

Gender Perceptions Among Lake Victoria Push-Pull Farmers: Analysis of Food Safety and Aflatoxin



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This report highlights the research completed by a 2016 World Food Prize Borlaug-Ruan Intern at the International Centre for Insect Physiology and Ecology (icipe) in the countries of Kenya and Uganda.

Additional information is available at
www.push-pull.net

For more information regarding the personal experiences of the intern and a digital version of this report, visit hollyjenowski.wordpress.com

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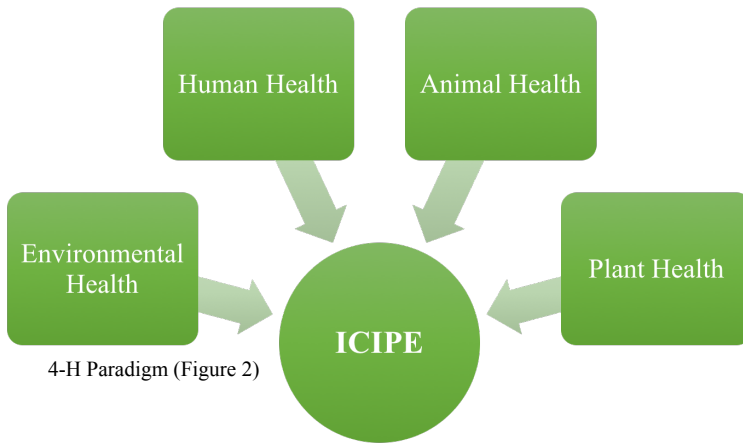
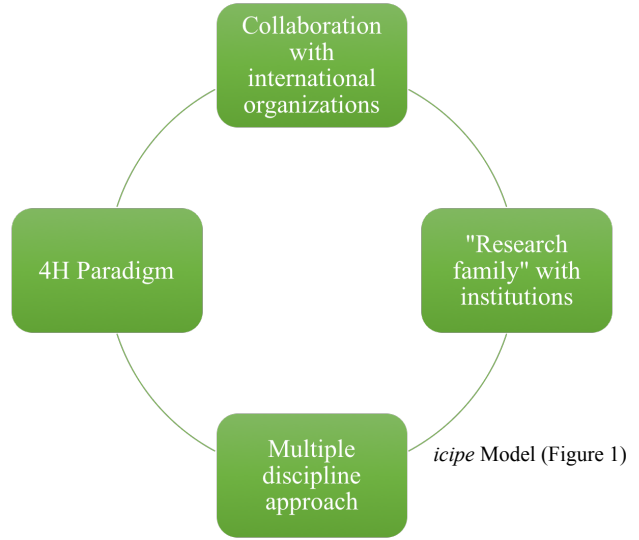
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A. ICIPE

at a glance

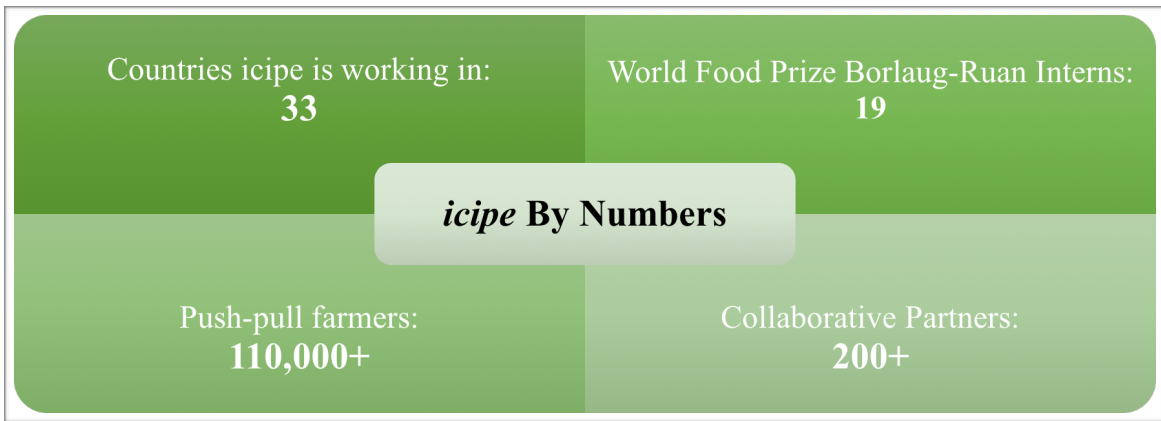
Mission

“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” (Mission).



