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Kenya, Factor 5: Climate Volatility

### **Kenya: How a Changing Environment is having a Negative Effect on Food Security**

Kenya is a country that has been having food security issues for many years. These issues have been caused by a number of reasons such as disease, lack of education, and poor farmland, as well as natural disasters such as droughts and flooding. There has been progress made and some things are improving but now another problem has presented itself, the changing climate. This change is having a large effect on Kenya, from the small farmers, to the plants, to the land itself. The people of Kenya must adapt in order to end their food insecurity.

Kenya is located on the east coast of Africa at the equator, bordering on the Indian Ocean. It is surrounded by Tanzania, Somalia, Ethiopia, Uganda and Sudan. The total area of Kenya is 580 367 km<sup>2</sup>. The population of Kenya is 45 010 056 people. The capital city is Nairobi ("Kenya", Countries and their Cultures).

Kenya is in a part of Africa known as the Sub-Sahara. This means that much of the land is arid or semi-arid which can be used for agriculture, mainly livestock. The crops that are grown there are not as productive as crops grown in other areas. The majority of farming is done in the central highlands and the Rift Valley region located in the central part of Kenya ("Kenya Climate & Agriculture"). There is some farming done in the coastal region, fruit, nuts and cotton are mainly grown there. The growing season on the coast only lasts for a short period of time before the land becomes desert in the dry season. Eastern Kenya is too dry and western Kenya is too wet for farming and these areas make up the majority of Kenya's land. About 9 percent of Kenya's land is arable land used to grow crops. About 37 percent of the land is used to raise livestock ("Kenya", CIA World Factbook). The rest of the land is arid or mountainous, making it unsuitable for agriculture.

Farm families make up 75 percent of the population in Kenya ("Country Fact Sheet: Kenya"). The average rural family in Kenya consists of seven people, the parents and an average of five children. The family is usually headed by the man, but about 30 percent of households in Kenya are headed by women (Kiriti and Tisdell 7). Most rural families are farming families. The men take care of the herds and the women work the fields ("Kenya", Countries and their Cultures). The men will also help with field work when it is a busy time of year. The children work on their family farm once they are able to. Typically the girls do jobs like fetching water, tending the fields and helping take care of the younger children. The boys will usually help the father with the herd. The inheritance passes down to the oldest son and the daughters are married off and leave the household.

The first seven years of school in Kenya are free. However, secondary school must be paid for and is too expensive for most of the population. A lot of people in Kenya don't even finish the first seven years of school because they must stay at home and work. About one-half of the population completes the first seven years of school and only one-seventh of these continue on to high school ("Kenya", Countries and their Cultures). Despite this, 78 percent of the population is literate ("Kenya", CIA World Factbook).

The health care system in Kenya leaves much to be desired. The government runs clinics but they are understaffed and poorly supplied. There are 0.18 physicians per 1000 people in Kenya ("Kenya Demographics Profile"). The clinics focus on preventative medicine, such as vaccines, which have helped but are not enough. Having access to modern health care is rare, especially in the rural parts of the country. Many people still rely on traditional cures such as herbal medicine and healing rituals.

The majority of the farming in Kenya is done by small, family farms which make up 75 percent of the country's agriculture production. The small farms are usually family run and have an average of 2 hectares (5 acres) of land ("Kenya-Agriculture"). In the areas of Kenya with good farmland they grow crops and raise livestock in order to maximize production potential. In the areas with decent farmland crops that don't need much rain are planted. Livestock are also raised in these areas. In the arid and semi-arid areas of Kenya the land is used to raise livestock, there are basically no crops grown there because they cannot survive the conditions. The farmers use limited technology. Generally farming is done with manual labour. Modern chemicals and modified seeds tend to not work very well because of the climate and frequent droughts and because the small farmers cannot afford them (Madon). Men are typically responsible for the livestock but women do about 80 percent of the other agricultural work.

The most common crop grown in Kenya is maize. Other crops include potatoes, beans, wheat, sugarcane, peas, sweet potatoes and other fruits and vegetables ("Kenya", CIA World Factbook). Coffee and tea are also grown as cash crops to export around the world. The most common livestock is cattle, both dairy and beef cattle. Other livestock includes chickens, goats and pigs. For the majority of people in Kenya, the food they eat comes from their own farm. Maize is the staple food and it is a large part of their diet. They will also eat potatoes and beans. Meat is expensive, so it is not eaten very often. In the coastal areas people eat fish caught from the ocean ("Kenya", Countries and their Cultures).

