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Kenya, Factor 2: Water Scarcity

Kenya: Adequate Nutrition Amid Water Scarcity

Kenya is located in Sub-sahara Africa, with an approximate area of 224,445 square miles (*Countries and Their Cultures*). Kenya borders Somalia to the east, Ethiopia to the north, Tanzania to the south, Uganda to the west, and Sudan to the northwest. Its 333 mile coastline is along the Indian Ocean. The official languages of the country are English and Kiswahili (Swahili). Swahili is a mix of Arabic and African language influences. It is a dry country with an average rainfall of 630 millimeters/year (Marshall). Kenya has been, like most sub-Saharan countries, facing water scarcity in recent years. This condition has been worsened by climate change, which anticipates water droughts worsening in coming years. As a result, Kenya's population is being faced with food insecurity. With a rapidly growing population food will have to increase, not decrease. An inability to cope with water scarcity could affect Kenya's ability to meet their nutritional requirement.

The average household size in Kenya is 3.9 people (*Kenya Ministry of Health*). Rural households more frequently are headed by women than urban household, 36% of rural households to 27% of urban households. Rural households also have a higher average size (4.4 people) than urban households (3.2 people) (*Kenya Ministry of Health*). About 74% of Kenya is rural. A larger household benefits rural life, since the majority of rural Kenyans are smallholder farmers relying on family labor for the majority of their workforce. Fostering a child under 18 is also very common in Kenya, with about 17% of households doing so (*Kenya Ministry of Health*). The child being fostered is often a cousin, nephew, or other non-direct family member. While polygamy was traditionally common in Kenya the practice is dying out, in part due to the Christian missionaries and financial burden that comes with supporting multiple wives.

The average Kenyan diet is made up of various starches, fruits and vegetables, and occasionally meat. Maize (or corn) is the staple of many Kenyan's daily diet. It is usually ground up and made into *posho*, a type of porridge. *Posho* can have vegetables, mashed beans, and potatoes mixed in. Another type of porridge is *matoke*, a banana porridge. A popular side dish is *mboga*, boiled greens. Due to its high price, meat is not eaten regularly. Fish is popular along the coast of the Indian Ocean and Lake Victoria. Tea mixed with sugar and milk is a popular drink in Kenya. It is a cultural custom in Kenya to kill and roast a goat, or sheep and cow, for special occasions. This dish is called *nyama choma*, which translates to "burnt meat". 30.8% of Kenyans struggle to meet their daily nutritional requirements. Rural people find it more difficult to get adequate nutrition than urban households. 91.3% of urban residences have a food security status of acceptable, versus 86.4% of rural residences (*Kenya Ministry of Health*). Undernutrition contributed to a third of deaths under the age of five. Stunting also affects one out of every three children in Kenya, an effect of malnutrition (*U.S. Agency for International Development*).

Kenya gives children a traditional education, more commonly in rural areas than urban, as well as a 21st century academic education everywhere. It takes a village to raise a child as uncles, aunts, and other community members often all feel responsibility for children. Children are taught specific duties for their sex: girls learn how to cook and care for children, while boys are taught herding and field work-if they live on farms. Boys and girls are also grouped into "age sets" of children born the same year. In these children will form close bonds and undergo initiation rituals. From ages seven to fourteen, children attend free primary school that is held in english. One in ten Kenyan's do not complete primary school (Clark). Only one in seven children who completed primary school go on to secondary school, partially due to the expense. Secondary school is dived into two levels each lasting two years. After each level students are given national exams that they must pass to continue schooling. Privately funded secondary schools now outnumber state secondary schools (*Countries and Their Cultures*). There currently are eight universities in Kenya, in addition to technical institutes that focus on training in agriculture, teaching, and other

professions. Kenya's education system has been accused of widespread cheating. There is a significant lack of qualified teachers to educate the growing number of school-age children.

Health care in Kenya is understaffed and lacks adequate resources, especially in rural areas. Resources are unevenly distributed between urban and rural communities. In 2011 there was 1 physicians for every 5,000 civilians. Government run clinics focus mainly on preventive medicine. While these clinic have been successful in decreasing malaria through the use of nets, the country still suffers from high rates of diarrhea, dysentery, sexually transmitted diseases, and trachoma. In rural areas, where any modern medicine is rare, people still heavily rely on traditional practices. Kenya has one of the world's highest fertility rates (4.46 per woman) (*Countries and Their Cultures*). Birth control initiatives to curb this growth have largely been ineffective, one major barrier in lowering birth rates is the government's refusal to encourage condom use. This has also increased the severity of the AIDS epidemic. Child morality rates have declined, but maternal morality rates remain high. 61 years is the life expectancy of Kenya, which is higher than many African countries. AIDS has had a devastating effect on the country, with roughly five hundred Kenyans dying from the disease daily.