Vision

- ▶ Pioneer global science in entomology
- ▶ Improve the well being and resilience of people and the environment to the challenges of a changing world (Mission)



(Figure 3) Sources: icipe by Numbers, “What We Do”, “Shaping”

A. ICIPE

A. Introduction

The International Centre of Insect Physiology and Ecology (*icipe*) was established in 1970 and remains the “only international institution in Africa working primarily on

arthropods (insects, ticks and mites, spiders and others)” (What). Headquartered in Nairobi, Kenya, *icipe* prides itself on developing methods for pest control that are effective, ecological and affordable to the resource-limited rural and urban communities it serves, while conserving and utilizing Africa’s rich insect biodiversity. In collaboration with hundreds of research institutions, international organizations and world class researchers, *icipe* has made significant gains in hunger and poverty alleviation. Work is conducted across Africa and through the field stations in Mbita Point and Port Sudan (What).



Image 5

B. Why arthropods?

Since its inception, *icipe*, commonly known as **African Insect Science for Food and Health**, has worked on the opportunities and challenges insects and other arthropods provide to advance food security (What). Arthropods are a paradox within the sustainable growth equation in Africa where, on one hand, they have the ability to severely reduce the output of humans, animals and plants. On the other hand, because of their tremendous biodiversity, insects harbor great potential for development (What). From its Kenyan heartland, *icipe* is leading the fight against food insecurity, one arthropod at a time.

C. Thomas Odhiambo Field Station (Mbita Point, Kenya):

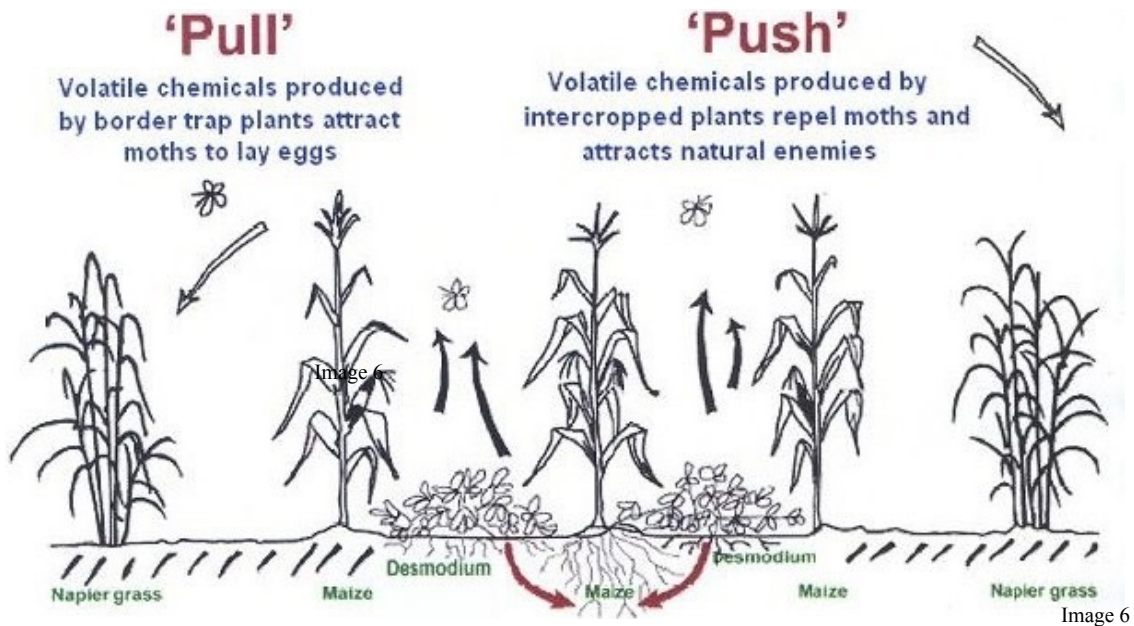
As the base for the Centre’s research in the Lake Victoria region, the Thomas Odhiambo Field Station features state-of-the-art laboratories, offices and insect rearing facilities that attract international scientists and scholars. At least one World Food Prize Borlaug-Ruan International Intern works with *icipe* each year, many of which are stationed at Mbita Point. The field station also serves as the home for push-pull technology research. In addition to scientific research, the campus also hosts St. Jude’s Medical Clinic, Mbita International Guest House and Mbita Point Elementary School (*icipe* Thomas).

