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Kenya: Hunger Becomes History

"It takes a healthy ecosystem to have a healthy community," articulated Ray Meylor, a farmer from Ankeny, Iowa. The country of Kenya is in a large battle for food security. Every day, citizens go hungry and are undernourished. Proper agriculture practices are vital towards maintaining food security, yet Kenyans are not using appropriate techniques. In order to win the hunger battle that citizens around the world face, sustainable agriculture must be implemented. Improving agriculture in Kenya, food insecurity can become an issue of the past.

Kenya's economy depends on agriculture. About 80% of citizens directly rely on agriculture or food processing to make a living ("Kenya - Agriculture"). With the majority of the workforce being in agriculture, the labor needs to be effective. Some of the major cash crops in Kenya include: tea, sisal, cotton, fruits, vegetables, and coffee. The cash crops of a country help build its economy. Farms located in Kenya are usually around five acres in size and often rely on rain as their main water source ("Kenya" Britannica). Five acre farms are abnormally small, especially compared to the average in the United States, 443 acres (Farms and Land). When it comes to water, Kenya has two of Africa's great lakes, Lake Victoria and Lake Turkana. Having these sources of water allows for improved agriculture. Additionally, Kenya has long rains followed by short rains. Despite these sources of water, droughts are a frequent problem. Water is needed for farming, and droughts make it difficult to perform agriculture practices ("Kenya" Culture Grams). This can decrease food production and pose threats to food security.

Populations are growing throughout Africa. Kenya has a population growth rate of 1.6 percent, with a current population of around 49 million people. The majority of people in Kenya live in rural areas ("Kenya" Culture Grams). The growing population creates a greater need for an increase in food production since "official estimates indicate over 10 million people are food insecure" ("Policy Responses Food"). With low food production and a growing population, food insecurity has become an immediate threat.

Family life in Kenya is significant, yet challenging. The average amount of children for families is three. Families' diet usually consists of food that is easy to grow in gardens or are easily accessible such as fruits (pineapples, mangos, oranges, etc.), sweet potatoes, avocados, milk, ugali, and red bean stew ("Kenya" Culture Grams). The majority of a family's income is spent in the market purchasing food. In addition to the challenges behind accessing food, families must travel up to 30 minutes to the nearest water source ("Wanjiru Family"). Furthermore, housing in Kenya varies from mansions to huts. Those in urban areas live in slums and sometimes have concrete walls which are used for security. However, in rural areas, people live in small compounds or huts, normally made of mud. Few homes have furniture, running water and electricity. Quality healthcare is also uncommon for families, as hospitals lack adequate medical supplies and many Kenyans "rely on traditional healing methods" ("Kenya" Culture Grams).

Education is valuable for those in Kenya. Free public education was introduced in 2003, but students must still supply their own "uniforms, text books, and school supplies" ("Kenya" Culture Grams). Normally, children will complete primary school but will not continue their education after that, so they do not

develop skills in order to work and provide for themselves when they are older. Families often choose which of their children can attend school. Many times, it is the son. Women throughout Kenya do not get proper opportunities to learn, therefore, they lack the necessary education for performing sustainable agriculture practices. However, the women that do end up attending school "tend to have healthier children and… these children are also more likely to attend school, breaking the cycle of illiteracy and poverty"(Hine). Additionally, schools lack funding, so teachers are not paid much and often have to work second jobs ("Kenya" Culture Grams). Improper and unaffordable education for families contributes to the food security issues that are present. Because of these challenging situations within Kenya's education system, many families have a difficult time providing for themselves.

Sustainable agriculture is agriculture that works, "to meet society's food and textile needs in the present without compromising the ability of future generations to meet their own needs. Practitioners….seek to integrate three main objectives into their work: a healthy environment, economic profitability, and social and economic equity" (Feenstra). Preserving the environment to fit current needs along with the needs of future generations, is an important aspect of society. Sustainable agriculture works to produce quality food that has the ability to meet the quantity needs of a community while also benefiting the economy of a society. The presence of sustainable agriculture is critical to support the well-being of a society.