Even though agriculture is Kenya's main industry there is a food shortage. This is mainly due to the weather and climate in Kenya. The vast arid regions are unsuitable for crop growth, and the areas where crops can be planted often suffer from drought or extremely heavy rains. Another problem is that there is often no infrastructure to store the crop so it spoils before it can be eaten or taken to market (Madon). The markets are in the towns, so many farmers lack access because they are simply too far away. Most of the roads in Kenya are dirt roads (Curtis 38). These roads don't hold up to flooding which has been happening quite frequently in recent years because of climate change in Kenya. Once the farmers get to the markets they don't get paid very much for their harvest (Madon). For this reason, the farmers often don't have much money. This means that they cannot afford a completely balanced diet.

Many people in Kenya live in poverty because they don't have very much money or food. Most of the food that a family grows is eaten by that family. This means that if their crop fails they go hungry. People in Kenya spend most of their time farming or collecting water so even if they can afford to go to school many people don't have the time.

Kenya's economy relies heavily on agriculture. Agriculture directly accounts for 24 percent of the GDP and indirectly accounts for an additional 27 percent ("National Climate Change Action Plan" 4). This poses a problem because of the changing environment in Kenya and around the world. This problem is especially bad for the rural farmers who eat the food that they grow. If their crops are wiped out then they must find a way to feed themselves, but this can be difficult. Most farmers in Kenya rely on their own farm for food so getting food from elsewhere would be a challenge because if one farm experienced crop failure it is likely that the other farms in the area also had similar problems. The majority of crops in Kenya cannot handle the erratic weather patterns that are effecting the country.

The average daytime temperature in Kenya has risen by about 1.3 degrees Celsius from 1960 to 2006, which doesn't sound like a lot but it has a substantial effect on the climate. Climate volatility in Kenya has caused some areas in the country to become drier and other areas to become wetter. While some parts of the country are experiencing drought other places are in danger from extreme flooding. The long rainy season in Kenya which starts in March and ends in May has become shorter than it previously was, however the short rainy season which starts in October and ends in December has been getting longer. Areas near the coast have experienced the most change, this is thought to be because of rising ocean temperatures in the Indian Ocean ("National Climate Change Action Plan" 3).

Climate change in Kenya has had many effects on the country such as prolonged droughts, frost, hailstorms, extreme flooding, receding lake levels, the drying of rivers and other wetlands and the depletion of glaciers on Mount Kenya (“National Climate Change Action Plan” 4). This has caused problems for the farmers of Kenya because their crops are not able to withstand the changing weather patterns. For this reason many people in Kenya, especially in rural areas, face food security problems.

The farmers in Kenya depend on rain-fed agriculture to grow their crops. This is becoming a problem because of the changing climate. Some of the land is being flooded while other parts of the country suffer drought. Over the past 20 years the droughts in Kenya have become more frequent and lasted for longer periods of time. In the 2008 drought the agriculture sector in Kenya experienced a 72 percent drop in production (“National Climate Change Action Plan” 46). Maize, tea and coffee were the crops most affected. The farmers are also facing problems because the rain is not falling at the times of year as it has previously and this is effecting the planting and harvesting of traditional crops.

Many of the farmers in the arid and semi-arid areas are finding it hard to survive and are moving to the cities in order to find work. However things are not much better in the cities. They are becoming overcrowded due to the amount of people migrating there. This sometimes causes the people who originally lived in the city to move out to the rural areas. These people do not have the knowledge to properly work the land and often crops are planted on land that would be better suited to raising livestock.

The climate volatility in Kenya is not going to end any time soon. Kenya has a very low level of carbon emissions but they are feeling the effects of the carbon emissions from the rest of the world very strongly. For this reason Kenya's climate is experiencing major change. Temperatures have been increasing and the rain does not fall at the times it used to. This is leading to problems because traditional agricultural practices are not able to withstand the changing environment. If current farming practices cannot adapt to the climatic changes in Kenya that means that there will not be enough food produced and the people will have a harder time getting enough food to eat.

