

Improving African Rural Lives

-The Case of icipe and NGO's Collaboration



International Centre of Insect Physiology and Ecology

Mbita, Kenya

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When my journey first began, I was overcome with tension. The long trip to Kenya, Africa gave me plenty of time to reminisce about all the recent events leading up to this moment. Although I was very excited, I felt a bit overwhelmed with the idea that a small-town girl like me had been blessed with an opportunity like this one! I had traveled to Prishtina, Kosovo for an educational exchange experience I had through Iowa FFA and Hawkeye Community College, but that was a shorter trip and didn't require much preparation compared to this trip. The Borlaug-Ruan International Internship was something I had been working hard towards for almost two years. It all began with a research paper of mine about Malawi struggles to sustain environmental devastations and sustainable agriculture. My goal was to initially present my ideas and solutions at the Borlaug Dialogue, but first I had to present at the Iowa Youth Institute. I received my acceptance email from the World Food Prize to present and gain hands on experience at the Borlaug Dialogue Event. The Borlaug Dialog is inspiring and motivating to be part of something bigger than you. During this event I received some encouraging information about available internships for the top presenters, one of them being the Borlaug-Ruan International Internship. So, applied for it and waited. It was months before I received word that I had made it past the first process of acceptance. As time went by, I was notified I made it through the second process which was a phone call interview, and later a skype interview. It was weeks before I received the heart wrenching email that I unfortunately had not been selected for the internship. I would be lying if I told you that I was not disappointed in myself. I thought back at all the things I could've done better or tried to

figure out where I had gone wrong. I cried... a lot. But my family was beyond encouraging, and everyone reminded me that God had a specific plan. So, I tried to focus on school and cattle to get my mind off things. Then about a month later while I was at work, I received a phone call from Crystal asking how I would like the opportunity to be in Kenya for the summer. To describe my emotions at the time would be impossible, I was flooded with so much joy and excitement that I could not contain my tears. I accepted right then and there! Fast forward to my trip. I was there, after all the heartache and waiting it was finally a reality, and I was so ready for this!

First, I would like to take the time to thank Dr. Norman Borlaug, Mr. John Ruan and Ambassador Quinn for making the Borlaug Ruan International Internship possible. Without the influence of these men I would not have had this amazing opportunity to work in Kenya for two months. Without the influence of these men young students like me would not have the opportunity to expand agriculture experience and knowledge. Next, I would like to Thank Ambassador Quinn for the 20 years of dedication to the World Food Prize, you truly are inspiring and a heart kinded gentleman.

This internship has made a big impact on me and I would like to thank Ms. Crystal Harris and the World Food Prize Staff for organizing this internship to be one of the most aliette internships ever. You all were there for in times of need and emergencies.

I would like to thank the Director General of the International Centre of Insect Physiology and Ecology, Dr. Segenet Kelemu for letting me apart of ICIPE's impressive research

development that is helping alleviate poverty and sustain food security and health status for people in the tropics. I would also like to thank the Push Pull program leader, Professor Zeyaur Khan and Research Scientist, Jimmy Pittchar for all the support in my research project the impact you and staff are making on smallholder farmers in sub Sarah Africa. My research and having personal interactions with farmers could have never been possible without you.

Thank Matilda Ouma, as a Mentor and my agriculture mother you have given me a new perspective on life and introducing me to your beautiful culture. You and your family were always there for me and I am forever thanking you. Love you!

Thank you, Send A Cow, and Heifer International for sitting down with me and answering my questions and showing me the progress, you have made in farmers livelihoods. My research and having personal interactions with farmers could have never been possible without you.

Thank you, friends who have supported me, through my Internship. Thank you, family, for keeping in touch with me through the summer activities and cheering me on when days get tough. My family is what made me push through my struggles and mad best out of my internship!

Lastly, I want to thank my partner in crime Morgan Hasler. You were my rock for the past two months knowing that I could come to you when times were rough. Even though at

times we need space from each other I could never have gone through those two months without. You are the big sister I never had, Love ya!

