

The Process of Appreciation

Because if one does not know a culture, food insecurity problems are impossible to solve.



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Acknowledgements

A special thanks to...

The World Food Prize Foundation, for funding an experience different from any other

icipe, for becoming my home for the summer

Dr. Tino Johansson, for allowing me to work on such a remarkable project

Dr. Fabian Haas, for introducing me to the wonderful world of macro-invertebrates

Mrs. Lisa Fleming, for ensuring my safety and security at all times

Ms. Sarah Achola, for guiding me through the entirety of my research project and experience

My Kenyan Family, for both showing me and immersing me into the beautiful culture and scenery Kenya has to offer

Mr. Brad Horton and the Kennedy Community, for sparking my interest in such an amazing program

My Family, for supporting me in all of my interests regardless of how crazy they may sound

My Friends, for making me feel as if I never left home

Dr. Norman Borlaug, for inspiring us all to believe in a vision and find solutions

A wise teacher once told me there is a process for fully understanding another person and his or her culture. Everything starts with learning the culture of others. The process of learning is followed by understanding why the people do tasks the way they do. Appreciating what the culture has to offer comes next. And finally, celebrating the culture. My journey as a Borlaug-Ruan Intern went through this very process. From learning to understanding to appreciating to celebrating, I feel as if I thoroughly comprehend and appreciate the Kenyan culture and way of life. What follows is my journey to appreciation and celebration.

Learning

Introduction

Everything started with a spark of interest, funny how a single conversation with a complete stranger can change one's life forever. I still clearly remember the run. I was an entering freshman in high school talking to a much respected senior on our cross country team. She was telling me about an experience she had the past week at the World Food Prize Global Youth Institute. I inquired about the process of attending the Institute and how to become involved in the program. The senior advised me about the dreadfully long paper she had written and the internship she was applying for with the World Food Prize Foundation. At the time, the research paper sparked my interest and actually sounded kind of fun. As an eager freshman, I asked the teacher who sponsored students if there was a possibility I could attend the event the coming year. The teacher advised me I would have to wait a few years, as our school only sent seniors, but he would keep my name in mind for when the time came.

The World Food Prize Global Youth Institute was constantly in the back of my mind with a hint of anticipation about whether I would be the one allowed to attend. As my senior year quickly approached, my teacher pulled me aside to ask if I was still interested in attending the Institute. Of course I was interested and that summer, I was advised to write my research paper. Like most students, the summer silently slipped away and the requirements and suggestions for the research paper sat glaring at me from my desk. With a few weekends before the paper was due, I sat down for a few solid days to conduct my research and write my paper. I found the topic of food insecurity in Cambodia interesting and my solutions coincided with another summer experience I had partaken in the past summer. At the time, I did not realize the connection I was making between my aspirations for the future and efforts to diminish world hunger, but the connection was clearly there.

In October 2011, I attended the World Food Prize Global Youth Institute. Similar to most students, I was inspired by efforts occurring throughout the world to address world hunger, and was fascinated to learn about the world conference occurring a few hours from my home in Cedar Rapids, Iowa. Over the course of the weekend, I talked with past Borlaug-Ruan Interns and became intrigued by their stories. After the inspiring and passionate speech from former Brazilian president and one of the 2011 World Food Prize Laureates, Luiz Inácio Lula da Silva, I realized I could make a difference and help feed the hungry. The weekend I spent in Des Moines made me understand even with an interest in marine biology, I could apply science to feeding people, through the use of fish. I knew applying for an internship would be competitive and the choice was a hard one to make. The summer would be my last summer to spend at home with the familiarity of work, friends, and family. The decision to apply came with much anticipation, and in the weeks waiting to hear back the angst in my stomach unconsciously told me how much I cared and strived for such a remarkable opportunity.

The much awaited letter came with an interview date scheduled for when I would be out of town visiting colleges. My heart sank realizing my chances of a summer filled with learning and growing in a foreign country could be gone. With a few phone calls, I was relieved to know the staff was willing to interview me over Skype. In a foreign city, on a college campus, I searched for the best place to conduct my interview—a conference room it was. The interview seemed to be going well until the lights shut off in the room I was sitting in. There was nothing I could do and I just remember thinking how I blew my chance at an unforgettable, life-changing summer. Unexpectedly, I received a letter offering me an internship at *icipe* (International Centre for Insect Physiology and Ecology) in Nairobi, Kenya. Having no prior knowledge of insects and

knowing very little about Kenya itself, I knew the experience would be filled with a plethora of learning. When I told people I was headed to Kenya for the summer they often looked at me with surprise and concern for my safety. I found myself wanting to learn more before my trip and completed my senior research paper on food insecurity in the country.

End of year activities created a chaotic life and preparing for my trip became mixed in with the slew of other senior year events. Between getting numerous shots available only at universities and buying last minute electronics to capture every moment, within a week of graduating I had boarded a plane to head half way around the world, still unsure of what exactly I would be doing.

The Place I Called Home

The first few steps any person takes for the first time in a foreign country are always memorable. I distinctly remember the confusion I felt as the people engulfed me when exiting the plane. I was pressed against others' shoulders walking to customs in a confused American manner. As any traveler, I was concerned my luggage would not make it or the officers would not let me pass through customs. Fortunately, the arrival went smoothly despite the many languages surrounding me, so different from anything I had heard in the past. A sigh of relief swept over me when I spotted the driver holding a sign with my name on it. Amidst all the commotion going on around me, a person simply holding a sign with my name was enough to put me at ease. Darkness had already fallen by the time I arrived, and I quickly realized the driver would not be able to answer the numerous questions filling my brain. I arrived at the *icipe* Nairobi campus in under an hour and with my late arrival was given a key to my room, the place I would call home for the next two months. Despite my hours of sleep on the planes, traveling had worn me out and even with my ever-lingering questions, I immediately fell asleep.

I was eager to get up the following morning and learn about what I would be engaged in for the coming months. To my disappointment the questions continued to mount, as it was a Sunday and absolutely no one was on campus besides a few people living in the Guest House. I took the day to acclimate myself to my new surroundings and learn a little about where and why I was at *icipe*. The institution was founded in 1970 by Thomas Risley Odhiambo after the need was identified for more tropical research institutions focused on alternative environmentally friendly pest and vector management strategies. A 4H paradigm was developed, focusing on human, animal, plant, and environmental health. *Icipe's* mission is to "help alleviate poverty, ensure food security and improve the overall health status of peoples of the tropics by developing and extending management tools and strategies for harmful and useful arthropods, while preserving the natural resource base through research and capacity building." I was reading literally every word from the material I had received at my orientation and the connection of *icipe* with the World Food Prize became evident when reading about Dr. Hans Rudolf Herren who had served as Director General of *icipe* and was a 1995 World Food Prize award recipient. Dr. Herren created a chemical-free biological control for the cassava mealybug which saved up to 20 million lives from an approaching disastrous famine. Later in my studies I would also make the connection that the money he received as an award recipient helped to co-found the Biovision Foundation in 1998, which funded one of the projects I worked on during my stay.

Karibu

Karibu, meaning welcome in Swahili, greeted me repeatedly everywhere I went during my first days. The days were filled with constant greetings and introductions. The many people I

met became a swarm of faces making it difficult to recognize and remember their names and faces. As much as I tried to commit names and faces to memory, there were so many people the process became impossible. On my very first day in the office, I was given a tour of all the different units and projects being undertaken at *icipe*. I was fascinated by the methods used to test and kill stemborers using parasitoids. In other labs insects were being identified and various repellents tested. My lengthy list of questions continued to expand, as I still had very little knowledge of what research I would be assisting with in Kenya during the coming weeks.

Not until my first day at lunch did I meet Dr. Tino Johansson, the researcher whose project I would assist with for my first few weeks at *icipe*. Dr. Johansson received his doctorate from the University of Helsinki, Finland specializing in geography. Dr. Johansson gave me a nice firm handshake, but seemed quiet and reserved. The lunch went by fairly quickly, with Dr. Johansson interjecting his opinions and stories sporadically throughout. Even after asking what I would be assisting with in the coming weeks, his answer was vague, telling me he would explain more the following day. As I would soon learn, Dr. Johansson was new to Kenya and was slowly learning the ways of the people. Dr. Johansson's stories never failed to result in laughter in the office.