B. Push-Pull

A. Push-Pull Technology:

One of *icipe*'s champion developments is the creation of Push-Pull technology (PPT). Push-pull has a strong foothold in Kenya, where it originated, and is expanding to regions like Ethiopia, Tanzania and Uganda. Under the "Plant Health" paradigm (Figure 2), the innovative strategy effectively confronts the triple menace facing African cereal farmers: the parasitic Striga weed, stemborer pest, and poor soil fertility (How). As demonstrated in Image 6 below, the chemicals produced by the intercropping of *Desmodium spp.* (the 'push' plant) repel the stemborer (Push-Pull). Then, the stemborer is attracted to the trap plant (the 'pull' plant) and lays its eggs there (Components)

"To end hunger and poverty for 10 million people by extending Push-Pull technology to 1 million households in sub-Saharan Africa by 2020"
- Zeyaur Khan, Coordinator of PPT



There are currently over 110,000 practicing push-pull farmers across Africa. Of those, 59% are women (From). The technology is "one stone to kill many birds" and the benefits of adopting include (From):

- Improved nutrition for people and livestock
- Increased financial stability and food security
- Additional education for children and adults
- Strengthened social networks and opportunities
- Fodder for animals
- Connections between families and generations in ways never seen before

C. Background



Image 7

A. Introduction to Issue

One of the fastest growing and most dangerous food safety risks worldwide is aflatoxin, the most notorious mycotoxin. The Food and Agriculture Organization estimates that 25% of the world's food crops are infected by mycotoxins (Atehnkeng). Aflatoxins contaminate many dietary staples such as maize, groundnuts, sorghum, rice, and cassava (Atehnkeng). Aflatoxins can pose serious health risks including liver cancer, child stunting, and death if enough is consumed. Kenya is known for having the highest incident of acute toxicity; the largest outbreak of 317 cases, including 125 deaths, occurred in the country in 2004 (Unnevehr). While less researched, Ugandan samples of maize have provided evidence of contamination.

B. What Is It?

Aflatoxins are chemical poisons produced by fungi, frequently *Aspergillus flavus* (Atehnkeng). This poison cannot be seen with the naked eye and requires chemical testing to verify contamination; in addition, it does not have a particular taste or odor (Atehnkeng). Hence, it is challenging to convince farmers and consumers about the issue infecting their food supply. In sub-Saharan Africa, the crop disease is detrimental for food security.

C. How It Happens

Exposure is “problematic in low-income populations in the tropics that consume relatively large quantities of staples” which makes Kenya and Uganda hotspots for aflatoxin (Focus20). Contamination occurs in certain conditions: dry weather during planting, high moisture during harvest, inadequate drying and storage of crops (Atehnkeng). It can begin in the field, increase during prolonged storage and continue to spread through transportation. The cultural crop handling practices, weather conditions during crop growth, plant susceptibility and other factors can significantly influence the potential and seriousness of aflatoxin contamination (Atehnkeng).

C. Background

D. Impact on Food Safety

There are far-reaching consequences of aflatoxin contaminated foods on trade, health, and livelihoods. This food safety epidemic and Kenyan “public health problem” reaches four key areas of food security: availability, access, utilization, and stability of the food supply; it makes an even larger impact on human health (Unnevehr).

- **Availability** - Cereal crops are primarily produced for personal consumption in Kenya and Uganda. When an entire crop is lost due to aflatoxin, food availability is lowered substantially. Producers of the dangerous crop earn less because of product rejection, reduced market value or inability to access the international trade market, which can lead to a shortage in cereal crop availability (Atehnkeng).
- **Access** - “Lower farmer income in turn limits ability to purchase food for the family which translates into reduced access to food” (Atehnkeng). Limited access in Kenya and Uganda can mean increased hunger. In Kenya, for example, more than 40% of diets consist of maize and maize products (Unnevehr).
- **Utilization** - Because of aflatoxin’s lethal nature, it can be difficult to utilize rotten cereal crops effectively. Usage is limited to complete rejection or alternative, safe uses (Atehnkeng). Many farmers and consumers will use dangerous cereal crops anyway, further poisoning themselves and others.
- **Stability** - Given the link between aflatoxin and adverse human health impacts - particularly the confirmed linkages to liver cancer and potential association with stunting and immunosuppression - contaminated foods present a clear food security threat and shake the stability of Kenyan and Ugandan economics (Atehnkeng).

Ultimately the key food security areas of availability, access, utilization and stability contribute to a much larger problem in human health that is often unrealized by farmers and consumers. This **underlying systemic health problem** is deeply rooted in African culture where there is little to no wastage. Many individuals would rather not waste anything, including foods with potential aflatoxin contamination.

D. Methodology

A. Abstract

A rising food safety issue taking the crop and food security of sub-Saharan Africa is best known as aflatoxin, the silent killer. Aflatoxins, produced by the fungi *Aspergillus flavus*, is a major mycotoxin influencing the quality of cereal crops meant for human consumption. The study assessed farmers' attitude toward, and knowledge and perceptions of the nature, causes and prevention of aflatoxin contamination and other food safety issues. This study presents ground level insight on farmers' experience with aflatoxin, rotten maize prevention and disposal strategies, post-harvest losses and food safety issues that impact the Lake Victoria region. For the purpose of the study, Kenya and Uganda are the primary countries that make up this region.