Dedication

For Ms. Cindy Snell

For the last four years you have been an important part of my life. You are so much more than my FFA Advisor and animal science instructor. You were the person first to see the potential I had to take love for agriculture to new heights. Thank you for introducing me to Bettie Kawonga “40” Chance Award Recipient. You have such a caring heart and I have been blessed to have you in my life. Thank you for showing me that it is okay to take chances but leave room for disappointment or hurt. I will always remember our fun adventures including our Kosovo trip. I would not be where I am today without you and I hope one day I can inspire someone as much as you have inspired me.

~ Eternally grateful, Renee Piekema

Abstract

Through high school my involvement and hard work in programs like FFA, I have taken the opportunity to travel abroad to Kosovo with Hawkeye Community College with the Iowa Kosovo exchange program. Five fellow FFA members from across Iowa visited government ministries, agriculture businesses and agriculture high schools immersing the culture, education, and agriculture of this great country. Now I have taken a task with the World Food Prize that has challenged and impacted my view on sustainable agriculture and the fight for food security around the globe.

With the two months in Kenya, I came up with a goal of mine to gain knowledge and understanding of new farming technologies that is impacting farmers livelihoods and Livestock health and products. However, I came to realize that the success of the improvement of rural family quality of life was not individually accomplished by International Centre of Insect Phycology and Ecology (ICIPE) but because of the collaboration of ICIPE and non-government organization like Send A Cow and Heifer International. Combining extensive research and fieldwork these collaborations have improved the quality of life of over 97,000 farmers due to the technology ICIPE has created, Push- Pull Technology.

Through my research I have conducted 66 interviews with farmers in Tanzania and Kenya and Interviewing representatives from each collaborator. All my questionnaires were reviewed by a Social Scientist, Jimmy Pittchar and test run to make sure I will receive accurate and informative data. Analyzing my data for specific impacts on new skills farmers are implementing, the continuing progression in the spread of push pull technology, and the quality and quantity of fodder. Saharan African countries including Kenya and Tanzania struggle to sustain agriculture and food security for many families. In fact, 800 million people go hungry and we only use 15 crop species and 8 livestock species out of 7000 plant species and several thousands of animal's species for food. If we continue to support research institutes and non-government organizations including International Centre of Insect Phycology and Ecology (ICIPE), Send A Cow and Heifer International. I am calling all agriculture supporters and hunger fighters to support and spread awareness for organizations who dedicate their work to improve the quality of life of others in need.

Introduction

Iowa, The Place I Call Home

Iowa is known for having some of the world's most fertile soil. It's the land where farmers, their wives, and even children will work tirelessly from dawn till dusk to provide for their families, and families across America. In fact, "Iowa farmers produce about seven percent of the nation's food supply and raise 25% of the nation's total hogs" (Iowa Farm Facts). The farmers across these 35.7 million acres of land are what we know as Iowa's heritage. These families are the ones who will be the ones to preserve the Iowa agriculture industry for generations and generations to come.

Running along these millions of acres are from small towns to cities suburbs like Des Moines and big universities like Iowa, Northern Iowa, and Iowa State University all filled state pride. Go Cyclones! America Needs Farms! High school football on Friday Night Lights and College game day on Saturdays. I ran with a diverse crowd high school and many activities, but my passion was always for agriculture. I involved myself in Whitebreast 4H and Waukee FFA chapter that introduced to opportunities like showing cattle at the Warren County Fair, Iowa Beef Expo and Simmental Junior National. I gained an amazing experience as I traveled with Hawkeye Community College and FFA members across Iowa to visit Kosovo. And Lastly the world food prize Organization.