My first day in the office was followed by a quick walk to a local vendor. The girl who had shown me around throughout the day, offered to take me. Having not yet been outside of the *icipe* compound in daylight, my surroundings shocked me. The roads were barely paved with potholes every few feet. Litter rotted in bushes alongside the road, caught in anything and everything. I think what surprised me the most were the stares of others. Walking down the street for the first time, I felt as if everyone was looking directly at me. I was the only Caucasian person on the street. I am not sure what exactly it was I expected, but the constant attention was not something I enjoyed or welcomed. Soon I would learn, this constant attention would follow me everywhere, as for many Kenyans a *mzungu* (Swahili word for white person) roaming the streets was an uncommon sight.

As Dr. Johansson had promised me the day before, the following day he thoroughly explained the Climate Change Impacts on Ecosystem Services and Food Security in Eastern Africa (CHIESA) project. The CHIESA project is a four year project lasting from 2011 to 2015. The project is focused on research and development with the goal of increasing knowledge, building capacity, and developing adaptation strategies to climate change impacts in Eastern Africa. This is accomplished by filling knowledge gaps in climate and land use change impacts on ecosystem services and food security using three transects. The transects are located on the southeastern slope of Mount Kilimanjaro in Tanzania, the slope of Taita Hills in Southern Kenya, and the slope of the Jimma Highlands in Southwestern Ethiopia. The project is funded by the Ministry for Affairs of Finland. After all necessary information is gathered, scientific output is shared to help communities make decisions on adaptation options and tools to enhance their adaptation capacity. My role in the project would be to work with CHIESA's research assistant, Sarah Achola, to develop a strategy of gaining valuable information about climate change from farmers in Taita. We were given two hours of time for two community meetings and were to develop a technique to use for gathering information. The information Dr. Johansson provided me answered many of my questions, yet some still existed, especially about how the second half of my internship at *icipe* would be spent.

Later in my first week, I was introduced to Dr. Fabian Haas, the researcher in charge of the project I would be spending the second half of my internship working on. Dr. Haas received his doctorate from Friedrich-Schiller University, Jena, Germany conducting his studies on the

wing folding in beetles. Dr. Haas has been the head of the *icipi* Biosystematics Support Unit since 2006. My initial meeting with Dr. Haas was speedy and to the point, as I would later learn most things were with him. He explained the Biosystematic Water Monitoring under his project funded by Biovision called Monitoring Environmental Health and Ecosystem Services for Community-based Groups in Kakamega Forest. This project only lasted a year and had goals of evaluating the water quality in Kakamega and helping the local community to institute a pollination garden and educational snake park. My role would come in the water monitoring sector as I would be traveling to Kakamega to perform Rapid Water Sampling, collecting macro-invertebrates to later identify and score in the lab. The biological component of water was assessed because this component best captured the past and present water conditions.

My first week living in Nairobi was a challenging one. The loneliness and differences were something I had never experienced before. The language also posed an obstacle. Even though English was widely spoken, thick accents and different slang was hard to comprehend. Quite frequently people I was talking to would throw in Swahili words as well, forgetting I did not know or speak that language. I found myself constantly grasping for words or parts of sentences and at the end of each day found myself exhausted from simply listening to people. I tried learning bits and pieces of their language, usually failing to pronounce words accurately. By the end of the first week I had learned enough Swahili to greet a young child. I began to find comfort in activities I was familiar with. Morning runs around the compound set me at ease. I became the morning greeter and said good morning to everyone I passed on those runs. The grounds crew began to know me, just through my simple stride.

Finding My Niche

Lingering in the back of my mind was the report I would be writing demonstrating my research and how exactly I had helped food insecurities or gathered information about them. As much as the projects I was working on sounded interesting, I really wanted a project to call my own. I thought long and hard about specifically what I wanted to research and how I would get in contact with the right people. The idea was nagging at me, as I could not find the right balance. One morning on a run, the idea came. Dr. Haas had told me about some water quality assessments he was conducting in a local slum. The section of the CHIESA project I was working on would be a perfect comparison between two areas where communities had similar resources available, but whose situations were different. I would compare climate change impacts on food securities in Taita and in Huruma, both locations shared a common resource, a forested area.

Under the guidance of Ms. Achola, I chose to perform Focus Group Discussions among rural farmers and in a local slum as well. A Focus Group Discussion consists of a meeting with key persons of interest in an area, who have in depth knowledge of the study area or are directly affected by the varying climatic conditions and its consequences. I chose to use the Focus Group Discussion method because when talking in a group, ideas may trigger other ideas or thoughts within others attending the group. A questionnaire would be substantially easier to analyze, however, Sarah and I came to the conclusion a questionnaire would not provide the baseline information we were seeking. We did not want to “put words in the participants’ mouths”, per say.

Sarah and I spent considerable time refining many drafts of our questions for Taita. Our wording had to be precise to convey the points we intended to cover. Dr. Johansson aided us in development of the questions. Many of the people we were interviewing in Taita were not

proficient in English, therefore, Sarah would also serve as the translator, holding the majority of a meeting in Swahili. After many days of revision our questions for the Focus Group Discussions in Taita were finished (Appendix 1). These questions included ideas beyond what I specifically wanted to focus on, for the benefit of the CHIESA project, but also included the questions I found essential. For purposes of the CHIESA project, Sarah and I created a timeline activity to use in the meetings if time permitted. The timeline served to put changes in weather patterns and their effects in order to help us better understand how different changes affected the people.

Setting up a Focus Group Discussion in Huruma, the local slum, was substantially more work for me. This time, I was required to assume the overall planning position, making arrangements for the meeting. One day, I arranged for Dr. Haas to take Sarah and me to visit Huruma. The visit was my first to a slum in Kenya, essential for devising the questions I wanted to ask in the Focus Group Discussion. Even after many days of exposure to unclean city streets, the slum was clearly in the worst condition of anything I had yet to encounter.

For my first visit to Huruma, a park ranger escorted us through the maze of homes and community projects. The homes were positioned literally inches from one another, practically as close together as they could get. The area was littered with piles of trash, as no waste system had been integrated into their community. The piles of trash hid domesticated animals and goats feeding on anything they could find in the pile. On the outskirts of the community, ran a small flowing creek. Community residents used the creek to wash their clothes and other daily items. The water must have been crawling with bacteria, but many of the people did not seem to notice, or have much of a choice. The ranger explained how a recent flood had destroyed their water purification system. The effects of climate change on the community's health were evident.

My visit to Huruma concluded with meeting the local pastor who would assist me in organizing the local Focus Group Discussion. The pastor provided vital information about when and why the slum was created. When planning the community meeting day with him, the pastor informed me the participants would want compensation for the time they spent in my discussion. A simple soda as a "thank you" would not be enough since many people would not be able to perform their miscellaneous day job due to my meeting. I settled on 200 shillings per participant, requesting that those most informed about their households attend. My budget constricted me to only eleven invites. I set a date and time when I would return to conduct the research. My initial trip to the slum was eye opening. As hard as I tried, many of the people lived lives I could not imagine. The trip provided me with some much needed background information to form my questions for Huruma (Appendix 2).

A New Culture

Within my first weeks in Kenya, my colleagues escorted me into the city of Nairobi. Initially the whole experience was quite the culture shock. From the bustling people to the chaotic driving each adventure was a new one. The streets were very foreign, as cars avoided speed limits (if they even existed). Lines dividing traffic were also disregarded with cars zigzagging their way and accelerating when any gap became present. Speed bumps appeared every few meters. I later learned this was the economical way of forcing cars to slow down. I soon came to understand cars were not a necessity in the city, as many used the highly dangerous public transportation system or resorted to walking. Along highways, a constant stream of people walked along the edges, some even crossing the unrelenting flow of oncoming traffic. Cars rode bumper to bumper and a vehicle running out of gas in the very middle of the road was not an

uncommon occurrence. My rides traveling into town scared me at first, but soon I became accustomed to the hectic Kenyan routes.