Keywords: aflatoxin, gender perceptions, food safety, Lake Victoria, post-harvest

B. Objectives

The overall objective is to investigate the attitudes toward, and knowledge and perceptions of aflatoxin, post-harvest losses and food safety among push-pull farmers in Kenya and Uganda.

1. To evaluate the degree of knowledge about aflatoxin and perceptions by gender
2. To compare education to gender and review which has a larger impact on aflatoxin awareness
3. To evaluate actions made by farmers in respect to potential aflatoxin-infected cereals
4. To assess the need for education in aflatoxin prevention and control
5. To determine differences between Kenya, Uganda, and their respective push-pull programs
6. To analyze existing food safety issues, post-harvest losses, and storage practices as it relates to aflatoxin

C. Sample Research Questions

1. In general, do you believe that men and women have the same awareness of aflatoxin? (1, 2)
2. Have you received any formal training on how to manage storage/diseases on cereal crops? (2, 4)
3. Have you heard of aflatoxin? (1, 4)
4. Can you tell if a crop is infected with aflatoxin? (4)
5. In your opinion, is there a connection between post-harvest handling and disease contamination? (4, 6)
6. In your opinion, is aflatoxin a large or small problem in your region? (4)
7. Select your biggest concern on your operation: food quality or quantity? (6)

D. Methodology



Image 8

D. Methods

The tools used in the study included pre-tested questionnaires, a Focused Group Discussion, and key informant interviews based on a finalized questionnaire.

Literature Reviews and Experiential Learning

A literature review covering more than 35 scientific reports, publications and related studies was conducted. Extensive background on education, gender and push-pull technology was researched through discussion and experiential learning onsite at Thomas Odhiambo Field Station in Mbita and surrounding farmer households.

Questionnaire

A detailed questionnaire was designed to gather both quantitative and qualitative data from the selected push-pull (PPT) farmers. The questionnaire aimed to address study objectives and to establish a foundation for future *icipi* campaigns. Questions were pre-tested with a sample of Kenyan farmers to gauge effectiveness. Criteria for selection of farmers included current use of PPT for at least one year. The 40 questionnaires in full were entered into an analysis program - Statistical Package for Social Sciences (SPSS). Following coding and entry, answers were deciphered to understand the information as it relates to the purpose of the study.

Key Informant Interviews

Interviews were divided by country to ensure a true evaluation of awareness across PPT farmers in the Lake Victoria region. A total of 20 females and 20 males were administered the official questionnaire. Each farmer was allocated approximately 20 minutes for the interview and the interview was conducted in the homestead.

Focused Group Discussion

One Focused Group Discussion was conducted in Kenya with 14 farmers. The group contained an equal number of men and women respondents, many of which had been interviewed previously. Discussion centered on topics presented in the questionnaire and the development of a social advocacy education plan.

E. Findings

A. Key Findings:

There is low knowledge about aflatoxin — but there is hope.

1

While a majority (55%) of participants ranked their personal knowledge of aflatoxin at “None” and others demonstrated incompetency through further questioning, respondents were overwhelmingly interested in learning more about aflatoxin. 95% requested additional training and education and many offered suggestions for future educational programming.

Farmers are most uneducated about aflatoxin’s impact on animals.

75% of respondents used rotten maize as “animal feed” for poultry and/or livestock with an equal number unsure of the effects on animals as those who selected that it had no impact on animal and human consumption. In addition, when asked to select areas of society that aflatoxin influences, “animal productivity” was the most missed option among all surveyors.

2

Men and women do not have the same awareness of aflatoxin.

3

Both men and women equally struggle with understanding aflatoxin and its complications. 87.5% of respondents felt that men and women do not have the same awareness of the issue. Men tended to believe that males were more aware because of their education, whereas women sided with females because of their experience with cereal crops.

Education and/or gender did not make an impact on knowledge.

No research demonstrated that the level of education a push-pull farmer has directly influenced their aflatoxin awareness or personal knowledge as demonstrated through multiple questions during key informant interviewing. Gender did not make an impact on knowledge, as originally anticipated.

4

5

Farmers recognize the connection between post-harvest and disease contamination.

On a positive note, a large majority (87.5%) of respondents recognized the connection between post-harvest handling and disease contamination of cereal crops. Of those that could not identify such connection, 80% were male respondents.

