

The Developmental Influence of Piglet Nutrition within a Tropical Climate

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The World Food Prize Foundation
2017 Borlaug-Ruan International Internship

EARTH University
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Introduction:

My name is Sarah Heiller, and I grew up on a diversified livestock acreage in Boone, Iowa where I graduated from high school in 2016. Having grown up in one of the most prominent agricultural areas of the world, I was immersed into this industry from a young age. With living on a farm, showing pigs, and extensive participation in 4-H and FFA, agriculture was something I have always found interest in. However, my experiences gained through the World Food Prize transformed this mere interest of mine into a passion I want to spend my life pursuing. It was this passion that the World Food Prize instilled within me that drove me to attend Iowa State University where I am currently a sophomore studying animal science and Spanish.

I began my involvement with the World Food Prize my Junior year of high school in 2015 when I submitted a research paper for the Iowa Youth Institute. I had very little idea what I was getting myself into when my teacher, Peggy Watkins, approached me about writing a paper. I was beyond excited and surprised when shortly after the Iowa Youth Institute, I find out I had been accepted to attend the Global Youth Institute the following fall.

The experiences I gained from the 2015 Global Youth Institute gave me a newly found moral obligation and desire to be part of the efforts to overcome food insecurity and other global issues. I am grateful to the World Food Prize Foundation for increasing my awareness of the global impact of agriculture. I had always been aware of international issues surrounding food insecurity, but had felt a strong disconnect from them. To me, these problems were across the world and out of my reach. The World Food Prize opened my eyes to the active role I can play in helping to work towards and potentially even solve these issues; I just had to take the initiative to do so. And conveniently enough, not only did the World Food Prize provide my inspiration to take this initiative, but they also provided the perfect opportunity to follow through with it—the Borlaug-Ruan International Internship. The individuals at the Global Youth Institute who were returning from their summers as Borlaug-Ruan International Interns who were my age, and some even younger, were phenomenal advocates for this unique opportunity. Hearing about the amazing things they were exposed to during their internships reinforced one thing to me—a Borlaug-Ruan International Internship is a life changing opportunity. An opportunity that I would not want to miss. After going through the application process, I was ecstatic when the news finally came out that I had been selected as an intern. Especially after I found out I would be spending my internship at EARTH University in Costa Rica. Because as a student studying animal science and Spanish, the opportunity to conduct my own animal research project within a Spanish speaking country was truly the perfect fit.

Three years ago as I was writing that initial research paper, I never would have imagined it was going to lead me to where I am today. Looking back on myself as a Junior in high school, it feels surreal that the 2015 Iowa Youth Institute was just a stepping stone that would eventually guide me to be able to intern at EARTH University in Costa Rica. The World Food Prize helped me discover the direction I wanted my life to take me and gave me the tools to work towards it. I am excited to see the journey this opportunity will lead me towards. Because my experience as a Borlaug-Ruan International Intern was far from an end point to my thus far experience with the World Food Prize; but instead another stepping stone in a lifelong pursuit towards global food security.

Costa Rica:

When I arrived at the San Jose airport the night of June 10th around 9 o'clock at night, tired from a long day of traveling, I was hit by the overwhelming whirl wind of Costa Rica's capital city. The instant I got off the plane, I was crowded by locals trying to help me with my bags and trying to offer me rides despite me expressing I did not need help and had no tips to offer as compensation. I was relieved when I reached the security of the driver with the EARTH University sign, and with that I was finally in route towards the place I would spend the rest of my summer.

Through my years of Spanish language and cultural education, I had gained a decently extensive background over general Latin culture. But I had little knowledge on Costa Rica specifically. There is also an obvious gap present between reading about culture in a text book versus actual immersion and experience. A similar gap was also present in my Spanish language skills. As a Spanish major in my sixth year of Spanish education, I was very confident in my fluency before I left for my internship. However, with new accents, slang, and speeds of speaking, it at first seemed as though everyone was speaking an entirely different language than the Spanish I was accustomed to. But with the help of the EARTH University students and my mentors, I quickly adjusted to communication with native speakers. During my two months in Costa Rica, I had the opportunity to travel to different areas around the country; however, I spent the majority of my internship on campus at EARTH University.