Food also proved to be a new experience. In the first weeks, I was served a whole fish, staring back at me from the plate. Fresh fruit and vegetable vendors lined the streets, providing a constant reminder of why I was sent to Kenya. The fresh produce became some of the sweetest and most delicious fruits I had ever tasted. On one occasion, traveling back from a weekend trip, we stopped by the largest pineapple plantation in Kenya. Almost immediately after pulling off the side of the road, the car was engulfed by people trying to sell their pineapples to us first. The money we spent on the pineapples would provide these people with the ability to put food on their tables that evening. While devouring the juiciest and most delicious pineapple I have ever tasted, it was hard to imagine that in the village we had just passed, food insecurity was rampant.

Many of my memories in Kenya are marked by the children I interacted with at various places. One weekend I visited a Children's Home where twenty children reside. While playing with the children, I could not help but think how unfortunate all of them were. Regardless, though, each one of the children possessed a happiness I had never seen before. The games, laughs, and smiles I shared with each of them were enough to keep me working hard in the office, striving to improve the security of the very food those children count on and consume.

Weekends in Kenya were marked by various tourist activities. Some days were spent kissing giraffes, holding baby crocodiles, and venturing through museums grasping to understand as much of the culture and history as possible. Even on my weekend trips to the Masaai Market, for example, the eyes of the hungry would follow me. On one weekend trip when shopping for souvenirs, a young girl came up to me begging for money to be fed. I shook my head, empty handed with nothing to give her as I had been given advice to not give the children anything. The girl followed me for a while, with a hopeful glint in her eye. She eventually walked away, as she realized I had nothing I could provide her. However, little does she know, her eyes have continued to follow me, encouraging me to find solutions to help those similar to her.

Understanding

Out in the Field

Taita

The first Focus Group Discussion we held in Taita was conducted at the University of Helsinki Research Station. Before our participants arrived, Sarah and I organized the room in a manner making sense for the discussion to occur. This included lining chairs in rows with Sarah at the head of the room and myself and Dr. Johansson on the sides listening in. My tasks included ensuring names of each participant was collected and note taking/recording the translations. I greeted each of the participants as they entered, welcoming them and thanking them for their time. In order to arrange such a meeting, the village chiefs were required to be present. The presence of the village chiefs may have slightly influenced what the participants said, but for the most part, the meeting went smoothly and the information we were hoping for was gathered. Those who attended the meeting were either farmers or their wives. To encourage people to attend, we offered to pay for their transportation costs. Many may have over estimated their costs of transportation. However, dishonesty, if any, most likely provided another meal for their families. The constant reminder of food insecurity was present.

The second day of meetings was held at a community center in Mwatate. The process was similar to the first day; however more time allowed us to go through the timeline activity

Sarah and I had created for CHIESA. The farmers' memories surprised me, as they remembered years certain pests attacked their crops or times when rains or droughts completely ruined the crops. In my mind, the timeline activities clearly brought to life the food insecurities these farmers deal with on a daily basis.

One afternoon Sarah and I went to hike in the Ngangao Forest, a protected forest many surrounding communities use for resources. The forest area was a similarity shared between the study conducted in Taita and the one I conducted in Huruma. Another day after completing our meeting we visited the local market in Taita. All of the problems in the change in climate and food supply the people had discussed in the days meetings were apparent. The food offered was sparse and not of the best quality—most looked under ripe. The prices at which the food was sold was also high, especially for a community that should have been harvesting their crop at that time.

Taita landscape consisted of rolling hills. Almost all roads were unpaved, taking hours to get anywhere. On the trip back to Nairobi, Dr. Johansson stopped at Tsavo East National Park for a game drive. As one would expect, the beauty of the animals was fantastic. Beyond this, the connections continued to form with what the farmers had explained in the previous days. Drought was rampant and many of the creeks and rivers were completely dry. The animals were suffering without their constant supply of water leading me to think about the people suffering of the people in Taita as well.

Kakamega

Kakamega is located to the west of Kenya. Traveling to the west brought new scenery. Dense, vibrant green vegetation lined the streets and intertwined with sporadic communities. Our work on Biosystematic Water Monitoring was laborious, with daily trips to different sites throughout Kakamega. To reach these sites we hiked through local farms, down rolling hills, and through thick forests. The sites we sampled were in obvious need of improvement. On one occasion we witnessed a motorcycle being washed in the water—the very same water people drank and used for cleaning. At another site we witnessed local farmers herding their cattle through a waterway for drinks. Once again, this water would be later used by local people.

The actual monitoring and rapid sampling process was intensive. We hired a local community member for the day to assist in our studies. Not only did the community member provide valuable labor, but she also shared important information as she seemed to know who used the water sources and for what purposes. The sampling process began with a panoramic picture of the surrounding area to gather vegetation types and other surrounding physical factors. Next, a pan was filled with clear water from the sampling site. While this was being done, another person dug a pile of sediment from within the water source and sifted the gravel through the water, ridding the sample of as much loose sediment as possible. The sample was then poured into the pan and forceps were used to remove any macro-invertebrates found. The macro-invertebrates possessed remarkable camouflage causing us to wait for the sediment to settle before proceeding. The captured macro-invertebrates were put into a vile of alcohol solution, killing them almost immediately. We would repeat this process for about an hour before moving on to the next site. Samples were taken to the lab where identification would take place. The second day of sampling was very similar to the first, with slight changes in order. We traveled to the site in the opposite order, trying to see if the time of day had any effect on the water quality.

Near one of the sampling sites, we visited a local honey harvester. The man revealed the hives to us and explained the process of harvesting. The quality of the water and the ability of the

bees to pollinate local crops went hand in hand. Throughout my studies and experience in Kenya, I was learning in one way or another, everything relates back to the security of the food.

One morning in Kakamega was spent at an up and coming nature conservancy to teach community members about the importance and dangers of the animals lurking in the forest. Huge snakes lined the inside of enclosures. The findings of our research would also be available at this conservancy for community members. Another morning we traveled to the Kakamega Forest, a lush and lively area full of numerous wildlife species. The birds and monkeys were visible throughout our hike. Emerging from the forest, I noticed women carrying firewood on their heads down the road. Women did this to earn money—money used for food. There was no escaping the vitality of food to the people. The sun throughout the day was hot and bright, beating on my back. The women I witnessed went through the same heat, daily. The difference between the women and me—I knew a meal waited for me upon returning to the hotel; a meal for the women was questionable.

Conducting Research

The research I personally organized took place one morning in Huruma, a local slum of approximately 3,500 residents. As the pastor we had talked to on our last visit had promised, he had eleven residents of the slum ready to answer the questions I posed. Different from Taita, we arranged the chairs in a circle; this was possible due to the lower number of people. We thought this arrangement would also make the participants feel at home and open up to us more. A slight problem presented itself when Sarah told the pastor she would be translating into Kiswahili. The majority of the participants were more fluent in their mother tongue, one in which Sarah was unfamiliar. The problem was solved by Sarah translating into Kiswahili and the pastor translating from that into the mother tongue. Some information may have been lost in these translations.

This focus group discussion required money be given to the participants. Participants were unable to perform their daily labor due to attending the meeting and were therefore, paid 200 Kenyan shillings for their time. This money would prove to be vital in feeding their family that night. The participants in this meeting seemed less open and willing to share compared to those who participated in the other meetings. The difference may have something to do with the participant's motives for attending. Those living on the rural farms were highly interested in the solutions the group would bring back, whereas perhaps those living in the slum did not believe their lives could be changed. I learned a lot from conducting these meetings, most of which information is found in the report.

My Time in the Office

The time I spent in the offices of *icipe* varied day by day. The weeks working on the CHIESA project were spent transcribing the tapes of our visit with Sarah. To assist me with future research endeavors, Dr. Johansson arranged for Geographical Information Systems training. In these daily hour long sessions, I learned the basics on how to devise a map for research purposes. Unfortunately, the free version I downloaded would not allow me to create the map I wanted for my own project. Therefore, Macharia, my instructor for the course, helped to create what I envisioned.