The Makings of a Successful Internship

When I first got to Nairobi, I was more concerned with finding a research topic, than taking time to enjoy the internship experience. I wanted to get started as soon as possible with my topic and begin collecting the necessary data. When I finally reached ICIPE's Mbita point

Campus I immediately started retrieving my research data, but little did I know there would be some barriers along that road. While collecting data or even normal day to day tasks I would run into problems adapting to the language, culture and new research methodology. Yes, at times it was a bit frustrating. However, with my mentors and translators helping me, I was able to transition and adapt to these barriers with some ease. Through this internship I've come to understand that international travel and becoming an adult is learning to trust yourself; in the choices you make and the adventures you face. Obviously, some choices we make are not the best, but most of the opportunities we take to educate ourselves or learn a new skill, may be the best choices we will ever make. So, leave some room for defeat; learn from your mistakes and come to know your limits. Being able to trust myself I learned to enhance my adaptability, communication, self-motivation and leadership skills.

During the first week in Kenya I began to relax and appreciate Kenya's culture while I was in Nairobi. To make my internship a success I had to adapt to the culture and jump over the barriers. Kenya's culture is filled with beauty and energy with a balance of grace. In the capital city Nairobi, I went to the Nairobi National Museum where I learned the history of the country, the struggles they faced to gain their independence from Britain, tribal culture and morals of family importance, and how the simple things in life can be sustainable.

Nairobi is a big city that has many manufacturing plants and big corporate buildings. Just outside the city, are slums where pollution is terrible. Even as you drive through, the smog can make you nauseous. You see many people traveling throughout the day, many of which are disabled, and poverty stricken. It's quite heartbreaking to see so many people that our lacking, but I had to remember that this was only through my "American" goggles. Just

because we think other people are not well off, it does not mean that they believe they are. You see, most of the people I came across had a bright smile on their face and were making small talk to people they met on the streets. I have never seen a country so friendly and open to strangers. In America, we have become so numb to daily interaction with others. We are so caught up with our phones, jobs, and personal lives, that we forget to acknowledge others. In big cities, we will generally pass by hundreds of other people a day and won't give as much as a smile. This is something Kenya does not lack. There, no one is alone, and family and friends are only a door or a phone call away.

It is no different when you visit the rural countryside of Kenya. As I made my way to the countryside near the majestic Lake of Victoria. The importance of family and friends are heightened because as hard times roll in, their family and friends will always be nearby. Religion is very important in Kenya. One Sunday I attended a Catholic Church service, which by the way is nothing short of three hours! The families were dressed in their finest clothing as they praised, sang, and danced in the aisles of the church. Father Moses invited me to the front of the church to introduce myself to the community, everyone was so kind and welcoming. Father Moses even said I was officially a resident of village of Mbita, my heart was so warmed by the affection these people gave to me and for a second I felt completely at home. At the end of the service, as I walked back to the ICIPE campus, random people shook my hand! Children would look at me with amazement, as it's not every day they see a mazungu (white) walking around and interacting with locals. The purpose of this Internship was to gain knowledge and understand the new farming technologies that are impacting farmers' livelihoods and livestock health product; but I also

believe I was put in Kenya to understand these beautiful people's culture and struggles. I am so very thankful for the way they welcomed me and made me feel at home.

International Centre of Insect Phycology and Ecology (ICIPE)

Established in 1970 by an African Entomologist, Professor Thomas Odiambo was inspired to address issues in small-hold farmers' fields with insects and other accompanying challenges. Since establishment 49 years ago, ICIPE has stayed true to their mission which is "to use insect science for sustainable development to ensure food security and improve the overall health of communities in Africa by addressing the problems of poverty, poor health, low agricultural productivity and environmental degradation"(ICIPE,2019).

To efficiently address these issues ICIPE collaborates with national, regional and international organizations. Their goal working with collaborators is to, "Strengthen the Centre's capacity and that of its partners towards improving the livelihoods of millions of people in Africa towards enabling smallholder farmers, on whom most agricultural activity in Africa depends, access the appropriate technologies and strategies to address existing and emerging constraints" (ICIPE,2019). ICIPE also has programs in human health, animal health, plant health, and environmental health.

