostly on their farming activities which were dictated by the prevailing climatic conditions.

## 2. Methods and materials

### 2.1. Study area

Kitui County where the study was carried out is located between latitudes 0°10’and 3°0’ south and longitudes 37°50’ and 39°0’East. The county is among the 47 counties in Kenya and is located about 160km east of Nairobi City. It covers an area of 30,496.4 km<sup>2</sup> including 6,369 km<sup>2</sup> occupied by Tsavo East National park making it the sixth largest county in the country (GOK, 2013). The topography of the County is low laying and can be divided into hilly rugged uplands and lowlands which experience erratic and unreliable rainfall distribution. The altitude of the Kitui County ranges between 400 m and 1800 m above sea level (GOK, 2013). The altitude of the Kitui County ranges between 400 m and 1800 m above sea level (GOK, 2013)

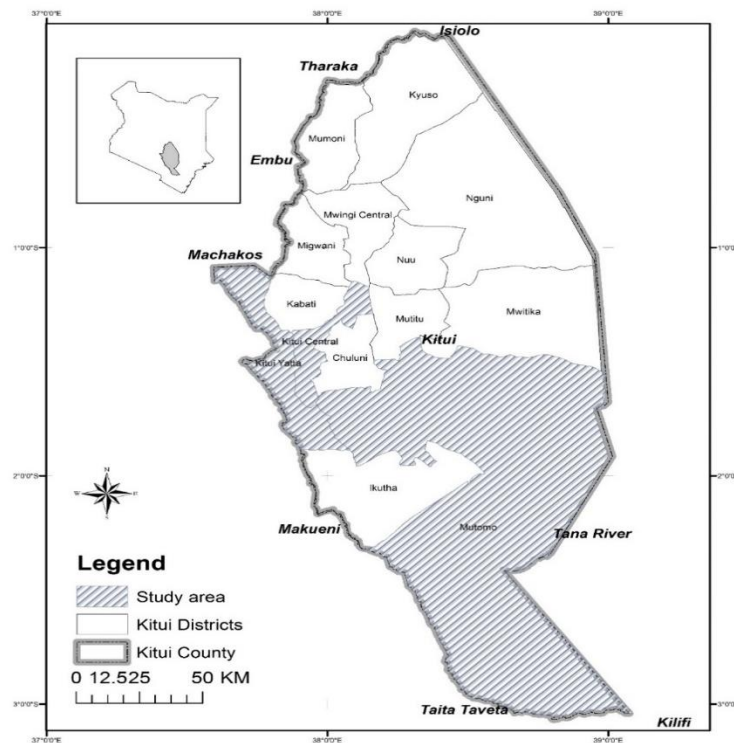


Figure 1. Map showing the study area’s position in Kenya

## 2.2. Rainfall and temperature changes from the farmers' perspective

The farmers who formed the study respondents were asked to indicate whether they had noticed any changes in the rainfall and temperature experienced in the area for the last thirty years. About 356 (89%) of the 400 respondents admitted to have noticed a reduction in the rainfall received in the region. 9.2% (37) of them reported not to have noticed any changes in the rainfall received. A few of them 1.8% (7) did not remember whether the rainfall had changed in the last 10 years or a longer period. Concerning temperature, 96% (384) of the respondents reported to have noticed an increase in the temperatures experienced in the study area while only 1.75% (7) and 2.25% (9) had not noticed any changes and were not sure respectively (Table 1).

**Table 1.** Changes in the temperature and rainfall

Attribute	Response	Frequency	Percentage
Noticed changes in rainfall	Yes	356	89
	No	37	9.2
	Not sure	7	1.8
Noticed changes in temperature	Yes	384	96
	No	7	1.75
	Not sure	9	2.25

## 2.3. Effect of weather conditions on agricultural production

The respondents were asked to indicate the main extreme climatic conditions experienced in the study area and show its effect on agricultural production. The results (Table 2) show that a total of 97% (388) of the respondents reported that the changes taking place in the climatic conditions mainly temperature and rainfall had reduced their agricultural production while only 1.25% (5) did not notice any changes. Interestingly 7 (1.75%) of the respondents indicated that the changing climate had led to an increase in agricultural production. This however depended on the type of crop grown and the crops' response to the changing climate. The negative effect of the changing climate implies that climate change is predominantly the main factor that has resulted in reduced agricultural production in the study area, but may not necessarily be the only factor.