Food security can be improved by utilizing sustainable agriculture practices. In Kenya, the current practices "contribute to the pollution of water mainly by sediment and nutrient deposition" ("Water Pollution Crisis"). These current practices not only pollute the water, but they also pave the way towards unsustainable management of farmland and waterways. Having proper water quality is crucial to fit the needs of countries all around the world, including Kenya. Agriculture depends on water; it "is used to grow fruits, vegetables, and raise livestock. Water is also used in agriculture for irrigation, the application of pesticides and fertilizers, and frost control" ("Agriculture"). Kenya's economy relies heavily on agriculture. Therefore, it is crucial to have quality water in these areas. However, the unsustainable agricultural practices being used currently pollutes the water, thus creating a constant cycle of polluted water entering agriculture areas. Water with high salt and/or metal concentrations can lead to high plant stress and a decrease in crop yield and production ("Agriculture"). These poor farming practices in Kenya impact its water quality which ultimately leads to food insecurity.

Irrigation is needed to produce an efficient amount of food. Agriculture in Kenya depends on rain to irrigate their crops. They have no sufficient irrigation system set up. Due to the reliance on rain for irrigation, crops often die during droughts. It is estimated that "2% of arable land is under irrigation" ("Kenya Economic Update"). This number is exceptionally low. In Asia, approximately 37% of arable land is used for irrigation. These numbers have a drastic difference. While Asia does face food insecurity, its use of irrigation produces food more efficiently. The droughts and infrequent rainfalls in Kenya cause food productivity disturbance, which could be dealt with through the implementation of more sustainable farming methods.

Finding and implementing sustainable agriculture in Kenya should be of high priority. By using more efficient agriculture techniques, food security issues can decrease. A watershed mitigation farm is a sustainable type of farming that would meet many of Kenya's needs. Its purpose is to increase table food production with high-quality nutrients. In doing so, the watershed mitigation farm also cleans water and increases soil quality.

This type of farm has been implemented in Ankeny, Iowa by Ray Meylor. Cherry Glen Farm uses sustainable agriculture to increase table food production while conserving and improving the land and the

environment. They started by introducing mycorrhizal fungus to the soil on their farm. This fungus brings many benefits to plants including enhanced nutrient and water uptake, improved root growth, plant growth and yield, and reduced transplant shock and drought stress (Meylor). The benefits that this fungus brings can greatly help Kenya. It will help them during droughts so that they are still able to produce food. It will also make the food more nutritious. Meylor states: "We also apply animal manure to add bacteria to the field. The plant root gives off sugars to feed the fungus. In return, the fungus stores water for the plant + exchanges nutrients + gives off methane to feed soil bacteria. The bacteria makes nitrogen that then feeds the plants." From using the fungus, they are able to increase the amount of water that the soil can hold. This is crucial to promote a healthy community especially in Kenya, where droughts occur frequently. Their soil will contain more water so that when a drought occurs they will still have water to use for agriculture purposes. Introducing mycorrhizal fungus to the farms in Kenya has the ability to reduce drought-related issues and strengthen table food production.

Another necessary feature of sustainable agriculture is having healthy soil that creates nutrient-dense food for people to eat. The mycorrhizal fungus increases the ability for soil to retain more water. However, that is not enough. The soil needs to be healthy so the food that is produced can keep citizens from being malnourished. UNICEF reported, "Almost 370,000 children across the country now require treatment for acute malnutrition, including 72,600 who are suffering from the most severe form, which requires specialized, life-saving care" ("Nutrition Crisis Deepening"). It is important for children to get a significant amount of appropriate nutrients. People suffer from malnutrition daily, but healthy soil from sustainable agriculture practices has the power to fix this. The nutrients in plants are supplied from the soil. It is well known that "healthier soil grows healthier plants, and healthier plants are more nutritious plants" ("Nutrient Density"). In order to provide more nutritious food in Kenya, creating healthy soil must be a priority. The watershed mitigation farm in Ankeny, Iowa uses their opportunity to produce nutrient-dense food. Meylor explains how "farmers that use Roundup will kill soil bacteria, so we introduce manure to create a healthy soil ecosystem." Manure develops healthy soil which in turn provides healthy food for the community. Cherry Glen Farm has seen drastic improvements to the soil quality due to their sustainable agriculture practices. "Within three years we have restored our soil so we have great rain infiltration, water holding capacity, and a biophysical healthy soil that will again produce nutrient dense table foods" (Meylor). This type of farm has the potential to improve the soil in Kenya. Healthy soil will prevent malnutrition and save people's lives. From implementing this sustainable farming in Kenya, tremendous changes would be seen.