The weeks after returning from the field with macro-invertebrate samples were spent in the lab doing identification activities. Without prior experience with macro-invertebrate identification, I sat for long hours attempting to classify the macro-invertebrates into their orders and families. Different identification tools were used and substantial reading took place. After

many hours of observation through microscopes and searching pictures on the internet, I was able to identify most of the specimens. Some of the collected vials took me as much as three hours to classify. However, through my experience studying the unique creatures, I found beauty in them. The macro-invertebrates had abilities and intricate appendages unique to each one. The adaptations they undertook to survive and thrive in aquatic environments when one day they would inhabit the air truly amazed me. Furthermore, Dr. Haas taught me how to use the scoring system with the data we collected. We used a South African scoring system as Dr. Haas had found that to be the most accurate for Kenya based on past research. To finish up the project, I was taken to the Nairobi National Museums one day to help photograph bees in their archives. These photographs would be displayed on the poster in Kakamega containing the data we collected.

Bridging the Gap

Being in a foreign country for so long, I would sometimes find myself thinking everything was very different. I soon came to understand, that beyond all of the noticeable differences, our cultures were more similar than I ever could have imagined. For instance, a parade I witnessed on a morning while out running was similar to other parades. The community rallied around this event and although the streets were not paved, nor was candy thrown out, this event brought the community together, much like parades do in the United States. One weekend I traveled to the Westlands, a westernized district, where I visited a mall similar to those in the United States. I ate lunch at a food court, watched a movie, and grabbed an ice cream cone. There were still differences present, for instance, waiters served those in the food court and my ice cream cone did not taste like ice cream, but the ideas were similar, a place where families and teenagers could come on weekends to relax.

While working in the office, I found myself bridging gaps in American culture as others filled me in on the Kenyan way of life. Many times I received questions regarding what people had viewed in movies—prom, football, and foods. I rarely completely denounced what the person had seen. Some movies have done a decent job at depicting American life. Kenyans were also always fascinated with President Obama, since President Obama's roots are in Kenya. His picture was found on almost every street, advertising different products. President Obama's image was prevalent more in the Kenyan streets than I ever would expect to see in the United States. Throughout the week I would bring in small presents from the United States usually consisting of food. The familiarity with subjects I have known for my life felt good. I also found relief in sharing my culture with others.

Appreciating

Mombasa

After one of my advisers at *icipe* read my resume and saw my interest in marine sciences, she immediately thought of sending me to Mombasa to see what the Kenya Marine and Fisheries Research Institute (KMFRI) was doing with regard to food security issues. In order to travel to KMFRI, I was required to send a letter to the institute to approve my stay for the week. After the approval, I began a week long internship at KMFRI. KMFRI is divided into multiple research programs including aquaculture, environmental ecology, socio economics, fisheries, natural products, and information and database management. As I toured the labs and talked with scientists about the research they were conducting, I found many links to what I had known from the past and what I had recently learned at *icipe*. For instance, one scientist discussed socio

economic ways they surveyed local fish farmers to determine how the fishing was progressing. One of these ways was conducting a focus group discussion, something I am very familiar with. Another scientist discussed the changing climate and how mangrove destruction could be playing a part in it and how it was affecting the fishermen. Each component of the ocean is interrelated. From the ongoing study of food security issues, I have unconsciously made links back to the ability of families to have another meal.

Mombasa also brought with it a new culture to delve into—Swahili. Beyond my time spent learning at KMFRI, the lady I was assigned to took me out to explore Mombasa. I was able to get a holistic feel for the city from my tour of Old Town, Fort Jesus, and a snorkeling excursion. The snorkeling excursion also brought additional opportunities to learn as I met with a lady running a mangrove coral garden for tourists. While not only saving the increasingly depleting mangrove forests, vital for the production of fish, the woman is making money from a tourist attraction, giving her the ability to feed her family. My stay at KMFRI opened a new realm of possibilities and proved to me I can continue studies in marine environments while also helping people to have a secure food supply.

In the Eyes of a Child

During my internship a colleague of mine's husband, ran a primary school, Little Prince Primary School, in the second largest slum in Africa, Kibera. After attending a benefit dinner for the school one Friday evening, I was eager to actually go to the school and see the students interact, play, and learn despite their impoverished circumstances. Little Prince was under a non-governmental organization called Our Valuable Children. The school is private and, parents apply to have their children attend the school. Being from a slum, most parents cannot afford the entrance fees, so all of the children are supported by donors. However, more parents apply to have their children attend the school than are actually accepted, thus turning away many children due to space and monetary restrictions.

When I first arrived at the school, a social worker allowed me to tag along on her home visits for the day. After touring Huruma, I was expecting similar circumstances. The circumstances in which people reside in Kibera were even worse. We crossed a very small stream, the only water source for thousands of people, busting with contamination from washing clothes and dishes. Piles of trash lined the dirt path we walked on. The trash had clearly been rotting for weeks, if not longer, as the smell was retched. Having seen the corrugated metal one-room "homes" in the past, was one experience. Stepping inside of them and sitting down to talk with the families was eye opening and something completely different.

Inside the shacks, furniture was packed in. One mother explained how she slept on the mattress while her children took the couch. A small fire burned in the middle of the shack as an area for meal preparation. The small and random tasks performed for money to feed the families sounded labor intensive and substantial compared to what the families receive in payment. There is hope for these women associated with Little Prince, however. Workshops are available to learn new trades and attempt to rid their families of the never ending cycle of poverty.

When interacting with the children at the school, each one was so happy and energetic. They played as if they had no idea that the way they lived their lives were some of the worst throughout the world. I witnessed their lunch period. My tour guide explained to me how many of the children only came to school to receive the lunch. For some, the lunch was their only meal throughout the day. Thinking carefully about what I saw and learned throughout the day gave me

a better understanding of the impact food insecurity really has on people. As hard as I tried to put myself in the position of the children and families I met, I cannot even imagine such a life.

Immersion

I took any opportunity that presented itself to become fully immersed into African culture and customs. Most weekends I was taken to church with a fellow colleague. The church held true to all stereotypes of African church services. People sang and danced their praise. The sermon was even shouted into a microphone. Even with these African stereotypes holding true, there was a welcoming nature to everything I experienced in Kenya, something so new and different from any other cultural opportunity I have experienced. Their ability to welcome me with the openness of their arms took a while to understand and become accustomed to. By the end of my trip, I was not surprised when visiting a home and a full course meal would come out, prepared especially for me. Even the willingness of people to take me around and show me truly what their country has to offer, was astonishing.

The adjustment to the African lifestyle was a challenge at first. Never in my life had I experienced people showing up two hours later than they had advised me, taking frequent breaks throughout the day, and walking at the most leisurely pace possible. The time has taught me not everything in life has to be fast paced. Although this lesson did take me two months to learn, I have finally figured it out. The African culture embraces the time spent stopping to smell the roses and because of it their culture is rich.

The fullest immersion came on a weekend camping trip. I was encouraged to watch a goat slaughtering. Wanting to experience Kenyan culture to the fullest, I witnessed the event as it occurred. Sparing the details let me say it was sad and my eyes were tightly closed for a majority of it. Also on this weekend trip I saw flamingoes and the hot springs of Lake Bogoria, climbed Mount Longonot, and viewed the beautiful Rift Valley. So much beauty resides in Kenya, making the constant reminders of the starving that much more vivid.

I had the chance to visit a boarding school of a sibling of a fellow colleague. After exiting the car, I noticed a majority of the people surrounding me were staring. I had drawn much attention from the entire campus. It was not until someone told me I was probably the first Caucasian person many of these people saw, that I realized why everyone was looking at me. Then, a very young boy came up close to me. He stared at me for a while, mesmerized by my skin color. I gently stuck out my hand, greeting him with, “*Sasa.*” He still didn’t respond. Not believing his eyes, he reached out his hand and touched my skin, making sure I was real. The whole experience was completely new for me, but made me feel as if I had officially become a part of Kenya.

Throughout my stay, I began to look forward to my weekend trips which gave me a new perspective on the lives Africans lived daily. These glimpses led to further discoveries in why food was insecure or how people were combatting the issues. The trips also showed me the beauty Kenya had to offer. On one trip we traveled to Fourteen Falls, nestled in a rural community. Excitedly, our group climbed across the falls in knee deep water. The climb was a challenge, attempting with every step not to fall in. The Falls were more than a beauty, however. These Falls provided basic food for the surrounding communities as witnessed by the man I saw carrying a fish back to his family on a drive along the road.