E. Findings

A. Objective 1: Knowledge and Gender Perceptions

Overall, the study proved that push-pull farmers practicing in Kenya or Uganda have little to no accurate knowledge about aflatoxin.

Rotten Maize and Aflatoxin

51.8% of respondents believed that aflatoxins pose a significant risk to food safety, human health, trade and animal productivity and selected those categories from a list of options. If the respondent had personally experienced or had heard of someone getting sick from aflatoxin poisoning, they were more likely to respond with all four (food safety, human health, trade, animal productivity) than someone with no demonstrated connection to an aflatoxin-related illness. The most missed area in the above question was “animal productivity”.



Image 9

Perceived Knowledge/Personal Reflection

Many participants did not know about aflatoxin, and of those that did, none could accurately identify, describe, and/or detail aflatoxin, its causes, or implications as demonstrated in further questioning.

When asked to rank their personal knowledge of aflatoxin on a scale of "None" to "Excellent," **55%** of respondents selected “None” showing their interpretation of their subject knowledge. Furthermore, **90%** self-ranked themselves of “Average” level or lower.

Awareness of Aflatoxin

Several push-pull farmers identified aflatoxin as “cereal crop disease,” “poisonous to human consumption,” “green or grey rotting,” and/or “bad maize”. While this may appear to be a positive response, the above symptoms and outcomes are not exclusive to aflatoxin and are signs of other cereal crop issues that the farmer may also be facing. As such, **67%** of respondents stated that they could not tell if “a crop was infected with aflatoxin”. **70%** of PPT farmers responded that aflatoxin is more severe in times of intense rainfall as described with responses of “long rain season” and “depending on the amount of rain that year”.

E. Findings

B. Objective 2: Education versus Gender



Image 10

EDUCATION

One's level of education did not directly contribute to understanding aflatoxin or its causes. There was no trend that established a correlation between level of education and aflatoxin knowledge.

Awareness Distribution

A majority of respondents felt that men and women did not have the same awareness of aflatoxin. When asked to self-rank the level of their existing aflatoxin knowledge, respondents with the highest level of education (university graduates) ranked themselves "Average" or "None" while other respondents with less educational experience ranked themselves "Above Average."

It is empowering to note that education levels did not make a negative impact on the "request for an educational component" at the conclusion of the interview or deter farmers from wanting additional information on the topic.

The original intention of this study was to analyze the varying degrees of aflatoxin knowledge based on perceptions by gender. However, as the results show, gender nor existing educational background significantly influenced aflatoxin knowledge.

GENDER

Gender does not seem to play a direct role in awareness of aflatoxin. Both men and women tended to lack basic understanding of aflatoxin.

Self-Ranked Knowledge

Women tended to be harder on themselves than their male counterparts. **35%** of female respondents ranked themselves at or above "Basic," while **55%** of men did the same. Men and women had equal misunderstanding of aflatoxin as evidenced in future questioning.

When ranking their partner's knowledge on aflatoxin, **40%** believed that their spouse had "No Knowledge" on the topic.

Furthermore, **87.5%** of respondents felt that men and women do not have the same awareness of aflatoxin and the issues it presents. Men tended to believe that males were more aware because of their education, whereas women sided with females because of their experience with cereal crops.

E. Findings

C. Objective 3: Farmer Actions with Cereal Crops

Fear and Action

While respondents seemed to realize that rotten maize was bad for human consumption, their actions did not always follow suite. Nearly all farmers surveyed were afraid to “allow their families to consume wet or discolored maize”. However, the majority of respondents still fed the rotten cereal crop to their livestock and/or poultry. **20** push-pull farmers who believed infected feed was “harmful to human and animal consumption” still fed it to their animals.



Image 11

In addition to animal feed, respondents engaged in the dangerous or discouraged practices of consuming, selling, and grinding rotten maize. Other responses included mixing rotten crop with good crop and using rotten crop for local brews.

D. Objective 4: Need for Aflatoxin Education

Existing Education and Providers

A large majority of Kenyan push-pull farmers had “received formal training on how to manage storage and diseases on cereal crops,” but in Uganda only **55%** had identified participating in similar training. The primary training provider was *icipe* (**27.3%**), followed by agriculture extension and the World Food Programme (both at **18.2%**).

Additional Comments

In “additional comments, questions, or concerns” at the conclusion of the interview, all of the push-pull farmers provided valuable feedback to address the study’s objectives. The most popular response was a “request for an educational component” (**28** responses), followed by “questions/comments about aflatoxin awareness and/or prevention”(24 responses). **22** responses identified a positive attribute or outcome of practicing push-pull technology. The remaining frequent answers included remarks of “push-pull lowering aflatoxin risk mechanism” (**7** responses) and questions regarding the “impact of climate change on aflatoxin/push-pull” (**5** responses).