74% of Kenya's population is rural (*Climate-Smart Agriculture in Kenya*). Overwhelmingly, rural households rely on agriculture as the main source of income. Out of the entire land area of Kenya, only 17% is of high agricultural potential (Marshall). 11 million Kenyans currently are employed in smallholder farming. Smallholder farmers often own a small-scale farm and rely on family labor to grow subsistence crops in addition to one or two cash crops. The average farmer owns 0.2 to 0.3 ha of land (*Climate-Smart Agriculture in Kenya*). While the majority of the population practices small-holder farming, the majority of Kenya's land area belongs to farms greater than 50 ha. About 80% of the Kenya's total food production is from small-scale farmers, while 20% is from large-scale farmers (>50 ha).

Large-scale farms take one of two forms. Either privately-owned or state-held ranches that are equipped for commercial farming or extensive, low-technology production using communal grazing systems. There is usually a mix of crop-livestock systems and partial commercial production on Kenya's small-scale farms. Many of Kenya's small-holder farms practice rain-fed agriculture. Rain-fed agriculture is when a farm relies on rainfall for their source of water. This practice is not uncommon in sub-Saharan Africa and other developing countries. There is little use of modern production practices, such as hybrid seeds, concentrated feeds and fertilizer, pesticides, machinery, or irrigation. As of 2012, only .16% of arable land was irrigated (*Climate-Smart Agriculture in Kenya*). Fertilizers are used less frequently in relation to global standards, but greater than other sub-Saharan Africa countries.

Sweet potatoes, millet, corn, and fruits (bananas, mangoes, and oranges) are the main subsistence crops grown in Kenya. Common cash crops grown are coffee and tea. Kenya also has one of the most developed dairy subsections in sub-Saharan Africa. 80% of the dairy produced is by small-scale farmers. Presently, over a million smallholder farmers in Kenya rely on dairying for their livelihood. Ayrshire, Freshian, Sahiwal, and Channel island cows are the main dairy animals used in Kenya. Tea is Kenya's major export crop. Coffee is also a significant cash crop in Kenya, crucial for small-scale farmers who produce the majority of this crop. The majority of Kenya's maize (70%), tea (50%), beef (70%), coffee (65%), and milk (80%) is produced by small-scale farmers (*Climate-Smart Agriculture in Kenya*). In recent years there has been an increase of crop cultivation, specifically in cereal and pulses, which has helped cope with a population and food demand boom. However, there has been heavy losses in the cattle industry(US$8,395), mainly due to reduction of grazing land and livestock mobility. Horticultural products have grown in production over the last decade, as farmers in densely populated areas grow them to increase their income.

There are many factors that increase a farmers chance of participating in markets. Gender and age play a significant role, with older males being more likely to go to markets. Ownership of transportation equipment (such as motorcycles, cars, or bicycles) also increase the chance of participating in markets (Olwande). Farm groups also increase access to information important to production and marketing. Maize marketing is becoming more accessible to the poor, which is shown by the larger increase in poor

farmers selling maize in market than non-poor farmers (Olwande). It has been shown that participation in markets has played a vital role in brining farmers out of poverty. This strong relationship indicates that increased access to markets among small-holder farmers can lead to poverty reduction, whether it be in the form of modernized communication or transportation technologies. One way to increase production entering markets is through the use of modern technologies. Implementing modern technologies for particularly poor farmers could aid them in participating in markets and brining them out of poverty.