Celebrating

A Look Forward

Many days have passed since I returned from Kenya. A part of me continues to believe the experience was just yesterday, while another part convinces me my travels are a distant dream. Most days the experience does not even seem real. Before going on the trip I was told the experience would change me, I never thought it really would change me. I knew the sights, smells, and feelings I would experience would have an affect on me, but I never could have imagined the changes I still grapple with today.

Since being in Africa a plate of food has never looked the same to me. There is simply no other way of stating this. Regardless of the mounds of food and endless supply of ice cream I have the opportunity indulge in at the cafeteria, my plate remains pretty consistent. However, one thing is always the same. When I turn my plate in for dishwashing, the surface is cleared completely. When people around me waste food, I am no longer hesitant to speak up. Everyone has heard the cliché statement about wasting food and children starving in Africa. After my summer experience, I know this statement could not be truer. Needless to say, the people I eat dinner with are now substantially more aware of taking only the food they plan to consume.

Throughout my two months spent in Kenya I did what I could to help food insecurity issues. The research I was part of is continuing today, waiting to be finalized and published to be shared with the communities in which I worked. Although climate changes are inevitable, the research performed and solutions offered will, at the very least, help people better adapt to the changes. Beyond the solutions I was part of, I look forward to reading the results of Dr. Johansson and Dr. Haas.

The two months I spent in Kenya were fantastic, however, my efforts will not stop there. My major has not changed, as I am still entering the field of marine biology, but what I plan on doing with that degree is continuing to evolve. As of now, I am not completely sure where I am headed. But Kenya had an everlasting effect on me, so my experiences there will somehow play part into my future. Whether my career is increasing the productivity of fish farmers or teaching local communities with food insecurity about harvesting invasive fish species, solving problems of food insecurity has become a goal.

Even though my trip was primarily about food security, living in Kenya taught me more than I ever could have imagined. Constant reminders of the people and experiences I had there are everywhere. For instance, a picture of me with Kenyan children is the screen saver on my phone. This may seem like a minute detail, but there are too many nights to count, it is a picture of those children that convince me the education I am pursuing and the perfection I am striving for is worth all the hard work. I have so many opportunities waiting ahead of me whereas those very children have few; the children are enough inspiration alone to be the change I wish to see in the world.

During many meals or daily conversations I find myself slipping back into African stories, telling the people I meet with about my experiences over the summer. Explaining the poverty I saw constantly or the amazing people I met is a constant reminder of my trip. By being in Africa for an extended period of time, I feel as if I have embedded part of their culture forever with me.

Coming back to the United States was an adjustment. The roads seemed smoother, I could mindlessly have conversations with people, and the pace of life sped up drastically. No one stares at me as I walk down the streets anymore. As nice as it is to blend in with the crowd, a chorus of children following me with, “*Mzungu, how are you?*” was always a welcome greeting.

Even though these children no longer greet me with every step, little do they know, their voices still follow me and remain uppermost in my thoughts. The children are still hungry, and I am still hungry to find solutions.

Pictures



Huruma Slum: Location of Focus Group Discussion



Conducting a Focus Group Discussion in Huruma



Listening and Recording Information from Participants



Identifying Insects for Biosystematic Water Sampling



Children Who Touched My Heart



Fourteen Falls

Climate Change Impacts on Food Security and Livelihoods in Kenya

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Abstract

Climate change is an increasingly important issue affecting many different communities throughout the world. The following report focuses on rural farmers and city slum inhabitants and how climate has affected their daily life, food security, and livelihoods. The data presented is derived from focus group discussions in three different parts of Kenya. Data includes information on how the communities are changing overall, the current security of food, the livelihood of many inhabitants, and how these communities are or are not adapting to cope with the changes present. The report focuses especially on the relationship between climate change and the security of food. The data presented and analyzed supports the major hypothesis that climate change is having a drastic impact on communities in Kenya irrespective of whether people live in a slum or rural area. Furthermore, the study supports the proposition that climate change is an event affecting many people worldwide. The report is the first step in gaining baseline information on how climate change and food security are related.

Keywords

Wundanyi • Mwatate • Huruma • Climate Change • Food Security

Introduction

Food insecurity is an increasingly serious problem throughout the world. Even though many of the causes of food insecurity are currently known, more research is necessary to fully understand all of the causes for food insecurity and how it effects communities in which it is prevalent. The specific aim of the study is to gain vital information on how climate change is affecting the food security of people and strategies used to cope with the ever-changing climate. Based on the information gathered an assessment will be made to determine if communities are coping with food insecurity in the best possible manner.

Past studies have shown that when not asked directly, households attribute other factors to their food insecurity (Mertz, et al.). In a study done with farmers in Easter Saloum, the participants did not mention climate as a main concern when groups were asked to identify both the main positive and challenging aspects of village life (Mertz, et al.). However, these studies did reveal that the communities strongest concerns were the winds, which are climate related (Mertz, et al.).

To deal with climate change, there are two fundamental societal options—mitigation and adaptation (Fussel). Mitigation is limiting global climate change by reducing emissions of greenhouse gases (Fussel). Adaptation consists of actions targeted at the vulnerable system in response to actual or expected climate stimuli (Fussel). According to one study more focus needs to be placed on mitigation because adapting now involves risks as insufficient information about future conditions may limit the effectiveness or increase the cost of the measures adopted (Fussel). The main barrier to mitigation methods is the lack of reliable meteorological data (Ziervogel, Zermoglio). Another study preformed in the Limpopo River Basin in South Africa found large households are more likely to adapt (Gbetibouo). The adaptation may be due to more

labor (Gbetibouo). The study also revealed off-farm income makes adaptation methods more affordable (Gbetibouo). Most communities have no other choice but to adapt to the changing climate. Without adaptation, climate change would be detrimental to the agricultural sector (Gbetibouo). As another study found over 60 percent of Africans remain directly dependent on agriculture and natural resources for their wellbeing (Ziervogel, Zermoglio). Many barriers to adaptation are present as well (Gbetibouo). These barriers include poverty, lack of access to credit, and lack of savings (Gbetibouo).

Methods

The study was conducted using a focus group discussion. Focus group discussions consist of a meeting moderator posing specific questions to a group of individuals who are permitted to respond to the questions in any way they desire. The discussion participants are encouraged to fully participate, but have the opportunity to choose when they want to provide their input. Focus group discussions held in Wundanyi and Mwatate were conducted with the moderator standing at the front of the room and the participants seated in chairs facing the moderator. The discussion in Huruma was held with the participants sitting in a circle of chairs, the moderator was also included in the circle and asked questions of the participants. The method of using a focus group discussion to collect data was chosen to gain baseline information about the challenges and opportunities the communities are facing with the changing climate, or to establish if they noticed the changing climate. Focus group discussions also allow for group sharing of ideas, in which the ideas of others have the potential to trigger other thoughts or comments by other participants. Focus group discussions in Wundanyi and Mwatate were both conducted in Kiswahili and then translated into English. The focus group discussion in Huruma was conducted in a mixture of Kiswahili and the local tongue with translation from the local tongue to Kiswahili to English.