E. Findings

E. Objective 5: Country Differences

Overall, the country where respondents were practicing push-pull technology had no impact on the aflatoxin knowledge demonstrated throughout the questionnaire. Additional responses and ideas were recorded from those residing in Kenya during the study's Focused Group Discussion.

One notable difference came from the name recognition of “aflatoxin” among interviewees. **70%** of Kenyan farmers surveyed had heard of aflatoxin prior to the questionnaire, while only **40%** of push-pull farmers in Uganda were familiar with the term. In addition, more Kenyan respondents received information from *icipe* as opposed to Ugandan participants who tended to have varied sources of information.



Image 12

F. Objective 6: Additional Farmer Practices and Insight

Storage Method and Location

In both countries surveyed, participants overwhelmingly identified “theft” as the number one reason for the method and location of their cereal grain storage. **72.5%** of push-pull farmers stored in the home because of theft, followed by the responses of “convenience” (**10%**) and “rodents/animals” (**7.5%**). All participants (**100%**) stored in their households with the most common method being gunny bags. Both chemically treated and untreated gunny bags were used, with the latter being more popular among respondents.

All forty respondents (**100%**) were interested in adapting or changing their storage methods after hearing about aflatoxin through the questionnaire.

Only two respondents (**5%**), both females, could correctly identify a specific way that push-pull technology aids in aflatoxin prevention. However, **60%** of participants could identify and explain the mechanics of push-pull technology in stemborer and/or striga control. **97.5%** of respondents, even if they could not identify how push-pull lowers aflatoxin risk, believed that push-pull technology is a “viable option for aflatoxin control.”

F. Recommendations

Key Recommendation: Social Advocacy and Educational Campaign

- Social Media
- Education
 - Public school system
 - Outreach to farmers
- Gender: Equal, yet different

A. Introduction to Key Recommendation

After thorough analysis of the data and reflecting on comments offered from participating push-pull farmers, the final recommendation proposal is to develop a social advocacy and educational campaign, sponsored by *icipe*, that acknowledges and addresses the issue of aflatoxin in the cereal crop supply of the Lake Victoria region. The campaign will be multifaceted and envelope each area of society, with special emphasis on the ones incorrectly identified by respondents throughout the study. For example, the areas of human health, trade, animal productivity, and food safety will be discussed. The basis will be a coordinated effort with agriculture, trade, health, and food safety sectors at the continental, national, regional and local levels (Aflatoxin).

B. Social Media

According to CNN, over 120 million people are using Facebook each month across Africa with four and a half million residing in Kenya (Parke). Due to modern technology and social media increasing in popularity, it is imperative that the aflatoxin campaign includes outreach through these platforms. I propose usage of Facebook, Twitter, and Snapchat as the primary avenues for mobile dissemination of aflatoxin related information due to their relative popularity among different demographics in both countries. While social media will be a key component of the strategy moving forward, it is important to note that all information distributed through this method must be available in other forms for those without Internet access.

In addition to social engagement, the proposal recommends partnership with media and news sources. During the Focused Group Discussion, farmers expressed interest in learning about aflatoxin through mainstream media sources like the television and radio. Similar to push-pull dissemination, it could benefit from having individuals like “push-pull champions” speak of the issue prominently.

C. Education

As demonstrated through the study, there is a disconnect in farmer knowledge about aflatoxin. I believe this is of no fault to the individual farmer, but reveals a larger problem in how education is distributed in rural communities. As mentioned in the “Social Media” proposal component, one method of educating should be through use of mainstream media sources.

F. Recommendations

C. Education (Cont.)

Education should inform all people about aflatoxin and include direct outreach to farmers. Curriculum should be developed for students (primary to collegiate) to develop understanding of aflatoxin, its causes, and ways to test for contamination. The goal is to expose every member of the household to some form of aflatoxin information so that the material is more likely to be of concern to the family. Outreach to farmers can include existing Farmer Field Schools, training days, and agriculture extension programs (Khan). Educational publications need to be developed similarly to the comic book created for push-pull technology. Spreading awareness of aflatoxin to farmers through existing push-pull dissemination channels is a wise investment. Education must be comprehensive and address the causes, storage methods, post-harvest losses, testing for aflatoxin, health risks, trade impacts, proper uses of rotten cereal crop, etcetera.

It is imperative to note that solely educating is not the answer to controlling and preventing aflatoxin outbreaks in the Lake Victoria region. Aflatoxin is a complex and deeply rooted issue that will require years of education and collaboration in order to be successful on a larger scale. Education combined with providing incentives and materials will result in less aflatoxin issues.