EARTH University:

Background:

EARTH University is located in Guácimo, Costa Rica within the Limón province which makes up the Caribbean side of the country. Established in 1986, the name EARTH actually stands for *Escuela de Agricultura de la Región Tropical Húmeda* (Agricultural School of the Humid Tropical Region), although the acronym EARTH correlates perfectly with the global diversity found at the university. With a campus now comprised of over 400 students from a total of 41 different countries, EARTH has developed an extremely unique culture of its own. With 8,342 acres of land, the campus provides many resources: academic farms, classroom and office buildings, laboratories, student and faculty housing, a commercial banana plantation, recreational areas, a natural forest reserve, and reforested area (Oportunidad Laboral Como Encargado General De Compañía—Costa Rica).

Educational Opportunities:

Students who attend EARTH University go through a careful selection process with a focus on leadership potential and work ethic. These two competencies are essential characteristics for the students to possess, as EARTH was designed to take students—primarily from developing and rural areas—and provide them with the necessary knowledge to return to help improve their home countries. Students receive an undergraduate degree in agricultural sciences and natural resource management. The university as a whole has a strong emphasis on sustainability, as well as student-centered learning through hands on experiences. In alignment with their environmental awareness, EARTH is a carbon neutral university. This status of neutrality is achieved through their extensive waste management practices, as well everyone's personal understanding of their environmental responsibility.

While interning at EARTH, I had the opportunity to participate in three classes: an animal science course, an environmental issues course, and a Spanish course. The animal science class was instructed by one of my mentors, Professor Rafael Marzall, and was taken with all of the first year students. It was a great curriculum review from some of my previous animal classes at Iowa State University, and focused on animal nutrition, anatomy, and handling during my eight weeks of course work. In correlation with the EARTH academic model, the class was a very hands on experience. For example, we did not just review animal anatomy in a text book diagram, instead we examined and dissected fully mature carcasses. This class was also extremely beneficial to my Spanish skills, as it was taught entirely in Spanish and used a variety of scientific vocabulary I had not yet been exposed to during my Spanish education in the United States.

The second course I participated in was a two-week intensive short course on environmental issues that discussed waste management and environmental economics. This course was a major change of pace from my first few weeks here. I went from working on the farm and only speaking Spanish, to taking a class in the air conditioned library with a small group of students from the United States. To conclude this course, we took a trip to Central America's most polluted river, Río Tarcoles, to take water samples. As well as visiting Isla Tortuga off the

Pacific side of Costa Rica in order to measure to island's carbon footprint and the economic impact of the tourism at this island.

The final course I was involved in was a personalized Spanish class that is typically required of all students and interns from non-Spanish speaking countries who come to EARTH University. My teacher, Libia, reviewed some grammatical concepts and helped me learn technical animal science related vocabulary relevant to my internship. This class was immensely beneficial in helping me to communicate effectively at work.

Personal Observation:

One of the most impactful observations I had during my time at EARTH was the incredible work ethic of all of the students there. For most of them, this education was a direct opportunity to improve not only their own livelihood, but potentially the quality of life for their families, towns, and even countries. Students put forth such a strong effort because the purpose driving them is so strong. With 60% of the student body on full scholarship, and the remaining percentage receiving some form of financial support, students also have to uphold very high standards in order to continue their education at EARTH.

Another unique aspect provided at EARTH is the powerful sense of community. There is an amazing family-like atmosphere present at this university created by the small number of people on campus, the secluded location, as well as a common passion and goal shared by all students and workers. This strong sense of community provided me with the support system that made my time at EARTH such a gratifying experience.

Finca Pecuaria Integrada—Integrated Livestock Farm

Purpose and Mission:

Like every academic farm found at EARTH, the purpose of the Integrated Livestock Farm is to educate students so they can implement their obtained knowledge after graduation. Thanks to this academic model, the animal production farm is utilized with very hands on educational practices. Students take a variety of livestock based classes throughout their four years at EARTH; these classes include basic animal care and practices, genetics, nutrition, and the opportunity for personal research in their fourth year. The daily work at this farm is performed by workers ranging in age, educational level, and country of origin. In order to provide students with a well-rounded animal science background, the university has a swine unit, a dual purpose cattle operation, a sheep herd, and a horse unit. Throughout my internship, I was able to work in all of these different areas of the farm. My work days began at 6 AM and concludes at 12PM. The internship programs at EARTH University are designed to be very flexible with a lot of personal independence. This freedom allowed me to customize my experience to fit my interests, which led me to spending the majority of my internship where my personal agricultural passion lies—the swine production unit.