The inefficient use of irrigation in Kenya is diminishing its food production. High food production is needed to keep people from starvation. Meylor's farm, Cherry Glen, uses gravity driven irrigation for its agricultural practices. When using irrigation there will be noticed improvements in "crop growth and quality. By allowing farmers to grow crops on a consistent schedule, irrigation also creates more reliable food supplies" ("Irrigation"). Irrigation is able to increase the food that farmers can produce. Mycorrhizal fungus helps the soil contain more water, but irrigation is still needed for farmers to be able to work consistently. Because Kenyan farmers rely on rain-fed agriculture, they are unable to farm during droughts, decreasing their food supply. Furthermore, agriculture needs a water supply. Irrigation can be this water supply during a drought. In order to have sufficient agricultural production and to achieve food security, "efficient and effective water management through irrigation is essential" ("Impact of Irrigation"). Implementing gravity led irrigation similar to the system already put in place at Cherry Glen Farms, could increase food productivity drastically in Kenya.

Equally important for sustainable agriculture is water quality. Quality water is essential for agriculture and "can have a huge impact on both crop production and the nutrition of a community" ("Water and

Hunger"). Improving the standards of the water in Kenya, will enhance agriculture. Kenyan's would be able to grow more food for its citizens and the food that is grown will be more nutritious. Meylor realizes the importance of water quality and has implemented a process of cleaning the water through his farming. Meylor takes advantage of "two water retention basins on [his] farm...Water in the basins is then utilized for irrigation supply, and plants extract nitrates from the water for their growth, cleaning the water as it travels through. Water not used then flows back into the aquifer clean" (Dotterweich). It is well known that proper water quality is needed for agriculture, yet many farmers pollute water through their agriculture practices. However, Cherry Glen Farm is different; their plants use nitrates in the water to grow which ultimately cleans the water. Through growing plants they clean water rather than polluting it. In addition, the filtered water flows to the aquifer where many people get their drinking water from. Executing a farm similar to Cherry Glen in Kenya will help improve water quality which is essential for agriculture.

A necessary part of achieving food security is sustainability. Cherry Glen Farm is sustainable. Implementing similar farming techniques in Kenya will also be sustainable. Many farmers pollute the water or lose money from fertilizers. This is unsustainable. Comparing Cherry Glen to other farms, it's agriculture practices are cleaning the water rather than polluting it. In addition, this project is economically successful and can meet the food demands of a society. Cherry Glen Farms has boosted "food production by 250%" (Siemsen). These farms will keep Kenyan's from going without food and allow them to be food secure.

A watershed mitigation farm is also profitable because the enhancement in food productivity will allow farmers to make a larger profit. With a larger profit, they will be able to buy more food, send family members to school, and help change the future. Another way that this farm is sustainable is because it can be irrigated by solar panels. Solar panels are environmentally friendly and can be used for irrigation. Since Kenya needs to use irrigation and their "current diesel-powered irrigation pumps are highly polluting and carbon intensive," solar-powered irrigation will bring benefits ("Solar-Powered Irrigation"). Cherry Glen Farm uses solar-powered irrigation. Therefore, creating farms like Cherry Glen in Kenya will be sustainable and help obtain food security.

Teaching Kenyans how to adapt to these new agriculture techniques is necessary to receive the benefits that they bring. One way to do this is by implementing a learning farm in Kenya. This could be a farm where farmers are able to learn proper agriculture techniques so they can apply them to their own farms. It is essential for people to know the importance of proper farming in order to reach high food productivity with needed nutrients. This will give the farmers in Kenya that did not get the opportunity to go to school, to learn how to farm sustainability. A farm that teaches people how to be sustainable utilizing the techniques at Cherry Glen, will give all farmers a chance to help accomplish food security.