In a study carried out in Kitui County, Khisa (2017) alludes to the absence of adequate response strategies to long-term climate change as well as to climate variability as the general consensus that emerged from the study. She further reports that diverse and region-specific impacts will become more apparent in the absence of adequate response strategies to long-term climate change as well as to climate variability.

The table shows that dry spell (drought) was the main cause of reduced agricultural production reported by majority of the farmers in the study area. A very small percentage 3(0.75%) and 4 (1%), almost insignificant number associated the reduced production to strong winds and floods respectively.

**Table 2.** Relationship between extreme weather conditions and agricultural production

Effect of temperature Changes		Extreme weather conditions experienced			Total
		Dry spell	Floods	Strong winds	
How changes in temperature have affected agricultural production?	Increased production	3 (0.75%)	4 (1%)	0	<b>7 (1.75%)</b>
	Reduced production	383 (95.75%)	2 (8%)	3 (0.75%)	<b>388 (97%)</b>
	No change in the production	5	0	0	<b>5 (1.25%)</b>

*Source: Survey data (2012)*

#### 2.4. Household food production and adequacy

Food security can only be guarantee when all people are assured of food availability, accessibility and utility. In assessing food security at the household level, the respondents were asked to make their own assessment of food adequacy and security in their households.

**Table 3.** Household food adequacy

Production	Frequency	Percentage (%)
Not adequate	292	73
Adequate	108	27
<b>Total</b>	<b>400</b>	<b>100</b>

More than half of the respondents did not harvest enough food and therefore assessed themselves as food insecure. Out of the 400 respondents, only 27 % (108) produced enough food to feed the household while the remaining 73% (292) did not (Table 3). The high percentage of respondents who did not produce enough food shows that the study area is food insecure and requires interventions to reverse the current situation.

### 3. Results and discussion

#### 3.1. Effects of climate change in Kenya

Kenya is vulnerable to climate change. According to Mutimba et al. (2010), Vulnerability to climate change refers to how a system responds to the changing climate which may have both beneficial and harmful effects. Over two thirds of Kenya particularly areas around the northern part of the country receive less than 500mm of rainfall per year and is classified as ASALs. This area is home to approximately a third of Kenya's population (Orinda et al., 2007). Hererro et al. (2010) reports that local seasonal and annual water balances are influenced by changes in temperature and rainfall patterns which, in turn, affect the growing season and production outcomes. Kenya being an agricultural country depends strongly on agriculture as the main sector which determines its economic performance. (Orinda et al., 2007). The changes taking place in the climatic conditions have had a negative effect on Kenya's agricultural sector. However, these changes differ between humid and arid areas. The agricultural sector's performance is determined mainly by climate which in turn, affects the general economic performance in Kenya and elsewhere in rainfed Sub-Saharan Africa (Hererro et al., 2010). Despite agriculture being highly sensitive to variations in rainfall, it accounts for about 26 percent of Kenya's gross domestic product (GDP) and 75 percent of its jobs. The study carried out in Kitui County showed a negative effect of the changing climate on agricultural production which was as a result of the extreme weather conditions that were experienced.

#### 3.2. Farmers' perception of the changing climate

From the study results (Table 1), most the farmers reported to have noticed increasing temperatures and reduced rainfall. These are a result of the climate change which has negatively impacted on the farmers' livelihoods. Despite the fact that developing countries (which are the world's poorest countries) contribute the least greenhouse gases (GHG) that have contributed to the changing climate, its impact is expected to be more severely felt in these countries than the developed countries. These countries are particularly vulnerable to rising temperatures and threatening decrease in water availability. Braun (2008) agrees with IPCC (2007) and reports that Africa, all the major world regions, has a low per capita consumption of fossil energy and has therefore contributed the least to potential climate change. However, due to its widespread poverty which limits its capabilities to adapt, it is the most vulnerable continent to climate change. The ultimate socio-economic impact of climate change will depend on the relative resilience and adaption ability of different social groups (IPCC, 1998).

Studies indicate that temperatures have generally risen throughout the country, primarily near the large water bodies (King'uyu et al., 2000, GOK, 2010). Other projections also indicate increases in mean annual temperature of 1° to 3.5°C by the 2050s (SEI, 2009). In the study area, the farmers indicated that the temperatures were rising while the amount of rainfall was declining. They also reported that the droughts had become more severe while at the same time had become more frequent. The study area has also been experiencing perennial water shortage which seem to worsen due to the changing climate. In Kenya, the country's ASALs have also witnessed a reduction in extreme cold temperature occurrences (Kilavi 2008).