Push-Pull Technology (PPT)

Push-Pull Technology (PPT) was developed at the International Centre of Insect Phycology and Ecology (ICIPE) in 1998. This farming system is becoming known around the world for

being effective and efficient to sustain agriculture in Sub Saharan Africa. This farming system has a complex structure that fights off Striga weeds, stemborers and the famous fall armyworms (*Spodoptera Frugiperda*). The Striga weed stunts the crop by intertwining the roots to hijack all its nutrients and the stemborers, while the fall armyworms attack and kill the crops by eating their way through the plant. It may sound like a complicated procedure to protect the fields but they break each part of the system down to where anybody can quickly understand.

Before ICIPE developed and introduced the push-pull farming system, farmers were not harvesting enough to feed their families because of the crop's low survival rate and low yield rate. Farmers would also struggle to feed their livestock a healthy diet, affecting their quality of production. This gave little to no income for families to support education, basic needs like putting a roof over their heads, nutritious food, and clean water. So many families in Africa look for second jobs, including the children to provide the necessities they need to survive. Now, 97,000 farmers have been pulled out of poverty due to Push-Pull farming system.

You may wonder how one farming system can solve all these problems, well it all starts with planting season. The major crops grown in Kenya are tea, sorghum, corn, and other specialty crops. Planting a legume called Desmodium in between the rows of the cereal crop. The Desmodium will then release a chemical smell to push away the Striga weed from germinating and prevents the stemborers and fall armyworms from eating away the crop. Desmodium also restores the nitrogen levels of the soil and retains the moisture levels as well. Next, farmers will plant either Napier (*Pennisetum Purpureum*) or a *Bracharia* species

grass around the border of the field to pull in the stem borer and fall armyworm moths to lay their eggs away from the plants by releasing a chemical smell. These grasses will then kill the larvae so they cannot develop into moths and attack other neighboring fields.

Together these plants will provide high crop yields, protection from climate change and provide high in nutrient fodder for livestock to feed on. Thus, gives the farmers food for their families, increases livestock production and has a surplus to sell at markets to earn an income.

Send A Cow

Established by a group of Christian dairy farmers from the United Kingdom in 1988, Send A Cow organization's mission is to give communities and families hope and means to secure their futures from the land. To accomplish their mission, they have established programs in rural Africa countries like Burundi, Ethiopia, Kenya, Rwanda, Uganda, and Zambia.

Send A Cow supports farmers and families to get back up on their feet by giving them skills and confidence they need in order to grow enough food, earn an income, and go after their dreams. Send A Cow works with 100% smallholder farmers, with 65% female and 50% widowed. They also have programs provided for people with disabilities and HIV/AIDS, this organization never wants to leave anyone behind. When training farmers they focus on 3 categories which are gender and social inclusion, farming the land, and marketing. Having such a big impact on farmers' livelihoods, I wanted this NGO highlighted in my research.

Heifer International

Seventy-five years ago, Dave West founder of Heifer International created this organization with a mission to end hunger, poverty, and environmental damage. Dave West knew that American farmers had resources that many farmers from neighboring countries did not, for example, cattle and study resources of nutrition from dairy. He gained knowledge of this issue when he traveled to Spain during the Spanish Civil War where he was Volunteering to provide refugees cups of milk.

Working in 25 countries, 10 from the African continent including Senegal, Ghana, Cameroon, Kenya, Tanzania, Zambia, Uganda, Rwanda, Malawi, and Zimbabwe. Providing 32 million families tools and training, Heifer International focuses on 4 components which are income and assets, food security and nutrition, women empowerment and animal husbandry, and entering a new country and establishing a program. They also focus on farmers passing on the gift, that can include knowledge, time, or when a farming family who received an animal gift passes on the first female offspring to another farmer in need.

Methods and Procedure

I interviewed 66 farmers, 51 from Kenya and 15 in Tanzania. Of the 51 farmers from Kenya, 32 were women and 19 were men. In Tanzania of the 15 farmers, 5 were women and 10 were men. The average age of farmers was 51 with an average of 7 family members per household. Sixty farmers that I interviewed had at least one Push-Pull plot with an average of 4 acres of farming land acquired by ownership, renting, or group farming. Every

respondent has received support or resources from ICIPE, government extensionist, or a Nongovernment Organization, focusing on Heifer International and Send A Cow NGO's. All farmer participants were chosen by having connections with outside resources to adapt PPT and owned any sort of livestock. I formed questionnaires for farmers but also representatives for ICIPE and NGO's like Heifer International and Send A Cow to collect quantitative and qualitative data.