D. Gender: Equal, yet Different

Although gender did not have as much of an impact on aflatoxin awareness as the study originally hypothesized, based on farmer feedback, it should be a critical component of the future campaign. “Equal, yet different” was the common theme perpetuated by participants during the Focused Group Discussion. A large majority of participating farmers felt that an awareness campaign, in its entirety, should not distinguish between gender, but instead should be content relevant for both sexes. While women are primarily involved with the preparation of cereal crops, as evidenced through questioning, the likelihood for change in current practices will increase if both men and women hear the same information. With that being said, the “yet different” part of the equation is relevant in aflatoxin education. The recommendation is to create project materials and outreach programs that are accessible and understandable to both genders and the appropriate audiences. However, there should be additional opportunities for men and women to gather separately to discuss making the campaign better and addressing the independent and relevant needs of each gender.

E. Specific Recommendations

- Agriculture: Emphasize the importance of sorting and discarding crops with physical flaws and deformities (e.g., visible mold) (Unnevehr)
- Trade: Increase demand for safe products, provide training to traders and retailers (Unnevehr)
- Health: Promote dietary diversity and food safety to minimize exposure at home
- Food Safety: Encourage alternative uses for unsafe commodities (Unnevehr)

G. Missouri to Lake Victoria

A. My Background (Missouri/Iowa)

“Take it to the farmer”

- Norman E. Borlaug

Growing up on a family farm in Mid-Missouri, agriculture was a large component of my upbringing and remains a huge part of my life. It was not until the World Food Prize that I connected agriculture (my background) and humanitarian efforts.

What started as a simple Google search for “agricultural internships for high school students” has led to an unwavering passion for alleviating food insecurity and a lifetime commitment to advancing the mission of the World Food Prize. I applied as an at-large state delegate to the Global Youth Institute during my sophomore year of high school, was selected, and attended the 2014 program in Des Moines, Iowa. Nervous and shy, I transformed into an outgoing hunger fighter during the three-day adventure.

By luck, during one of the lunch sessions at the World Food Prize the man directly across from me, Willie Meyers, worked at the University of Missouri. He was just as surprised as I was to find another person from Missouri and we exchanged business cards. After attending, I was baffled to find out that I was the only person from my state in recent years to attend the Global Youth Institute. I knew this was my chance to “take it to the farmer” and to implement what I learned at the World Food Prize. Pulling out Willie’s business card, I sent an email and the rest is history.



The Missouri Youth Institute, the first of my efforts to “take it to the farmer,” happened in February of 2016 as the largest first-time state institute with over 30 students. I served as the event emcee and liaison for the student participants. To say it reinvigorated my passion for food insecurity is an understatement. We are currently preparing for the 2017 edition and I cannot wait to share this report about my experience abroad with the group. Image 13

This year, I was able to serve as a Group Leader for the 2016 Global Youth Institute program and welcomed our first delegation of students from Missouri. Being the one that students looked up to and aspired to become was a surreal experience. I am currently a student at the University of Missouri studying Science and Agricultural Journalism with minors in International Agriculture and Rural Sociology. Career goals including a Masters in Food Policy and representing my state in the legislature. In the future, I hope to continue my involvement with the World Food Prize and continue my work with *icipe*. I must deliver on my promise to “take [my research] to the farmer.”

G. Missouri to Lake Victoria

B. Foundation for Project and Report

Research Project

The quote “take it to the farmer” easily became the premise of my research project. During my first meeting with my mentors, Dr. Zeyaur Khan and Dr. Charles Midega, I expressed that my one requirement of my project was that it had real-life application that could be taken back to the farmers I worked with. The idea for my aflatoxin/food safety study was born and I began creating a questionnaire that would allow me to gather information of relevance to the farmers. Listening to individual feedback at the conclusion of each key informant interview and during the Focused Group Discussion allowed me to develop a recommendation proposal in line with the ideals of the participating farmers. All questions asked and methods used were designed with the intention of taking the results to the farmer in a way that was relevant and impactful for their lives. “Take it to farmer” remained at the forefront of project planning.

Research Report

“Take it to the farmer” was also a foundational piece in the crafting and designing of my research report and accompanying materials. While this report strays away from the traditional, standard appearance of a scientific research report, it does so in an attempt to increase readability of the general public and of the farmers that the research is intended to benefit. During the Focused Group Discussion, farmers expressed an interest in scientific information about aflatoxin in a manner that they could understand. For example, several participants noted that they would prefer graphics, images, charts, and colors as opposed to a basic black and white format. I ultimately decided to create my report with my main audience, the farmers I interviewed, in the forefront of my mind. In the way that it is presented in this publication, my research is more accessible and user-friendly to the push-pull farmers in Kenya and Uganda. It is my sincere hope that more farmers are able to benefit from the manner of which my information is presented.