The focus group discussions were held in two main areas—Taita (Wundanyi and Mwatate) and Huruma. In Taita, the focus of the discussion group was to understand rural farmers' perception of climate change and community change. In Huruma, the focus of the discussion group was the general populace, often day workers who switched jobs on a daily basis. Taita was a rural community, whereas Huruma was a slum located near Nairobi. In addition to the differing locations and viewpoints, the two locations were chosen due to the resources each had available to them. Each community is located near a forested area, thus each

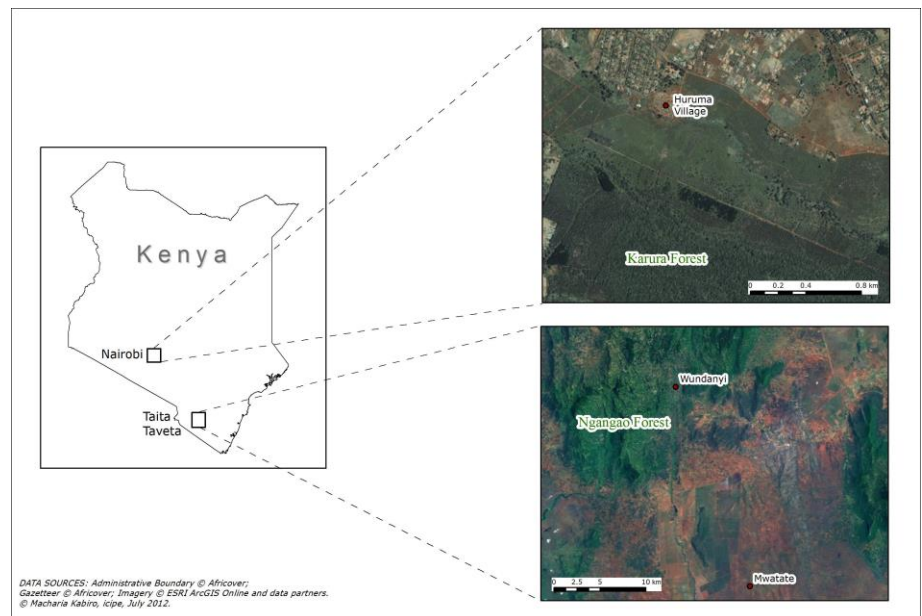


Figure 1. Taita and Huruma, the two focus group discussion sites.

shared a prominent natural resource. Figure 1 below shows the locations and resources available to each community.

Results

In all three focus group discussions the participants noted they had experienced change in the past twenty years. The changes and reasons for these changes differed among study sites.

In Wundanyi the valleys once full of water, are said to have dried up. This was the same case in Mwatate where participants noted rivers and wetlands reducing in flow and/or drying up. Water seemed to be a common change in Wundanyi as a certain type of tree that previously dripped water no longer does, along with a certain type of insect that dripped water as it flew by. Now the insect is said to be observed only infrequently. The Mwatate group attributed an increase in temperatures to an increase in evaporation in the area.

Members of the Wundanyi focus group discussion who are inhabitants of Werugha used to depend on Kishushe for food but currently the supplies have diminished. Previously the cassavas harvested in the valleys were quite large in size, however the size has now diminished. A bean crop recently has been affected by a disease causing the crop to dry up. Participants added that banana plants are also drying up as well. One farmer noted he had avocado trees with productivity on one side of the tree but not on the other. The avocados have also been falling before they are fully ripe. Tomato farming has been abandoned due to a bacteria affecting tomato plants. Food prices have increased in Huruma. The productivity of the farms in Huruma also experienced a decline. This change in productivity was attributed to soil erosion.

With the increased use of fertilizers and pesticides, the Wundanyi participants believe they have killed off insects which were useful to them in the past. Whereas in Mwatate, participants noted planting crops without use of pesticides to control pests made it difficult to obtain the needed productivity.

In Wundanyi, participants noted there has been a change in the predictability of seasons. Seasons, which were well defined in the past, now are not well defined and it is difficult to determine when they begin and end. One participant noted that they have lost the indicators used to discern the seasons in the past. Participants added that this unpredictability led to confusion about when to plant and harvest their crops and which crops to plant and harvest because they could not determine how long the rains would last. The question of what these indicators were in Wundanyi was put to the forum. Responses varied from bird calls and flights to warn of coming rains to flowering trees indicating the onset of rainfall. Changes in seasons were also mentioned in the Mwatate focus group discussion. There, participants previously experienced two rainy seasons (a long and short), now they perceive a reduction in the amount of overall rainfall received in the area.

Participants in Wundanyi mentioned western cultures such as Christianity interfering with their traditional cultures. As a result, sacred areas with indigenous trees were cleared to pave way for land cultivation. Removal of trees was also mentioned in Mwatate, but not for religious reasons. Land use for farming has changed in Huruma. Participants noted that in the past they had larger areas to farm. Now, people have resorted to farming on road reserves, swampy areas, and use of multi-storied garden sacks.

In Mwatate, participants noted in the past, after a harvest, harvested crop could be found in storage from the previous season's harvest.

Participants in the Mwatate focus group discussion mentioned an increase in settlements leading to a growth in their population. An increase in population was also mentioned in Huruma, with the increase said to be about 2,500 people between 1979 to the present. In

Huruma, the participants noted the increase in population led to an increase in problems and the ability to feed the community.

Additional changes in the past twenty years noted in the Huruma focus group discussion were identified as follows: fencing put in surrounding the forest, cost to use toilets (two shillings), an increase in men and women support groups, fish farming instituted, beehives established with plans for honey refinery in the future, elementary education is more available with more students proceeding to high school resulting in an increase in graduation rates, electricity supply available, accessibility to the slum reduced, use of plentiful firewood from the forest, and overall water quality has decreased.

In the focus group discussions a question was asked whether changes had been experienced in terms of climate change. Within all three discussion groups, they unanimously agreed there had been changes in the climate. In Wundanyi the changes included disappearance of birds, maize crops affected by emerging diseases, increase in the number of insect pests affecting vegetables, and a change to use both of the rainy seasons for farming purposes. Mwatate changes in climate dealt with the rainfall amounts greatly varying from what the participants experienced in the past. For example, in 2011, the rainy season started in Mwatate in September and ended in December and its intensity was very strong. In the current season, participants said they have experienced very low rainfall. Additionally, rainfall has been unpredictable. In Huruma rains were mentioned as a change stating that long rains in the past normally occurred from April to May and short rains from October to November, but presently the slum experiences long periods of dry weather. Present rainfall is said to have an extremely high intensity which results in destruction of destroys their crops. According to the participants, seasons in Huruma have also changed. The cold season used to begin in June but presently starts in May and lasts until September.

All focus group discussions experienced changes in terms of economic activities and livelihoods. The Wundanyi focus group discussion spoke of the following changes: increased cultivation of vegetables in wetland areas and areas surrounding springs, poor farming practices on hillsides with an increase in farms on the hillsides, seeds for planting must be purchased whereas in the past they were not, diversified crops planted, recent emergence of new crop diseases, fertilizers used to increase harvests, and productivity of soils resulting from fertilizer use has diminished. The Mwatate focus group discussion spoke of the following changes: small groups of women establishing small scale businesses to supplement their income due to low farm production, goat rearing now occurring in the Mwachabu location, fluctuation in market prices made incurring losses highly probable, charcoal burning activity begun to earn a living, prostitution is on the rise as young girls sell their bodies to obtain food, destruction of the family unit due to inability to make ends meet, increase in alcoholism, reduction in food indigenous to the area, and job scarcity resulting in disillusioned and disrespectful youth. In Huruma, participants noted the following changes: the community experienced a phase out of coffee plantation which was previously their main source of livelihood, productivity of farms has diminished, balanced diets are harder to obtain which participants attributed to an increase in food prices, and community members have shifted focus to become casual laborers. In the Huruma focus group discussion, participants attributed a negative change in health to an unbalanced diet. Participants also noted a change in the availability of obtaining food, as not only were food prices increasing, but farm sizes have drastically decreased as well. One participant mentioned in the past, two kilograms of maize flour cost 75 shillings. Now, that same package of maize flour is 130 shillings.

Changes in land use and quality of the land were experienced in Wudanyi and Mwatate. Participants of the Wudanyi focus group discussion noted an increase in soil erosion due to a change in livelihoods. Additionally, farm areas bordering towns have been converted into rental housing facilities so owners can earn an income. Participants of the Mwatate focus group discussion noted that terracing has stopped on the hillside and farmers no longer dig trenches to guide water flow. Trees have been cleared to make way for land cultivation. In both Taita focus group discussions participants stated there has been an increase in land subdivision leaving less land available to fallow.

Participants in all three focus group discussions were in unanimous agreement that the changes incurred were gradual with an overall negative effect. Figure 1 depicts the various responses received when we inquired about different mechanisms the communities are using to cope with the changes in land use. A question regarding other available mechanisms not current in use was also posed to the groups. However, no responses were given to that question.