People are often unable to receive adequate nutrition due to food insecurity in Kenya. Food insecurity has increased significantly in the last decades as a result of catastrophic droughts. The North Eastern Province, bordering Somalia and Ethiopia, has experienced frequent droughts with high levels of poverty, leading them to suffer undernutrition (Marshall). Poverty stricken families often cannot afford the increase of food instability caused by recent droughts in Kenya. Lack of adequate nutrition is evident in Kenya's high stunting rates among children. Food insecurity has increased in Kenya due to a parallel increase in droughts.In 2011, an estimated 3.5 million Kenyans were declared food insecure (*Climate-Smart Agriculture in Kenya*). Since 2008, food insecurity in Kenya has exponentially grown, due to frequent intense droughts, displacement of farmers after the violent 2007 election, high global food prices, and high costs of domestic food production (*U.S. Agency for International Development*). Kenya's arid or semiarid land makes it more susceptible to droughts, which hurts agriculture productivity. This drop can be seen in the yield of many staple crops - wheat, maize - being below regional and global averages.

Many factors keep Kenyan smallholder farmers in poverty. Low literacy levels often prevent farmers from being able to adequately manage and grow their farm. Also a land poor farmer cannot produce a large surplus of goods to send to market, in turn limiting their income (Olwande). A limited surplus for market will limit the farmers ability to enhance their farm's productivity, since they will not be able to buy fertilizers or improved seeds to enhance their outputs. While smallholder farmers are dependent on their farms for income, they often lack the skills and knowledge to effectively trade in market. Being unable to trade their goods effectively traps smallholder farmers in a viscous cycle of poverty. An inability to efficiently sell their surplus will limit a farmers ability to improve their farm's productivity, which further limits a farmers ability to produce a surplus to sell at markets.

Kenya is plagued by water scarcity, caused by reoccurring droughts, poor water management, and contamination of available water, all magnifying as global warming accelerates. (Marshall). About 80 percent of Kenya is arid and semi-arid, making it further susceptible to droughts. While the entire world is experiencing increasing temperatures, developing countries (like Kenya) are at a higher disadvantage. They often lack the ability to adapt and change their agricultural practices to accommodate water shortages. This inability to adapt causes declining soil fertility, land degradation, and soil erosion. The majority of Kenya's farms are rain fed, making them more susceptible to increasing temperatures, and droughts (Marshall). As a result smallholder farmers experience a decrease in crop yields, income, and livestock. The 2009 drought in particular saw billions of dollars lost in the agricultural industry, with crops and livestock making up the majority of the losses. In rural areas the government's lack of investment in water has amplified the water shortages (Marshall).

Kenya's water supply is not expected to increase, instead it is predicted to worsen in upcoming years. The eastern and northern climates of Kenya are predicted to experience a further precipitation decrease as a result of climate change, in addition they do not have the additional water source of Lake Victoria. These intensified and elongated droughts are expected to deplete farms of pasture and water resources. There will be further reduction in agricultural productivity of Kenyan farmers, as they are stripped of their natural resources. Maize, which is a staple cereal crop for many small-holder farmers, is particularly vulnerable to the predicted water scarce climate. Kenya's economic stability is strongly correlated with its agriculture. Studies estimate that by 2050, about US$100-200 million could be lost in maize production. A drought results in one third of Kenyan's income dropping, further limiting their ability to escape poverty. Places with already low rainfall patterns are expected to experience rising poverty and food insecurity rates as their climate becomes dryer. These droughts are especially threatening to rural women.

As they lack social and economical education, small scale farming is often one of the only opportunities they have to earn a living. Women are essential in rural communities, with 36% of rural households headed by women in contrast with 27% of urban households (*Kenya Ministry of Health*). While women contribute to 80 percent of all the labor used in food production, they only receive 7 percent of agricultural extension information. It is even more a priority for women's opportunities to increase, as the country's resources are strained women will become particular vulnerable to poverty. (*U.S. Agency for International Development*). If water resources continue to decrease, rural women's poverty rate will rise.

Water scarcity affects the average Kenyan family in multiple ways. Beyond the economic hardships caused by droughts, water scarcity further disadvantages Kenyan's lives. When plants die because of dehydration, wild animals are not able to get their nutrition from traditional sources. They often destroy homes looking for stored maize to save themselves from starvation. A loss of crops to starving animals further declines a Kenyan farmer's income. A lack of agricultural stability caused by droughts often puts farmers in economic instability, thus resulting in inadequate nutrition. A failure to get nutrition leads to more negative health factors for many Kenyans. Due to the reliance directly or indirectly on agriculture a famine can quickly occur along with droughts if aid is not provided as a prevention. An example of this was in 1997, when a state of national disaster was declared after a drought threatened the lives of 2 million people. Another occurrence, the severe droughts of 2010-2011 which resulted in an additional 4 million people needing food assistance, shows the threat excessive droughts have on not only Kenya's agricultural industry, but to their people's quality of life.