Creating new and essential ways for farmers to do agricultural work is essential for food production. However, in order for the population in Kenya to receive a sufficient amount of food, money is needed to implement these types of farms. There are multiple opportunities through organizations to receive grants to fund these projects. One of these is the Food and Agricultural Organization of the United Nations (FAO). Established in 1945, the FAO funds projects that work "to achieve rural development and hunger alleviation goals" ("FAO's Activities Compromise"). In addition, the FAO coordinates efforts between the government and various programs to develop agriculture, forestires, and fisheries in low income countries (Mingst). With funding and help from the FAO, communities around the world have prospered. One example of this is Vehari, Pakistan. In Vehari, the FAO and European Union (EU) introduced an agriculture method to help reduce the use of pesticides in farming. Through the program, Pakistani

farmers learned and saw firsthand the benefits of reducing pesticide use. They were able to grow healthy and nutritious food while saving money. With help from the FAO and EU, “Pakistani taxpayers are now financing what European Union taxpayers helped start” (“Success Stories”). The organizations worked with local farmers in order to decrease poverty. The farmers are now able to make profit and grow more healthy food for their community. With the FAO’s help to initiate watershed mitigation farms in Kenya, farmers will have the ability to produce more nutritious food. The organizations will teach Kenyans the benefits of sustainable farming. Implementing the farms will allow for greater food productivity and ultimately a greater profit allowing farmers and Kenyan communities to thrive just as Pakistani communities have. Another organization that supports projects like Cherry Glen Farming, is the International Fund for Agricultural Development (IFAD). Grants from IFAD “support research, innovation, institutional change and pro-poor technologies” (“Supporting Agriculture Research”). Similar to the FAO, IFAD supports agriculture projects directed towards food insecure communities. Through loans, IFAD projects empower citizens in rural areas “to grow more food, better manage their land and natural resources, learn new skills, start small businesses, build strong organizations, and gain a voice in decisions that affect their lives” (“International Fund Agricultural”). IFAD has helped develop many rural communities. They have “trained 2.5 million people in crop production practices and technologies,” and have “improved the management of 3 million hectares of common-property resource land” (“International Fund Agriculture”). Many farms and farmers have benefited greatly by the efforts made by IFAD.They have been able to train farmers with new and sustainable agriculture techniques that they can apply to their own farm. Through the help of IFAD, communities can expect greater agriculture practices leading to a healthier ecosystem and community. Applying for a grant at the FAO or IFAD could contribute to the funding of this project and make sustainable agriculture possible in Kenya.

Along with international organizations, there are also many local ones in Kenya that can work hand-in-hand to help Kenyan communities achieve food security. One agriculture organization is The Kenyan National Farming Federation (KENAFF). This local organization strives to improve agriculture in Kenya and create an overall healthier country. KENAFF has a vision to create “a vibrant agricultural sector sustaining improved livelihoods” (“Kenya National Farmers”). Furthermore, KENAFF has used the information provided by “Kenya Vision 2030, the United Nations Sustainable Development Goals, and the African Union’s Agenda 2063,” (“Kenya National Farmers”) in order to create a plan to achieve their goals for 2018-2022. The plan created by KENAFF greatly focuses on improving food and nutrition security across the country. Agriculture techniques used at Cherry Glen is an effective way to achieve the goals of KENAFF. With the help of KENAFF, sustainable agriculture practices can be applied to many local Kenyan farms. The efforts of KENAFF can help aid sustainable farming on grassroot levels.

Without sustainable agriculture, millions of people in Kenya are food insecure. A watershed mitigation farm will improve table-food production and undernourishment. Implementing this farm in Kenya must be of high priority. As Ray Meylor declared, the only way to have a healthy community is by having a healthy ecosystem. Using sustainable agriculture will create healthy ecosystems allowing communities to thrive. Sustainable agriculture has the power to make food insecurity, in Kenya, history.

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