	Wudanyi	Mwatate	Huruma
Activities used to cope with changes	owners building rental housing on farming land for extra income	oxen used to plow land	formation of women's groups
	rock harvesting for basalt		resorted to beadwork
	planting Napier grass instead of farming	early land preparation	sell firewood for money
	increase in number of people seeking education		
	new strains (early maturing) of maize planted in highlands	opened small scale businesses to increase income	use grass from forest for livestock
	farming in greenhouses		

Figure 2. Different mechanisms communities are using to cope with changes in land use.

The changes in climatic conditions and weather patterns affected the communities in different ways. The discussion groups in Wudanyi and Mwatate divided these into three categories – agriculture, land use, and economic activities and livelihoods. The participants of Wudanyi have made various changes to their planting methods. For instance, new strains of bananas have been brought, farmers have stopped rotational planting of crops, and farmers are planting crops which are not dependent on rainfall. The agriculture in Mwatate has changed in that productivity has declined. The farmers have made other changes such as using fertilizer. The participants noticed an increase and emergence of new types of insects and a suspected increase in soil acidity. From the land use perspective, Wudanyi focus group participants stated land previously used for cultivation is currently being used to build housing facilities. Also in this community, basalt harvesting has increased and fish farming has increased as a substitute for crop farming. The Mwatate community found changes in the farmers' rearing practices. Where cows used to be reared, camels were not previously present. The participants felt camels were destructive to the environment because they consumed everything. These participants mentioned how elephant invasions had increased over time. The final point of interest was that of economic activities and livelihoods. Wudanyi participants explained how youth were taking up motorcycle riding as an alternative form of employment. They also noted an increase in charcoal burning. Those in Mwatate noted the prices of goods have gone up causing many to buy produce from uplands as productivity in the lowlands has diminished.

Those in Huruma were asked similar questions, applying the ideas of inquiry about where the community members bought their food and how the types of food consumption had changed over time. Beyond the participants noting the increase in food prices, the types of food have changed moving away for indigenous vegetables due to the reduction in availability. Altogether, the availability of food has changed in this area. The participants explained that in the past they tilled their farms to acquire enough food for subsistence, whereas today, they are forced to buy their food. Participants noted that in the economic sense, the escalating prices have caused businesses to shut down.

Climate change has brought challenges and opportunities for the communities. In Wundanyi challenges include an increase in food insecurity and poverty, an increase in crime rates, a decrease in population growth, an increase in HIV, deterioration of interactions between community members, and an increase in accidents. One community member noted an increase in suicide rates because added pressure has been put on men to provide for their families. Another community member noticed an increase in pregnancies, as some girls are selling their bodies to obtain food. Although pilot projects were said to have started up in the area, most of these projects were abandoned. The participants in the Mwatate discussion had a somewhat varied response. They found challenges to be an increase in the number of trees being felled, an increase in insect pests attaching to plants, a reduction in the size of pasture, and women taking on jobs not traditionally meant for them. When this question was posed directly to Huruma, the community members focused on the opportunities the changes brought. These opportunities included a water plant for water purification, a school being built in the area for education, and a decrease in illegal logging due to a new fence imposed around the forest. These changes empowered women in Mwatate to go out and find work on their own. In Wundanyi, participants believe fish farming has been accepted and farmers diversifying their crops diversifies the diet of community members.

Coping with the climatic changes was yet another process. The people of Wundanyi coped with the changes through formation of youth and women groups. These groups would help them in accessing loans to start small scale businesses. Other participants noted some individuals began illegal businesses like selling drugs. Most community members have also taken up farming to cope with the changes in food supply. Mwatate dealt with the changes by increasing the number of businesses in the area.

Consistent among the three focus group discussions, none of the groups had financial savings of any type in case of a disaster or extreme climate conditions. In terms of receiving help at the current time, the government was said to have started a few organizations or incorporated a few organizations into some of the communities. Money in Wundanyi was allocated from the Constituency Development Fund (CDF) to build a dam for holding back water. Fish farming in this area was supported through the Government Stimulus Plan. A school feeding program was also set up in the community by a non-governmental organization. The government did supply food relief in Mwatate, but the amount supplied was not sufficient for the households. Other non-governmental organizations in the area were at work, such as World Vision and Orphaned and Vulnerable Children. In Huruma, the government had done little or nothing to assist the people with food security.

Assistance within communities was inquired about during our discussions. Generally, all of the focus group discussion participants explained help was given—conditionally. Whereas in the past help was always given, the participants explained how with diminishing food supplies, help only occurred during times of death and sickness.

Actions were taken in both Wundanyi and Mwatate to deal with the farming. In Wundanyi farmers switched from planting food crops to planting Napier grass for sale. They also took up dairy farming and opened small-scale businesses to supplement the family's income. In Mwatate the participants noted the increase in dairy farming for production and sale of milk. The change in farming was not inquired about in Huruma. Instead the topic of discussion centered around actions taken to deal with the local impacts. The responses varied from supplementing their income with casual labor, setting up small grocery stores, and doing beadwork. Those in Wundanyi learned about the changes through the Ministry for Agriculture and Ministry for Livestock extension offices. Individuals in Mwatate learned through different extension offices and non-governmental organizations. Huruma's participants learned through development schools and apprenticeships.

Discussion

Throughout the studies a clear distinction has been made that the climate is changing and a side effect is the change in food security. In every focus group discussion held, participants identified a change in climate. The climate change was identified as negative and gradual. Through the evidence provided, it became clear the changes are affecting the people in drastic ways. While we cannot draw a causation relationship between the climate change and its impact on the people, a vital relationship can be drawn as different attributes are attributing to the problem.

As stated earlier, Wundanyi reported a change in the amount of water available. The amount has declined in recent years. This decrease may be due to changes in climate and overuse of the land. A change in the amount of rain as well as lack of predictability was reported. In Huruma, rains often destroy the crops, having a direct effect on the food. The change in water availability may also be a prime cause of food insecurity issues being experienced in the area. If farmers lack water to irrigate their crops, harvests will be decreased, providing the community with less crops and a depleted food supply.

Farmers also reported struggling with the seasons. According to the community members, seasons are changing and substantially less predictable than they were in the past. Rainy seasons, and seasons in general, have changed causing confusion for the farmers about what to plant and when to plant and harvest. With the serious unreliability and "guessing game" farmers are experiencing with their crops, they are struggling to produce foods more than they ever have in the past. These changes in weather patterns are most likely due to climate changes. Whether climate change is contributing to weather patterns or not, the risk the farmers take is using unstable indicators. Indicators based on tradition are, as expected, naturally not very accurate. The predictions could be one of the forerunning problems in predicting the seasons and rainfall amounts.

When discussing land use, the issue of frequent loss of trees and ongoing deforestation was discussed. Not only could this be further increasing and impacting climate change, but loss of forested lands has other negative effects on land area which may in turn cause additional issues with harvesting of crops. In some cases with the study, the responses are challenging if not extremely difficult to compare. Questions about land use is one circumstance which was difficult. Participants of Taita focused more on how crops were affected whereas Huruma focused more on discussing general observed changes in the land.

A change in climate, economic activities and livelihoods was reported during all focus group discussions. Although, as stated earlier, we cannot infer causation, we can infer a relation between climate change and economic activities and livelihoods. In Huruma, an increase in food

prices and availability of food leads to food insecurity. If people cannot afford food because it is too expensive, they will not purchase it. If food is not available, prices will rise. The cycle appears to be never ending, unless something is capable of stopping the cycle. Altogether, climate change is one of the driving factors in this never-ending circle. Farming, especially for those living in the slum, is no longer an option. There is no space to grow crops and what little space people had was overtaken by the government for use. Since no space is provided for farming, residents of the slum are forced to purchase their food from small shops. However, food prices have risen and will continue to rise. With a decrease in food supply, those in markets who purchase food to sell, have less food to choose from for purchase and spend more to purchase the food they sell. In order to compensate and maintain their income, vendors raise prices for consumers in the store or markets. When people cannot pay inflated prices, the store cannot sell food and the business will eventually shut down. Food becomes scarce and no longer available for purchase. The community experiences severe food insecurity. Food price increases cause consumers to purchase the cheapest, readily available food which usually is the unhealthiest food. Unhealthy food leads to unbalanced diets. Lifespans begin to decrease due to improper nutrition.