Swine Production Unit:

The swine unit at EARTH University consists of two open air buildings normally housing around 100 head of pigs combined. One building is used to house breeding animals, and the other is used as a farrow to finish facility. The entire facility is vertically integrated which helps eliminate economic, environmental, and biosecurity related issues. All breeding is done naturally on campus with one boar and a rotation of around ten sows. Pigs not selected for breeding purposes will remain in the swine unit until the completion of the finishing stage, at which point they are harvested in the Food Processing Lab on campus. After harvest, the pork is sent to the campus cafeteria where it is prepared and served. All leftover organic waste from the cafeteria is then sent back to the swine unit to be recooked in order to kill any potential pathogens present, and then fed to pigs. The oven used to recook this food is powered by methane which is produced in an on-site biodigester.

In order to power this biodigester, the entire swine facility is washed out daily (with collected rain water), sending waste created by pigs through a channel system that eventually separates the waste into solid and liquid. The liquid waste is sent through the biodigester creating the previously mentioned methane biogas. And the solid waste is sent to the compost center to be processed into fertilizer that will later be used to grow food on other academic farms present at EARTH University. The pigs are watered through rain water collection set up on top of the two housing facilities. This system helps the campus to eliminate food waste, as well as save energy, water, and money. The swine production unit is primarily run by one female worker, Yamí, who carries out daily chores and maintenance. More extensive animal health practices are performed by professors to ensure optimal animal care and safety.

Mentors:

I had two primary mentors while at EARTH: Professor Carlos Orozco Corrales and Professor Rafael Marzall.

Professor Orozco is a professor at EARTH University who specializes in animal nutrition. He primarily teaches more advanced classes geared towards upper level students, and was my primary project mentor throughout my internship.



Pictured is Professor Carlos teaching me how to burn wounds close to prevent infection after tail docking of piglets.

Professor Rafael taught the previously mention introductory animal science class, and served as my work mentor. He helped coordinate my weekly activities and communicate with workers to arrange specific learning experiences for me.



Pictured is Professor Rafael during a class session focused on sheep care.

Research Introduction:

Problem/Influence on Food Security:

As developing countries—such as Costa Rica—progress, their citizens aspire for a more protein-carbohydrate balanced diet (Weaver). As the quality of lives and financial situations of people improve, more people are available to afford animal based protein, causing a demand increase in the meat industry that can be difficult to meet. High quality protein access may be restricted due to expense, accessibility issues, or a variety of other possible obstacles (Elanco). A multitude of possibilities exists within the swine production industry, to improve quality and quantity of protein available. These various options extend in range from technological complexity, price range, and overall accessibility. One option that is easily alterable when attempting to increase animal protein production, is a nutritional approach. By adhering to a developing pigs very specific and constantly changing nutritional requirements, one can optimize growth as efficiently as possible. This translates to more protein produced at a quicker rate. Helping rural farmers in developing areas learn how to properly feed their animals to increase production is a key component in overcoming global protein malnutrition.

In any form of swine production, the nursery phase plays a crucial role in the overall developmental process of a pig. The nutritional composition of the feed ration used has to be situationally ideal in order to ensure optimal piglet development. The nutritional inconsistency of the current diet of cafeteria leftovers in place at EARTH University has the potential to lead to both over and under feeding. Over feeding leads to an excess of expensive nutrients which cannot be absorbed and therefore become waste. And underfeeding results in nutrient deficiencies which can impede the growth rate of the piglets; this would overall decrease the production efficiency of the swine unit. Both of these outcomes result in an economic loss for producers.

Because of a piglet's very specific dietary needs at different stages in its growth, phase feeding is a very common way for producers to keep up with and meet their requirements and stay within their dietary margin of safety. By using a 4 phase feeding program, the sensitive digestive systems of piglets can slowly adjust to changing rations. Nutrient levels in the feed also change with the piglet's requirements as it grows. This practice helps to prevent over and under feeding.

Project Objective:

This experiment was conducted with the intent to compare two different diets and their effects on piglet development within a tropical setting. The overall goal being to determine the most effective diet from a strictly results oriented perspective. Despite the main objective focusing on pure data for any conclusions, issues such as economic and environmental factors will be later addressed.