This warming is leading to the depletion of glaciers on Mount Kenya (IPCC 2007, UNEP 2009). Osbahr and Viner (2006) explain that increases in temperatures would have a significant impact on water availability, and are thus expected to exacerbate the drought conditions already regularly experienced and predicted to continue.

### 3.3. Extreme weather conditions

Table 2 shows the results of interviews with farmers about the extreme weather conditions. Drought occurs when expected rainfall fails to come and the dry spell is prolonged over a long period of time. The results show that droughts have become more frequent leading to declining agricultural production. As a result of the recurring drought in large parts of the County, food deficit and food poverty are experienced most of the year. During the dry periods, the harvest is supplemented by relief food from government and donor agencies (Lasage et al., 2007). The results show that prolonged dry spell or drought was the main extreme weather condition that was reported by the 331 (82.8%) of the respondents while floods were reported by 64 (16.0%) (Table 2). Khisa et al. (2014) also affirms that the study area has been experiencing high rainfall variability which makes it very unpredictable and unreliable for agricultural use.

Flash floods occur occasionally when heavy downpour come unexpectedly which last for a very short period. Other extreme weather conditions that were experienced in the study area were strong winds, a weather phenomenon associated with arid areas. Kenya experiences a bimodal seasonal rainfall pattern because it lies astride the equator. The long rains season starts around March and runs through to June, with the peak centred on March to May; the short rains run from September and taper off in November or December coinciding with the shifting of the Inter-Tropical Convergence Zone (Herero et al., 2010). They further acknowledge that Kenya experiences major droughts every decade and minor ones every three to four years. In recent years, critical drought periods in the country were experienced in 1984, 1995, 2000 and 2005/2006 (UNEP/GOK 2000).

The study results show that rainfall fluctuations are experienced frequently with some years recording very low (almost zero) rainfall. The study results concur with Ludi (2009) and reports that a number of countries in sub-Saharan Africa already experience considerable water stress as a result of insufficient and unreliable rainfall, changing rainfall patterns or flooding. Ludi (2009) further reports that the impacts of climate change including predicted increases in extremes are likely to add to this stress, leading to additional pressure on water availability, accessibility, supply and demand. Such water shortages impact negatively on the peoples' livelihood in Kitui County. The study area experiences weather extremes which has also resulted in a lot of pressure being exerted on water demand and supply. GOK (2013) reports that the two main industrial crops produced in the county are cotton and sisal whose seeds are provided by Kenya Agricultural Research Institute, which provides clean certified planting materials for the crops.

GOK, (2009) reports that unreliable weather patterns, low agricultural productivity, high economic dependency and high human diseases incidence (malaria and HIV/AIDS, 14%) are cited as the key factors escalating helplessness in the County. Others include underdeveloped infrastructure poor marketing system and unemployment (4.7%). The situation is exacerbated by limited alternative economic activities and dependence on subsistence farming. Coping strategies employed by households such as charcoal burning is

causing serious degeneration of the environment, a trend that will undermine future livelihood activities thereby pushing households into a vicious trap.

Burton (2001) suggests that expected impacts in dry land areas include reduction in rainfall, rise in temperature, and increased rainfall variability. But he observes that not all areas will experience reduced rainfall. On the contrary, some arid areas such as Mauritania, Mali, and Niger may even get higher levels of rainfall. Some areas such as the highland are also expected to benefit, since the growing season will be lengthened and the incidence of frost diminished. The highland areas will also benefit from a combination of increased temperatures and rainfall changes which may result in an extension of the growing season. Although the projected increases in rainfall might appear to be good news for arid and semi-arid districts, rising temperatures might lead to increased evapotranspiration resulting in very little if any increases in the length of growing periods and rangeland or crop productivity (Hererro et al., 2010). In contrast, other, zones such as Burkino Faso, Mali and Ghana which are more sub humid zones, are expected to suffer from reductions in rainfall (Butt et al., 2002).