After individual questionnaires were conducted, I compiled two focused groups. My first focus group was members of a women's support group. This focus group had 5 women that had received support from Send A Cow NGO and ICIPE. The second focus group was compiled at an ICIPE Field Day, there were a total of 15 farmers, two out of the 15 were non-push-pull farmers but we're preparing to start a Push-Pull Plot. There were 8 women and 7 men. These questionnaires highlight the relationships between farmers and the government and NGOs. Focusing on different area constraints farmers have in the agriculture industry and the spread of PPT. I also focused on the suggested solutions and feedback on issues concerning the agriculture industry in Eastern Africa. All my questionnaires were reviewed by a Social Scientist, Jimmy Pittchar and test run to make sure I would receive accurate and informative data.

Results

Objectives and Findings

The goal of my research study was to understand how ICIPE PPT and outside resources like the government and NGOs collaborate to enhance animal husbandry and qualitative and quantitative livestock products by, spreading the knowledge of PPT to farmers who are struggling to make ends meet. During my time meeting and interviewing farmers, I had the opportunity to shine some light on the importance of animal husbandry for the benefits of high-performance animals and the increase of farmers' incomes. I organized my findings into four categories of Spread of Push-Pull, Farmers New skills, Fodder Production, and Animal Husbandry and Livestock Products.

Spread of Push-Pull

ICIPE's goal is "to end hunger and poverty for 10 million people by expending Push-Pull technology to 1 million households in Sub-Saharan Africa by 2020" (). For ICIPE to accomplish this goal they collaborate with Government Ministries and Extensions, nongovernment organizations including Send A Cow and Heifer International, International Research Centre, and Universities. My interviews with representatives from ICIPE, Send A Cow and Heifer International all stated that alliances and collaborations are an absolute necessity to end hunger, poverty and environmental damage. The representatives went on talking to me about 4 categories benefiting the alliances and collaborations for each organization. 1- Opportunity for networking and reaching to communities, 2- Sustain Push-Pull Technology, 3- Appreciation with Community on the ground research and lab research and 4- Receiving feedback on performance. All benefits help collaborators achieve group goals and individual goals to improve the livelihoods to smallholder farmers. Each

organization brings something unique to the table, for example, ICIPE brings scientific Knowledge, information packets, and seeds for companion plants for PPT. Send A Cow and Heifer International bring technical experts, animal management, reports/feedback from farmers and transportation.

Farmer New Skills

During farmer individual interviews, farmers confirmed what skills they learned from ICIPE and NGO's who offer support by providing tools and training to adopt Push-Pull technology and improving farmer's livelihoods. 100% percent of the farmers agreed to meet with an ICIPE staff about Push-Pull technology and 100% of all farmers confirmed that ICIPE, Send A Cow and Heifer International provided training on the needs of the farmer. Some examples of the skills farmers were trained on and are currently implementing are organic farming, conservation planting banana trees, water management, and irrigation systems, dairy/animal husbandry, gender equality and starting or expanding farmers business.

After implementing the Push-Pull technology and skills farmers saw benefits an average of 9 months. Farmers would state experiencing improved fields, livestock health and products, and increased incomes. I also saw a decrease in weekly spending on food, before farmers spent an average of 1,509 Kenyan Shillings (U.S. Currency \$15) and After spending 1,442 (U.S. Currency \$14) a 9% decrease. That is no significant decrease however, many farmers would increase their spending because the income has increased along with the size of the family.