Hypothesis:

It was originally hypothesized that piglets who received the four phase grain based diet would overall show superior developmental data when compared to piglets who were fed a diet comprised of cafeteria leftovers.

Methods:

Experimental Design:

The experimental units within each group were made up of piglets from two separate litters that were born four days apart—the first litter farrowed on June 15th of 2017 and contained four piglets, and the second on June 19th of 2017 with twelve piglets. With sixteen total piglets in a close enough age proximity to permit comparable dietary needs, the piglets were all weaned on July 8th of 2017 and split into two separate treatment groups of eight: Group A and Group B. Each group consisted of two piglets from the first litter and six from the second. This was to control any influence the minor age gap between the two litters may have had on the results. Similar precautions were also taken by placing as close to equal amounts of barrows and gilts as possible within the differing treatment groups. Therefore, Group A contained three gilts and five barrows, and Group B contained four gilts and four barrows.

Group A was randomly selected to receive the traditional piglet diet used at EARTH University. This diet was comprised of organic waste from the campus' cafeteria.

Group B received a four phase, grain based diet rationed specifically for piglet growth. This phase style feeding system is designed to progressively transition piglets from a liquid to grain diet after weening. As the piglet's body develops, the diet alters to meet the most current bodily needs.

Data was analyzed and compared by focusing on the average percent response of the two groups to five main components of piglet development: piglet weight, average daily gain, average daily feed intake, feed to grain efficiency, and grain to feed efficiency.

Responsibilities and Contributions:

My personal contributions with this research began by thinking of and planning the experiment under the supervision of my mentor, Professor Orozco. My first four weeks at EARTH University consisted of gestational care to the two sows that were pregnant for the piglets that would later make up the experimental units. This care consisted of ensuring proper gestational nutrition for the sows, as well as observing overall health. I then aided both sows in the farrowing process to help prevent unnecessary birth mortalities of the piglets. The day after each litter was farrowed I personally processed the piglets. This processing included umbilical sanitation, tail docking, needle teeth clipping, injections, and ensuring piglets consumed proper amounts of colostrum. The following week, under the initial instruction of Professor Orozco, I castrated the males and treated them with an antibiotic. After weening piglets on July 10th of

2017, they were placed into their two separate pens. From there, my responsibilities lied in distributing proper feed rations and communicating with farm staff on what to feed on days I was not present at the farm. Upon weaning I took and recorded the initial weights of every piglet and continued collecting individual weights once a week for the remainder of the experiment. Upon the completion of the experiment, these weights, were analyzed along with daily feed intake of each group, to compile the following data analysis.

Results:

The first week of the experiment started on the initial ween date, July 8^h, and ended when the piglets were weighed the following week on July 15th. As shown in Table 1, after the first seven days of trial, Group B (grain) already showed a higher percent response in all relevant categories.

Table 1. Performance data for day 0 to 7

	Treatment		% response for Grain diet
	Cafeteria	Grain	
# of pens	1	1	--
Pig wt day 0, kgs	6.1	6.0	-1.6
Pig wt d 7, kgs	6.5	6.8	4.6
ADG, kgs	0.06	0.11	83.3
ADFI, kgs	0.29	0.29	--
F:G	5.00	2.50	50.0
G:F	0.21	0.40	90.5

Week two's results varied slightly in the fact the percent response shown towards the grain based diet was negative in the categories of Average Daily Gain, Feed to Gain ratio, and Grain to feed ration (See Table 2). This implies that Group A showed better development in these regions of interest in the dates of July 16th-22nd.

Table 2. Performance data for day 7 to 14

	Treatment		% response for Grain diet
	Cafeteria	Grain	
# of pens	1	1	--
Pig wt day 7, kgs	6.5	6.8	4.6
Pig wt d 14, kgs	7.9	8.1	2.5
ADG, kgs	0.20	0.18	-10.0
ADFI, kgs	0.38	0.38	--
F:G	1.84	2.06	-12.0
G:F	0.54	0.49	-9.3

As displayed in Table 3, the third week of the experiment returned to a percent response once again favoring the grain based diet of Group B. These results were found during the span of July 23rd-29th.