At this point there is no stopping the changing environment in Kenya, the only thing that can be done is to adapt to the new climate. If the people of Kenya found ways to adapt their agricultural practices to the new environment they would be able to start producing food that could be better suited to the land and yield more crop. This would lead to less hunger in the country and more opportunities for the people to become better off. If the people were not hungry they would be able to focus on other things such as education and technological advancement.

One crop that can stand up to the droughts in Kenya is cassava. Originally from South America, cassava is a root crop that produces edible brown tubers with white insides. It is grown from stem cuttings of other cassava plants. Cassava is drought resistant and can grow in sub-optimal conditions. Cassava takes a long time to grow and mature. It is usually ready to harvest 6 months after planting but it can stay in the ground for up to 2 years without rotting, making it a good resource in times of famine (“Cassava”). However, once it is harvested, it doesn't keep fresh for more than 3 days if it is not properly processed. This means that there is a lot of post-harvest labour required, but not much labour is needed while the crop is maturing. Cassava is grown in many countries in Africa but not much is grown in Kenya even though it is well suited to the dry climate.

Cassava, better known to North Americans as tapioca which is the flour made from cassava, is a source of complex carbohydrates. There are two types of cassava the sweet and the bitter. The sweet kind can be eaten raw although it is better when cooked. The bitter kind however must be processed properly because in its raw form it contains cyanide which is poisonous but is destroyed when cooked. After the cassava is cooked it is often dried and then ground into flour which is used to make flat breads. Cassava can also be baked, fried or boiled. The cassava roots produce more food energy per unit of land than any other staple crop.

Cassava, however, has one major drawback. This is the fact that many of the cassava crops are being wiped out by cassava mosaic disease (or CMD) and the cassava brown streak virus. Both of these diseases are transmitted by whiteflies and cuttings from infected plants. Cassava mosaic disease affects the leaves of the plant. The infected leaves have a mosaic pattern that is usually white or light yellow. Infected plants will have smaller leaves than the healthy ones and also have generally stunted growth. The brown streak virus infects the tubers but the leaves do not show any sign of the disease, so the virus is able to infect an entire field without the farmer knowing until harvest. Climate change is also increasing the range of whiteflies. This is making areas that were previously disease-free susceptible to the disease because the whiteflies are able to get to more crops which spreads the disease (“African Cassava Mosaic Virus”).

There are several ways to mitigate the spread of cassava mosaic disease. One way is to plant varieties of cassava that have been modified to resist cassava mosaic virus. It also helps to plant the cuttings in areas away from the infected fields. Generally upwind is preferred because the whiteflies move on the wind. The disease can be spread through infected cuttings so planting cuttings that are not infected would limit the disease. Another way to help stop the spread is to plant cuttings at times when the whiteflies are not abundant. Intercropping the plants with other crops such as banana, sweet potatoes, cereals and legumes has been known to help but it is best if used with other control methods like using resistant varieties and removing any plants that do get infected.

Cassava is one of many crops that are able to survive in the changing climate of Kenya. It, and other crops such as millet and sorghum, would be better suited to Kenya than the crops they are growing now like maize and tea. Raising different livestock breeds that are better adapted to the changing climate would contribute to improved food security because much of the Kenya's arid and semi-arid land is pastureland. Planting drought-tolerant crops will help farmers cope with the climate volatility but there are also other issues that could present themselves in years to come. Solutions are available but need to be implemented.

In order to start this change there are some things that should be addressed. For the people to plant different non-traditional crops than they usually do new species and varieties are needed, but this can be expensive especially if the seeds are disease resistant. The disease resistant varieties are often not available at the small markets in the rural areas. The rural farmers need to be able to buy the seed in order to grow it. If organizations were able to provide the seed, or subsidize it, to reduce the cost then the farmers could afford the seeds. However this is only the first step, the farmers have to actually grow the new varieties. The technology and agriculture extension programs are in place, however the farmers just are not using them. Often the farmers will only grow the new seed for a short period of time and then go back to their original practices. Studies have shown that over time the new varieties do produce more but the results of the improved seed are not always immediately obvious (Manyong et al.). So it is important that the farmers actually understand and accept the superior results. This could be achieved by planting the new varieties on a small, local plot of land. Having the local farmers maintain this test plot would allow them to see the difference the new varieties make. If a local farmer who is trusted by the community used the new seed and had success this would prompt others to do the same things. This would allow the farmers to appreciate the fact that the new seed is better and hopefully they would start planting it in their own fields (Muhammad and Hickey). Farmers using the new technology would produce better crops.