Water security would have positive implications for Kenya's economy and the livelihood of Kenyans. It would provide many Kenyan's better nutrition, since 75% of Kenya is sustained by domestic agriculture ("Climate-Smart Agriculture in Kenya"). Adequate nutrition could reduce the frequent stunting of Kenyan children. It could also reduce the 43 million people unable to meet their daily nutritional requirements (*IFAD*). With one of the fastest growing populations, it is important to secure water before there's a greater demand for water, whether that be water for humans to drink or agriculture. Smallholder farmers would become less reliant on rain as their farm's water supplier, making them less vulnerable to poverty when droughts occur. Rural women may become more able to provide for themselves, as their income from farming becomes more stable.

As population grows, water scarcity will affect Kenya more than ever. 30.8 percent of Kenya is undernourished, more in rural areas than urban. Kenya is set to continue its rapid population growth over the next decades. The amount of food needed to sustain a growing population will increase, but there will be a decline of rainfall. Less rainfall will lead to a drop in crop yields, which will decrease the population's food source. To prevent people from suffering malnutrition, crop yields will have to increase instead of decrease. This can be done by encouraging Kenyan farmers to adapt farming practices that are sustainable for a dryer climate. A method that has been used to manage water throughout human's existence is irrigation. An encouragement by the Kenyan government and nongovernmental agencies for small-scale farmers to adopt irrigation techniques would be beneficial for Kenyan farmers, economy and society. Being able to farm in a dryer climate agricultural productivity will increase, therefor a growing population can be better fed.

Kenya is failing to implement widespread irrigation systems to cope with droughts. Currently, only 20 percent of land that has high potential for irrigation is irrigated. The barriers to implementing irrigation are the high development and maintenance costs and possible negative environmental impacts if contracted and managed poorly, but the positives outweigh the negatives. Two-thirds of Kenya's land has never been able to grow crops on due to a lack, or complete absence, or rainfall. (*Food Tank*). With a rapidly growing population, all possible land needs t one used to nutritionally sustain the population.

An increase in small-scale irrigation could see vast improvements in Kenya's agricultural productivity. With a combination of historic and anticipated climate information, a range of field, farm, and community scale water harvesting and conservation management strategies can stabilize yield under a less-predictable climate. The government of Kenya has identified irrigation as an important tool for growing the countries

food self-sufficiency as well as increasing a smallholder farmer's income (*Food Tank*). Therefor, the government should work together with Non-governmental agencies to provide funding for irrigation implementation. Women are expected to be the primary beneficiaries of increased irrigation practices. Women are often expected to do labor intensive duties on a farm, as men migrate in search of higher income (*Food Tank*). A particularly exhausting chore is gathering water for domestic and farm use. These chores can often lead to exhaustion and a decrease the productivity of their farms. An increase in irrigation would reduce the amount of chores women have to perform during peak seasons. Providing farms with a simple rain barrel would be a simple start to further irrigation, with low initial and maintenance costs.

Under the Ministry of Water (MOW) extensive work has been done to ensure water resource availability and accessibility to all. It has an Irrigation and Drainage Branch (IDB) within itself to look after irrigation in the smallholder farmer sector and to take charge of irrigation policy formulation, project planning and implication (Gakundi). While IBD in particular lacks adequate staff, regional branches have great experience in starting to implement change. More attention should be given to the IBD in the Kenyan government, as it is essential for their countries future food security. A small scale farmer can read to multiple manuals produced in 2003 by the IDB that contain distinct recommendations on the development, operation and maintenance of implementing irrigation on their farms (Gakundi). However, the government should provide expertise and leadership beyond a manual for implementing a practice as complicated as irrigation to relatively uneducated farmers. Since so many of Kenya's farms are run by women, woman to woman education could encourage implementation of irrigation more than a confusing manual, especially in a rural society skeptical of change.