The study demonstrated that food insecurity not only has an effect on health but also causes many relationship issues. Food fuels humans each and every day. The nutrients in food are essential to life. Therefore, when food substances are unavailable, people will take actions, often times putting themselves at risk, to compensate. In Mwatate, prostitution has recently become a reoccurring problem. In Wundanyi, community members compensate through selling drugs. If climate change is the driving force of food insecurity, the change in climate is also affecting social structures of society. The security of a person's food can lead to broken relationships and struggles with some important interactions. Tense and broken relationships make communication harder. When struggling with communication, problems are virtually impossible to solve. Therefore, a reoccurring theme of a never-ending cycle of food insecurity, if not broken, will continue to worsen over time.

The communities involved in the focus group discussions are slowly adapting to the changes. Wundanyi farmers have shifted from planting cabbage and kale to planting French beans, peas and beet root—crops that are not rainfall dependent. Farmers in Mwatate are resorting to fertilizers. The varied measures of adaptation questioned why all communities were not using all the measures of adaptation available. Other methods not currently in use appear to be known. However, in some communities participants were not aware of any other methods of adaptation. A lack of knowledge and education can be the reason behind this phenomenon. A lack of funding may also play a large part in the failure to use other methodologies.

Although communities are taking measures to adapt, if climate change continues, these measures will no longer be valid to address overarching issue. Even though communities are adapting, their techniques of adaptation and the way climate change is affecting them varies widely. For instance, when asked about challenges and opportunities in climate change, those in Wundanyi focused on the changes in a social setting whereas those in Mwatate focused on changes from an agricultural and food security perspective. The data presented may point to a higher concern for food security issues in Mwatate because those issues are the ones the participants we most concerned about. Whether this is actually the case or not, the varying effects and changes due to climate mean solutions will also need to vary.

Some general trends were apparent throughout the study. One common example throughout the responses was that little to no government assistance was observed within the

study areas. Most communities coped with challenges through non-governmental organizations. No government assistance was reported in Huruma. Government tactics were reported to be of no help or not applicable. If the government soon does not step forward to assist in an effective manner, entire economies could be badly hurt. The non-governmental organizations were reported to be somewhat helpful, but as was observed in Huruma, these organizations would arrive for three years, establish a program, and ultimately abandon it leaving the people to attempt sustainment of the program. The community members lack the knowledge, resources, or funding to continue the programs in most cases.

A few sources of error should be noted in the study. Language was constantly translated and through translations, the meaning of words or a few key points may have been lost. This is especially the case with the study in Huruma, where language was translated twice before being recorded. At the focus group discussions in Taita, in order to conduct the meetings, chiefs of the villages insisted they be present. Although we have no statistical data to support this, the chiefs may have had an effect on how much or little the participants shared with us.

Some general observations about the participants at of the meetings should also be noted. In Huruma, participants seemed more timid and less open than those in Mwatate and Wundanyi. At the Wundanyi focus group discussion, the participants really wanted answers to their questions and hoped to understand how studies being done would help them. Their eagerness proved the importance of food security to their community and family. Participants would often attribute other occurrences to changes in climate and connect the two. For instance, elephants in Mwatate and deteriorating use of land were connected due to the changing climate. In some cases the connections would not connect logically, however, the data was still recorded in the way it was reported.

In conclusion, climate change is having a widespread effect on the food security of people in Kenya and is also frequently their livelihoods. Strategies have been devised to cope with the changing climate and to provide communities a sustainable amount of food, however, due to varying reasons the communities are not implementing the coping mechanisms or, in some cases, the coping and adaptation mechanisms are not long term solutions. The research presented is foundational information upon which further studies can be developed and conducted in Kenya.

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Appendix 1

Semi Structured Questions for Taita (Wundanyi and Mwatate)

1. Has the village changed in the past 20 years? If yes, how has it changed and what are the reasons for these changes?
2. Has the village experienced any changes
 - a. In terms of climate conditions (if yes, please explain and give more details)
 - b. In terms of economic activities and livelihoods (if yes, please explain and give more details)
 - c. In terms of land use (if yes, please explain and give more details)
3. Have the changes been gradual or sudden?
 - a. Are the changes positive, negative, or neutral?
4. Has the community taken up any activities to cope with the changes? If so, what kind of actions have been taken and what kind of tools/methods have been used? If they have not been used, what is the reason for that?
5. Have you experienced any change in climatic condition or weather patterns in your village within the past 40 years? If yes, what kind of changes?
6. How has the changes in climatic conditions or weather patterns affected you?
 - a. In terms of agriculture (if yes, please explain and give more details)
 - b. In terms of land use (if yes, please explain and give more details)
 - c. In terms of economic activities and livelihoods (if yes, please explain and give more details)
7. Which challenges and opportunities have these changes brought?
8. What have you done to cope with these changes?
9. Have you utilized any opportunities that have arisen from the changes in climate? If yes, please explain in detail.
10. Which types of households are affected by the climatic conditions and weather patterns and how? Who in particular was affected? Where are these households located in the village?
11. Which parts of the village are the most affected ones? Why are these areas more vulnerable than the others?
12. Does the village have any savings in cash or in kind to be used in terms of disaster or extreme climate conditions?
13. Has the government launched any activities to help the affected households? If yes, please explain.
14. What are the main economic activities carried out in your village? Are there any other economic activities available? What economic activities are you carrying out?
15. Has the profitability of any economic activities or livelihoods changed due to the impacts of climatic conditions?
16. In the past 20 years, have there been any new economic activities introduced in your village? If yes, what kind of activities and by whom?
17. In the past 20 years, have some economic activities disappeared from your village? If yes, what kind of activities? Why have these activities disappeared?
18. Do the community members support each other during bad and good times? If yes, please explain.
19. Have the households in your village taken any actions to deal with the impacts of climatic conditions or weather patterns on farming? If yes, what kind of actions?
20. How did the households learn about these actions? Were these actions taught at schools or by extension agents?
21. Are there any options to cope with the experienced impacts that could have been taken up but were not? Why?

Appendix 2

Semi Structured Questions for Huruma Slum

1. Has where you currently live changed in the past 20 years? If yes how has it changed and what are the reasons for these changes?
2. Has where you currently live experienced any changes
 - a. In terms of climate conditions (if yes, please explain and give more details)
 - In the past 20 years?
 - In the past 30 years?
 - b. In terms of economic activities and livelihoods (if yes, please explain and give more details)
 - c. In terms of where food is bought, received from, and the availability thereof (if yes, please explain and give more details)
 - d. In terms of health (if yes, please explain and give more details)
3. Have the changes been gradual or sudden?
 - a. Are the changes positive, negative, or neutral
4. Has where you currently live taken up any activities to cope with the changes? If so, what kind of actions have been taken and what kind of tools/methods have been used? If they have not been used, what is the reason for that?
5. How have the changes in climatic conditions or weather patterns affected you?
 - a. In terms of where your food is bought/received (if yes please explain and give more details)
 - b. In terms of what kinds of foods you are eating (if yes please explain and give more details)
 - c. In terms of the availability of food (if yes please explain and give more details)
 - d. In terms of economic activities and livelihoods (if yes please explain and give more details)
6. Which challenges and opportunities have these changes brought?
7. What have you done to cope with these changes?
8. Have you utilized any opportunities that have arisen from the changes in climate? If yes please explain in detail.
9. Does where you currently live have any savings in cash or in kind to be used in terms of disaster or extreme climate conditions?
10. Has the government launched any activities to help the affected households? If yes, please explain.
11. What are the main economic activities carried out in where you currently live? Are there any other economic activities available? What economic activities are you carrying out?
12. How far from here do they carry out these services/jobs?
13. Has the profitability of any economic activities or livelihoods changed due to the impacts of climatic conditions?
14. In the past 20 years, have there been any new economic activities introduced in where you currently live? If yes, what kind of activities and by whom?
15. In the past 20 years, have some economic activities disappeared from where you currently live? If yes, what kind of activities? Why have these activities disappeared?
16. Do the community members support each other during bad and good times? If yes, please explain.
17. Have the households where you currently live taken any actions to deal with the impacts of climatic conditions or weather patterns? If yes, what kind of actions?
18. How did the households learn about these actions? Were these actions taught at schools or by the extension agents?