Table 3. Performance data for day 14 to 21

	Treatment		% response for Grain diet
	Cafeteria	Grain	
# of pens	1	1	--
Pig wt day 14, kgs	7.9	8.1	2.5
Pig wt d 21, kgs	10.4	11.2	7.7
ADG, kgs	0.36	0.45	25.0
ADFI, kgs	0.50	0.50	--
F:G	1.40	1.12	20.0
G:F	0.71	0.90	26.8

Week four of the trial (July 30th- August 4th) revealed an even higher percentage in response to the grain based diet over that of the cafeteria waste diet in every category. See Table 4.

Table 4. Performance data for day 21 to 28

	Treatment		% response for Grain diet
	Cafeteria	Grain	
# of pens	1	1	--
Pig wt day 21, kgs	10.4	11.2	7.7
Pig wt d 28, kgs	12.6	14.6	15.9
ADG, kgs	0.32	0.49	53.1
ADFI, kgs	0.75	0.75	--
F:G	2.37	1.54	35.0
G:F	0.42	0.65	54.8

Table 5 displays the data points for the overall experiment by comparing weights and feed rations from July 8th to those recorded on the final day, August 5th.

Table 5. Performance data overall

	Treatment		% response for Grain diet
	Cafeteria	Grain	
# of pens	1	1	--
Pig wt day 0, kgs	6.1	6.0	-1.6
Pig wt d 28, kgs	12.6	14.6	15.8
ADG, kgs	0.23	0.31	34.8
ADFI, kgs	0.48	0.48	--
F:G	2.05	1.55	24.4
G:F	0.49	0.64	30.6

Discussion:

With the exception of week two, all given data exhibits an overarching theme: piglets in Group B showed superior development to those of Group A. Many speculations can be drawn as to why the second week of data contradicts the rest of the findings. Some potential inhibitors may have been individual piglet health, or human error in either the weighing or feeding of the piglets. Another possibility is an unexplainable variance in the development process.

Conclusion:

When comparing a diet comprised of food waste with that of a grain based diet, in a tropical climate the grain based diet showed improved overall piglet development. Under the consideration of weight, average daily gain, feed to grain ratio, and grain to feed ratio, the overall data unarguably reveals a significant percentage response in favor of the grain based diet fed to Group B

Recommendations:

From a development oriented perspective, with the given results a reasonable recommendation for swine producers in a tropical setting would be to implement a grain based feeding program, comparable to that of this study, for early phases of production.

Improvements:

Due to unavoidable situational circumstances, the following factors may have influenced the data:

- Small data set, limited to two experimental units
- Minimal age difference between the two litters
- Room for human error with feeding and weighing of piglets

Personal Experience:

Swine Industry Takeaways:

Having grown up around large-scale swine production, it was a very eye-opening experience to work on a small pig farm in rural Costa Rica. Everything from the housing, to the feed, and even the genetic composition of the pigs varied from what I was used to. Being exposed to these contrasting production practices led to me a deeper understanding of the industry I have been involved in my entire life. Recently things surrounding swine production that I had accepted my

entire life have begun being called into question on a public level. As information has become more accessible, consumer concern in areas such as animal welfare and food safety has also increased. Working at EARTH University as a Borlaug-Ruan Intern helped to first hand expose me to other forms and structures of production. This overall benefitted me in making informed opinions on industry issues by understanding and having experience with differing perspectives on these issues.

A current hot topic of debate within the swine industry lies in the use of gestation and farrowing stalls in production. Both of these types of stalling are prominent in the United States, but many debate the use of these resources from an animal welfare perspective. Because EARTH University does not utilize gestation or farrowing stalls, I was able to see from a new perspective the impact these tools provide in swine production. I can now undoubtedly say that I think both of these items enhance animal welfare. Without gestation stalls, sows like the ones at EARTH are subject to competition and a system of dominance. This means that smaller sows do not get as much food as the larger, more aggressive pen mates. This can then lead to compromised nutrition, as well as injuries if fighting occurs. The necessity of farrowing stalls plays an even greater role. Going to work in the morning to find dead piglets that had accidentally been stepped on by their mother was very difficult, especially knowing most of those deaths could have been prevented if farrowing stalls were used.

Another area of controversy I gained personal insight to at EARTH, was the practice of euthanasia in swine production. Many argue that euthanizing an animal is inhumane and an unnecessary measure of extremity. But after watching piglets suffering and having no means to aid them, emphasized the necessity of this practice to me. At EARTH University, due to the lack of the previously mentioned farrowing stalls, many piglets will accidentally get stepped or laid on by their mother. In some cases, this incident was not immediately fatal. However, the piglet was almost always left with lack of mobility, difficulty breathing, and pain. It is situations like this, where an animal is suffering more by staying alive, that make me support the use of euthanasia.