The Lake Basin Development Authority (LBDA) is committed to creating rapid development in the Lake Basin region. They are under the Ministry of Devolution and Planning and was established in 1979 by an Act of Parliament (*Lake Basin Development Authority*). They have the power to undertake overall integrated planning, coordination and implementation of programs and projects in the basin. They currently have jurisdiction over 18 counties. They have invested in multiple areas - from a mall to a integrated land and water system management - and have had great success in many of these ventures (*Lake Basin Development Authority*). Their success is primarily accredited to strong organization, staffing, and financing. They have a technical professional staff of economists, sociologists, environmentalists, hydrologists, geologists, engineers, agriculturists, and many other valuable professions. Their Magwagwa Multipurpose Hydro Power Project covers 5 counties: Bomet, Kericho, Nyamira, Homabay, and Kisumu. One of their project objectives is water supply for irrigation, domestic and industrial use. They have a special focus on small-scale farming, but I believe the program can extend its participation with these farms. They aim to have 13,807 ha of irrigated land in Kano/ Nyakach plains (*Lake Basin Development Authority*). If they successfully meet this goal, they are an example of a provincial project that could be upscaled for national use. They have the organization to accomplish the irrigation goals that need to be meet to accommodate water scarcity in agriculture.

The best example of a governmental agency aiding Kenya in growing irrigation schemes is the National Irrigation Board's Galana/Kulalu Food Security Project. This government manifesto aims to have one million acres under irrigation by 2017 (*National Irrigation Board*). The area of focus is on Galana/Kulalu ranch which is located in-between two rivers, which will be able to supply an adequate water source for irrigation. The ranch soils have been identified as sustainable with irrigated agriculture and the projects copleation would bring millions of people jobs, help local commerce, and the national economy. Two dams, the Thwake and Galana dams, are set to be constructed along the Galana River for storage purposes. (*National Irrigation Board*). While this may appear to be a fool proof plan to sustainably combating water insecurity many challenges lie within this project. The region has a strong presence of armed groups, poaching activites, poor network roads, lack of basic amenities-electricity, health services, and portable water, and most of all inadequate financing (*National Irrigation Board*). However, nonprofit groups like The Agricultural Society of Kenya are devoted to aiding programs like this that aim to help Kenya's agriculture sector grows sustainably. The Society not only provides technologies to increase crop

yields and prepares farmers for rapid changes in climate, but also gives local farmers education on how to manage time adequately and correctly implement new recources. (*National Irrigation Board*).

While it is impossible for humans to predict the future, we do have strong evidence to believe that water scarcity will increase as global temperatures rise in upcoming years. It is crucial to find innovative ways to meet the agriculture demand of water, especially in already dry climates. Water insecurity will jeopardize farmer's livelihoods, a nation's food security and standard of living. Irrigation is an effective answer to this immediate problem. While it is perhaps costly, it is the most environmentally friendly option. Irrigation is better for Kenyan farmers that drought resistant GMO crops. While there is no nutritional difference between GMO and NON-GMO crops, we still do not know the genetic impacts our consumption of them will have on future generations. GMO crops should be reserved as a last resort to this problem, but long-term irrigation should be our primary defense.

With a growing population, comes an increase in the agricultural productivity of a country. Kenya is facing a water scarcity crisis, worsening due to climate change, which is decreasing the amount of fettle land to grow crops on. Regions like Laikipia, Kenya are already experiencing violence due to a lack of fertile land, as social upheaval that is a direct consequence of an environmental threat (Gentleman). Any expert will admit that humans have always fought over land, but the past year has been one of the bodies ever, with 80 people being killed in the particular region (Gentleman). This shows a new level of evil in people as they become more susceptible to environmental changes, which will dramatically effect this ability to live. The violence happening in Laikipia, Kenya will only increase in frequency and intensity as water scarcity increases (Gentleman). Another social consequence of water scarcity depleting fertile land is the decrease of jobs in that sector. If over 70% of Kenya's population is rural, then those jobs are going to be threatened as the amount of fertile land with the ability to grow crops decreases. So as the water scarcity decreases the amount of fertile land, the population and food needed to sustain that growing population only increases. Since rain water is the primary source of water for most Kenyan farmers, a large-scale irrigation system that would retain and apply rainfall effectively is essential to maintaining Kenya's economy, such as the National Irrigation Board's Galana/Kulalu Food Security Project. Control over when and where to apply rain water would stabilize crop yield and increase small-scale farmer's control over their incomes. A stable economy would benefit rural women most of all. Women still make up the majority of the labor force in small holder farms and by giving them a income, stabilized by ample water for their crops, you essentially liberate them. Irrigation implementation is a long-term solution to Kenya's increasing water scarcity.

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