Fodder Production

Before Push-Pull technology acquiring enough feed and fodder for livestock was time-consuming. Farmers and farmers' kids will herd their livestock across villages and fields to find a quantitative amount of fodder for the animals to graze. Many times, my driver would have to maneuver around livestock because many would roam around the roads or lay in the middle of the road unattended. Feed rations before Push-Pull fodder were sweet potato vines, banana leaves, Ugali, wild grasses, maize, and maize stocks. After Push-Pull plots were implemented farmers were cutting and feeding animals an average of 115Kg per day. 38% of farmers have seen the benefits of selling fodder surplus where only 65% have not seen any surplus however that could be because the average number of livestock is 30 per smallholder farmers. One of the difficulties I encountered was the lack of farm record keeping. Many farmers had to estimate or make an educated guess on any quantitative questions I may have asked. This also impeded me to prioritize livestock in my research. Many subjects I would have liked to go in detail with the farmers were limited. Majority of the farmers in America keep farm records for forecasting prices on markets like crops and livestock, they can also find more efficient ways to manage their farms with new methods and technologies. I highly recommend that all farmers should keep records for their farms.

Group Discussion

ICIPE states that there are 97,000 farmers pulled out of poverty and hunger because of PPT however, ICIPE may struggle to meet their goal for 2020, to end hunger and poverty for 10 million people by introducing PPT to 1 million families in Sub Saharan Africa. My question

was to my group of farmers is why is PPT progression slow? After my group meeting with the farmers, we found 3 factors of the slow progression of Push Pull Technology. The first was Federal Government cuts in agriculture assistant programs. The second factor is lack of accessibility of seeds for the companion plants, Bracharia and Desmodium. And lastly the need for higher education for an agricultural science and business.

The federal government has cut assistance in transportation for final product. Many roads in rural Kenya are underdeveloped to where it becomes a difficult task to take produce to markets. The Kenyan Government does not have the funding to build roads, decrease taxes, or supply farmers with decent priced inputs.

The logistical issues concerning the supply of seeds needed for the Push Pull Technology is a major stumbling block for the spread of this organic farming technology. Most of the seed must be brought in from foreign countries and research centers make it difficult for farmers to obtain inputs. After combining the cost of seed and the difficulty of acquiring it, the low-income farmers in Kenya are struggling to afford the Push- Pull companion plant seeds.

Lastly the small holder farmers need a higher education to produce a successful harvest. The lack of agricultural technology makes farming labor intensive. Farmers need non-government organizations to work with governments to be placed in communities that are struggling so that they can become more educated in farming technologies, climate change adaptation, and animal husbandry by expanding farmers enterprise.

Conclusion

The Need for Sustainable Agriculture

In conclusion to this cultivating experience with a personal goal to gain knowledge and understanding of new farming technologies that is impacting farmers livelihoods and Livestock health and products. Working and meeting with farmers, I have experienced the progress that Send A Cow, Heifer International and International Centre of Insect Phycology and Ecology (ICIPE). Training farmers on the implementation of Push-Pull Farming Technology and other management skills that are making progress in rural African families' quality of life. Smallholder farmers in Kenya and Tanzania do not need additional handouts but needs to strengthen themselves with new technology and education through the support of the ministry of agriculture government, research institutes and non-government organizations. This recalls a famous quote, "Give a man a fish and you feed him for a day but teach a man to fish and you will feed him for a lifetime." Training farmers in animal husbandry, organic farming, farm management in record keeping is going to up lift the country's sustainable agriculture and food security. Currently, 800 million people go hungry and we only use 15 crop species and 8 livestock species out of 7000 plant species and several thousands of animal's species for food. With the lack of diversity, it leaves the world population vulnerable to crop failure. What if we just find creative ways to use wild species and different crop varieties, to fight world hunger? Supporting non-government organizations and research institutes are the source to fighting hunger and teaching people how to effectively improve their quality of life. So, I'm

calling out for people to take action and support organizations that dedicate their work to improve the quality of life for families who live in developing countries.

I will forever be grateful for the amazing people who have helped me along the way for this success. This Internship has made a huge impact on how I view the importance of agriculture awareness and the importance of pursuing an education. I came back home with the understanding that success is not given to you, but you must work for your passions.

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