### 3.4. Household food production and adequacy

Extreme weather conditions directly influence food production and security. Food security is a dynamic phenomenon whose impact varies depending on its duration, its severity, and the local socio-economic and environmental conditions (Tefara and Tefara, 2014). They report that food insecurity may be classified as chronic or transitory. When a household continually runs a high risk of inability to meet the food needs of household members, it is referred to as chronic food insecurity while on the other hand when a household faces temporary decline in the security of its entitlement and the risk of failure to meet food needs of short duration then it is referred to as transitory food insecurity. The study results show that a large percentage of the farmers were food insecure and were therefore not assured of feeding their families throughout the year. If more farmers in Kitui district planted drought tolerant crops, food availability and accessibility would improve because such crops can withstand the dry spells since they can survive with minimal moisture (Khisa et al., 2014a). This would improve their household food security. FAO et al. (2013) observe that food security is a major global concern today and report that one in every eight people in the world (a total of 842 million) in 2011–13, were estimated to be food insecure and suffering from chronic hunger.

Over 80% of Kenya's population, especially those living in the rural areas derive their livelihood mainly from agricultural related activities (KARI, 2012). The food security situation in Kenya is continuously monitored by Kenya food Security Steering Group (KFSSG), a multi-agency task force that holds regular meetings and leads bi-annual assessment of both long and short rain season (Rembold et al., 2014). Several factors have been found to be the cause of the current food insecurity problems in Kenya some of which include the frequent droughts in most parts of the country, low domestic food production due to high costs of inputs, high global food prices and low purchasing power for a large portion of the population due to high levels of poverty (KARI, 2012).

GOK (2009) acknowledges that concern has been raised over the food supply situation in Kenya. The Ministry of Agriculture reports that over 10 million people in Kenya suffer from chronic food insecurity and



poor nutrition while estimating that at any one time, about two million people in the country require food assistance due to chronic food insecurity. The majority of the population in Sub-Saharan Africa make their living from rain-fed agriculture. They depend to a large extent on small-scale, subsistence farming for their food security. Approximately 85% of Kenya's population depend on rain-fed subsistence agriculture as their main economic activity from which they derive their livelihood (Rockström, 2000). However, deficient rainfall has been the main environmental factor behind food insecurity in the country.

Tubiello et al. (2008) acknowledges that climate change has an effect on food production directly through changes in agro-ecological conditions and indirectly by affecting growth and distribution of incomes, and thus demand for agricultural produce. More important from a long-term perspective, climate change also affects food security by altering the overall economic conditions that determine the purchasing power of consumers and consequently their access to food (Tubiello et al., 2008). Tubiello et al. (2008) concurs with DANIDA (2007) and reports that in Kenya the socio-economic development and improved livelihoods of the poor depend on the state of and access to environmental and natural resources with scarcity of water resources due to changing climate being one critical constraint for economic growth and poverty reduction.

### 3.5. Types of crops grown

In the ASAL regions in Kenya most of the land is primarily used for subsistence purposes. This is because of the very low productivity of these lands which cannot be put into any meaningful commercial agricultural use unless they are irrigated. This can be explained by factors such as the land being unproductive, the low rainfall received, the changing climatic conditions and also the lack of income to invest in mitigation measures on the farms. The small farms cannot be sufficiently used for cash crop production because of the need to first satisfy the primary need of food production. Recha et al. (2012) observe that the increase in population by 2.5% annually in Eastern Kenya will continue exerting pressure on the natural resources, which in turn will influence the magnitude of exposure to climate risk. Depending on how the land was prepared also has an effect on the yields that are harvested and the food that will be available.

Most of the farmers in the ASALs attempt to grow their staple food crops in an effort to provide food for their households but this in most cases results in crop failure due to the uncertainty of the weather conditions.

## 4. Conclusion

Climate change is widely accepted to be already a reality and its adverse effects on the livelihoods of poor communities are superimposed on existing vulnerabilities. It is evident that the climate is changing and that the change has both positive and negative effects on food production. Apart from environmental factors, human and economic factors have also had an effect on agricultural production. The amount of rainfall received in the study area has been declining while the temperatures have been increasing thus having a negative effect on agricultural production. The change that is taking place in rainfall and temperature has

resulted in a decline in the agricultural production in the study area which has had an effect on the food production and security among small scale farmers. There is need for a comprehensive analysis on the effect of climate change in Kitui County in order to come up with appropriate strategies to mitigate against these effects with a view of improving food production among the households in the county.

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