However having more food will not completely solve Kenya's food security problem, better roads and facilities are needed in order to properly store and transport the food. Having better infrastructure to stand up to impacts from weather would reduce the flood damage. The roads in Kenya are mainly dirt roads which don't hold up to being flooded. When the roads are flooded people cannot access the towns and markets to sell their crop. Most rural families in Kenya rely on the food they produce for income, and if they cannot get to a town to sell their crop this makes it challenging to earn a living. Improved infrastructure can also help Kenya adapt to the droughts. If excess water from the rainy season could be somehow stored for use during the dry season there would then be water available for the crops that do not have enough. This is where irrigation systems could be implemented to help to counter the effects of drought.

Things are not going to change on their own, people have to do something. It is not enough to hand a rural farmer a seed and say “grow this” they have to be shown why they should grow it and the most effective way to grow it. Knowledge is power and if the people of Kenya are able to finish school then they gain that power. Then they have the knowledge to help them adapt to their changing environment. It is a team effort to adapt to the new climate, the country as a whole must work together to overcome the barriers of climate change. Everything from the farming practices to the roads must be adapted in order to succeed. The land should be used in such a way that it is able to realize its full potential. Everything in Kenya will have to adapt in order to prosper in their changing climate.

## Works Cited

- “African Cassava Mosaic Virus (ACMV).” *Infonet-Biovision.org*. Web. 13 July 2015.
- “Cassava.” *Infonet-Biovision.org*. Web. 9 July 2015.
- “Country Fact Sheet: Kenya.” *Feed the Future.gov*. Web. 26 June 2015.
- Curtis, Mark. “Improving African Agriculture Spending: Budget Analysis of Burundi, Ghana, Zambia, Kenya and Sierra Leone.” *Curtis Research.org*. Web. 26 June 2015.
- “Drought-Tolerant Crops for Drylands.” *CGIAR.org*. Web. 26 August 2015.
- Kamau F. K. “A Kenyan experience on R&D efforts linking crop and livestock improvement, NRM and human health.” *ilri.org, Ministry of Agriculture*, Nairobi, Kenya. Web. 26 June 2015.
- “Kenya.” *Central Intelligence Agency World Factbook*. Web. 26 June 2015.
- “Kenya.” *Countries and their Cultures, everyculture.com*. Web. 26 June 2015.
- “Kenya-Agriculture.” *Nations Encyclopedia.com*. Web. 26 June 2015.
- “Kenya Climate & Agriculture.” *Our-Africa.org*. Web. 26 June 2015.
- “Kenya Demographics Profile 2014.” *Index Mundi.com*. Web. 26 June 2015.
- Kiriti, Tabitha, and Tisdell Clem. “Family Size, Economics and Child Gender Preference: A Case Study in the Nyeri District of Kenya.” *The University of Queensland*. June 2003. Web. 26 June 2015.
- Madon, Temina. “Overcoming barriers to agricultural productivity for smallholder farmers.” *WorldBank.org*. Web. 26 June 2015.
- Manyong, V. M., Dixon A.G.O., Makinde K.O., Bokanga M., and Whyte J.. “The contribution of IITA-improved cassava to food security in sub-Saharan Africa: an impact study.” *International Institute of Tropical Agriculture, CGIAR.org/iita*. 2000. Web. 26 June 2015.
- Muhammad, Lutta, and Hickey, Gordon M.. “Farmer groups key to boosting technology adoption in Kenya.” *International Development Research Centre*, Ottawa, Ontario. Web. 26 June 2015.
- “National Climate Change Action Plan 2013-2017.” *Government of Kenya*. 2013. Web. 13 July 2015.
- Place, Frank, Njuki Jemimah, Murithi Festus, and Mugo Fridah. “Agricultural Enterprise and Land Management in the Highlands of Kenya.” *Strategies for Sustainable Land Management in the East African Highlands, worldagroforestry.org*. Web. 26 June 2015.
- “Policy Responses to Food Crisis in Kenya.” *Food Security Report (Prepared by Kenya Agricultural Research Institute), foodsecurityportal.org*. Web. 26 June 2015.
- “Review of Food and Agricultural Policies in the Kenya 2005-2011.” *Monitoring African Food and Agricultural Policies*. Food and Agriculture Organization. February 2013. Web. 26 June 2015.