C. Top Fifteen Experiences

My two month internship in Kenya and Uganda was full of incredible experiences, phenomenal opportunities and people that left an imprint on my heart forever. Below is a list of the top fifteen experiences that I enjoyed while abroad:

1. Meeting Madam Sarah Obama

Sarah Obama, a notable “push-pull champion” generously welcomed me into her home and shared her experience as the grandmother of the current President of the United States.

2. Sipi Falls

I was able to visit Sipi Falls and climb through mountains to see three different waterfalls. I even used a walking stick!



Image 14

G. Missouri to Lake Victoria

C. Top Fifteen Experiences

3. Ruma National Park

I was able to travel in a safari vehicle and see wild buffalo, giraffes, zebras and gazelle.

4. Rusinga Lodge

I took a Kenyan who could not swim kayaking on Lake Victoria for the first time.

5. “Holly likes animals”

I soon became known among the local farmers as the American girl who liked animals and they would find their cats for me to play with during each interview.

6. Giraffe Center

I was able to feed and pet a giraffe up close!

7. Fresh Fruit

I will always miss the fresh fruit. Uganda had the best bananas, while Kenya had great watermelon.

8. Children

The children that I met during my interviews will hold some of my favorite memories. I played soccer with one little girl for almost three hours!

9. Equator

Did you know there’s actually not a line at the equator?

10. The Ferry

Riding the ferry was a fun experience!

11. Mizzou Shirt

I met a young boy who was wearing a sweatshirt from my university. This made the world feel much smaller!

12. Baby in the Orange Shirt

A little boy in an orange shirt that would not stop following me and wanted me to hold him. He was so cute!

13. “Leaving” Party

The Guest House kitchen staff are some of the nicest people I have ever met. They made me cake and a smoothie for our “last supper.”

14. *icipe* Staff

Without their Swahili lessons and American jokes, my internship would not have been as fulfilling.

15. Mother Matilda

Matilda is one of my favorite gains of this internship...everything from her accidental selfies to her translating skills!



Images 15-23

G. Missouri to Lake Victoria

D. “My Kiddos”

One adventure that tops my experiences occurred every workday from 5-6PM and involved 84 anxious fifth graders, one scared teacher, and one stuffy classroom. My time as “Miss Holly” is one I will forever cherish. Teaching English was one hour per day where I focused on making a direct impact on the lives around me; my kids certainly became “my life” in under two months.



Image 24

Names may soon begin to fade, but the moments will not. Exiting the school one day to find my entire class lined up in single file to prepare for whipping because of their unsatisfactory mathematics exam scores and the feeling of internal hurt that I felt will likely never leave my heart. Walking up to find one student using the shirt off his back and muddy water to clean a walkway during school chore-time will always remind me of the fortunes we enjoy in American public education. The video that I will continue to play of my exuberant, confident students standing on their desks singing “If You’re Happy and You Know It” reminds me that there is happiness to be found in all situations. Giving each student an eraser and a note, small tokens of my appreciation for the way they changed my life, and seeing the smiles on their faces enforced the idea that small efforts can make a lasting impact. Lastly, reading all 84 letters that my students wrote me during my last week as a teacher both breaks and comforts my heart.

From words of “I wish my mother was as nice as you” to “I want to be a pilot” to “thank you for teaching me all I need to know about English,” it became evident that I was more than just a teacher to these students. *And to me, they were more than just my students...they were “my kiddos.”*

G. Missouri to Lake Victoria

E. “Do One Thing Every Day That Scares You”

Whenever I was told that I would come back to the United States a changed individual, I laughed at the idea and thought it would never be possible. But here I am, two months after the internship, and rest assured - I am a changed woman, inside and out, with a deep and invigorating passion for solving food insecurity, both for my kiddos and the farmers that I met. If you take nothing else from my experience, I want to leave you with this: “do one thing every day that scares you.” Something that makes you weak in the knees, something that makes you want to turn around and run, something that intimidates you, something that you’ve always wanted to do. Teach a class of fifth graders, take a Swahili gym class, speak the local village language. I adopted this mantra whenever I was on the airplane to Nairobi, Kenya and carried it with me my entire summer. Perhaps the largest personal growth that I experienced this summer resulted from doing one thing every single day of my trip that was scary, challenging, unknown or uncomfortable to me.

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H. Appendix

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H. Appendix

B. Figures and Images

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- 3: *icipe* by Numbers

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