Overall, my time spent working at the integrated livestock farm at EARTH University made me realize how fortunate we are in the United States from an agricultural perspective. Having access to the most advanced technologies and facilities provides an inarguable advantage in production. This experience also endowed within me a significant sense of respect towards small scale farmers around the world for their immense work ethic and passion for what they do.

Personal Growth:

It is my second day at EARTH, and I head to the cafeteria for lunch after a long morning of work. Not seeing any of the students I recognize and still feeling a little nervous about my new surroundings, I head for an empty table in the corner of the room. After being seated alone for a few minutes, someone approaches me and invites me to come sit with him and his friends. We eat and talk for a while and then the same student, David, walks back towards the dorms with me. When I thank him for inviting me to eat with him, instead of simply saying, “you’re welcome,” he responds with a story:

David grew up in a very small, developing village in rural Kenya. He considered himself extremely blessed to have received a scholarship to go into the capital city to attend high school, an opportunity most of his primary school classmates were unable to have. During his first day at his new school, when it came time for lunch he found himself sitting alone in the corner of the cafeteria. He opted for this seclusion because he felt ashamed. He felt ashamed of where he came from. He felt ashamed because he had not had the same advantages in life as the students who surrounded him. And at that current moment, he was mainly feeling ashamed because he had never used silverware before and did not want to embarrass himself in front of his new classmates. A few minutes later, he looked up to see a girl standing in front of him. And just as casually as David had asked me, she invited him to come join her and her friends at their table. Free of judgement, she helped him with his silverware and included him with her friends like he truly belonged. With such a simple extension of friendship, she changed David's life. This one interaction was the little push that David needed; soon David began to feel confident in himself and proud of who he was. This confidence correlated into every aspect of his life, and soon his academics began to reflect it. This confidence and academic success is what led David to receiving a scholarship to come to Costa Rica and study at EARTH University.

He finished his story by telling me this, "This girl didn't even think twice about reaching out to me, and in doing so she changed the course of my entire life. I know what it is like to feel alone in a new place, so now I go out of my way to reach out to people the way she reached out to me."

David was just one of many inspiring people who impacted me during my two short months at EARTH University. With so many students from so many different backgrounds, the relationships I built completely altered my frame of reference. Despite everyone's varying stories, in some way or another, everyone wants to change the world. Throughout my life I had developed this concept that if I wanted to make a difference in this world, I had to make some miraculous ground breaking discovery that would solve things on a global scale. But even Norman Borlaug himself said, "There are no miracles in agricultural production" (Norman Borlaug Quotes). My time at EARTH University taught me true humility. It made me realize that the world's answers do not lie in one overarching solution waiting to be discovered. If we take a moment to step back from the big picture, it is the small victories we achieve every day that will bring change in this world. Whether it is a simple invitation of friendship, or ground breaking research, I now feel confident that I can make a positive difference.

Getting to meet all of these determined individuals from around the world, gave me a new sense of confidence that the goal of global food security is obtainable. But this goal will not be an easy feat. This is obvious—it is not considered the most difficult challenge for mankind for nothing. However, after seeing the potential people have by coming together, even on the small scale of EARTH University, I am confident global progress will continue to be made.

Acknowledgments:

I want to begin by extending gratitude to the World Food Prize Foundation for all of the strides they take towards alleviating global food insecurity along with other world issues. The opportunities available through their youth programs provide an unprecedented chance for high school students to discover and grow their passion for agriculture and other areas. I specifically want to thank Ambassador Kenneth Quinn and Lisa Flemming of the World Food Prize for not only accepting me into the Borlaug-Ruan International Intern program, but also for providing the support to help ensure I had the best possible experience.

Additionally, I would like to thank my high school teacher, Peggy Watkins, for encouraging me to write that initial research paper for the Iowa Youth Institute. Thanks to her commitment, myself and countless other students from Boone High School have been exposed to the Borlaug mission and gotten to participate in varying World Food Prize events.

Finally, I want to thank my family for their support in everything. I recognize the difficulty in letting your eighteen-year-old child travel alone to another country for an entire summer, and am grateful to them for letting me go on this journey despite any reservations they may have had.

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