

# “The 3 Stages to Change”

2016 Borlaug-Ruan International Internship

with CeSSIAM in Guatemala



CeSSIAM



THE WORLD  
FOOD PRIZE

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## **1. Introduction**

As a child, I was always eager to learn. In kindergarten and first grade my parents enrolled me in an after school tutoring program, not because I wasn't doing well in school, but because they needed someone to help quench my thirst for knowledge. I surpassed my high school credit requirements by twelve credits and graduated high school with thirty college credits. All the hours I spent studying didn't seem like work because I found joy in learning new things.

Up until high school I didn't have an option as to what classes I took. Reading, mathematics, social studies, science, and other core education classes were all that were offered. My freshman year in high school I was given an exciting list of new classes that I could be a part of. Due to the persuasion of my cousin, I decided to register for an agricultural education course. I had lived my entire life in the small, rural town of Fairbank, Iowa. Even though I lived on an acreage eight miles outside of town, surrounded by cornfields and livestock, I never really knew much about agriculture.

Between the agricultural education courses and FFA, it didn't take very long for my interest and knowledge of agriculture to grow. I went from being a shy girl with no knowledge of agriculture to a strong leader who was not afraid to voice her opinion on agricultural subjects. My agricultural education instructor always found ways to help me with my pursuits. In 2014, my junior year of high school, she approached me with information about the Iowa Youth Institute. No student from my school had attended before, so it was a learning experience for both of us.

I was ecstatic to prepare my paper over malnutrition in Haiti. One month after the Iowa Youth Institute, I received word that I was selected to attend the Global Youth Institute. I fell in love with both conferences due to the promotion of deeper thought. I was meeting with other students to talk about important global issues that we had been independently researching. We came up with solutions and ideas that most people our age would have never thought about.

One of my favorite memories from Global Youth Institute was hearing the stories of former Borlaug-Ruan interns. I was in awe that they had taken their ideas and implemented them into projects that impacted agriculture and the lives of others throughout the world. I remember telling my mother, "I want to be just like them."

At the age of 18 I moved three hours from home to start my education in Agricultural Missions. It had been over a year since attending Global Youth Institute when the idea of being a Borlaug-Ruan International intern was brought about again. Ready to follow former interns and Norman Borlaug's footsteps, I submitted my application and participated in the interview process. I cried tears of joy upon word of my placement in Guatemala. Everything was so surreal; it was a dream come true. I was ready for the learning opportunity but had no idea that the three stages of my internship could change my life so immensely.

## **2. Background on Host Center**

The World Food Prize Foundation carries out the vision of Dr. Norman E. Borlaug by emphasizing the importance of a nutritious and sustainable food supply for all people (“About the Prize” para 3). They are able to do so by recognizing individuals who have excelled in their contributions to global food security and by hosting several events for the public and youth to promote their mission (“About the Prize” para 7). In order to be successful in fighting the vast issue of food insecurity, the World Food Prize Foundation has formed strong bonds with other corporations who strive to accomplish similar goals. One of these corporations is Hormel Foods.

Hormel Foods has embodied a goal of “Providing consumers with high-quality, high-value branded products that are flavorful, nutritious and convenient” (“Missions” para 2). They use this goal to improve the lives of the communities in which they live and work and where they focus on hunger relief, education and supporting local programs (“Missions” para 4). Hormel Foods fights hunger in foreign places such as Guatemala. In order to accomplish this, they have created several foreign partnerships, including the Center for Studies of Sensory Impairment, Aging and Metabolism (CeSSIAM), in Guatemala to perform research.

CeSSIAM is a research organization dedicated to investigating the effects and specific micronutrients on outcomes such as health and function (“CeSSIAM” para 2). It also hosts pre-doctoral and doctoral students as they carry out research projects (“CeSSIAM” para 2). CeSSIAM has worked with The World Food Prize Foundation and Hormel Foods to host a Borlaug-Ruan Intern for the past three years.

Through the connection between the World Food Prize and Hormel Foods, my two-month long internship with CeSSIAM in Guatemala was made possible.

## **3. Why Guatemala, Program Setup, and Goals**

Guatemala has the fourth highest rate of chronic malnutrition in the world and the highest of the Americas with a current prevalence of 49.8 percent (“Guatemala” para 3). Guatemala is also one of the 36 countries that contribute to ninety percent of the stunting that occurs throughout the world (“Guatemala” para 3). There are several factors contributing to malnutrition in Guatemala making it a difficult issue to resolve.

In order to provide a well-rounded learning experience, my internship was broken into three stages; collecting circumference measurements, determining the likeability of added whey protein in a product called Incaparina®, and learning about Project Spammy®. These stages were designed to give me an insight to the nutrition landscape in Guatemala and allow for me to learn the process behind a scientific research project.

#### 4. Stage 1: Circumference Measurements

I spent my first three weeks in Panajachel, Guatemala collecting circumference measurements of children. The circumference of certain parts of the body provides information on the body composition. Three anthropometric measurements of interest include the circumferences of the cranium, neck, and waist. The measurement of the cranium is considered to monitor the growth of the brain (Natale & Rajagopalan 57); the neck has gathered interest as a relative measurement to the amount of abdominal fat (Magalhaes et al., 273); and measuring the waist allows inferences to be made about the abdominal fat volume (McCarthy 387). After understanding the measurements and collecting data, comparisons can be made with the existing standards.

The purpose of this study was to determine the repeatability and reproducibility of the circumferential measurements (head, neck, abdomen), by young, unexperienced measurers. I partnered with Windy Mulia Liem, a graduate student from the Netherlands, to address this project.

When taking the measurements, my partner and I used two tools that were used by the World Health Organization when they set the standards of these measurements. The first tool was a flexible, non-stretchable SECA brand measuring tape (SECA GmbH, Hamburg, Germany), designed specifically for head measurement. The second tool was a flexible, non-stretchable SECA brand measuring tape designed for waist measurement. Because there is no standardized tape for measuring neck circumference, we used the waist measuring tape for both the neck and waist. The values of these measuring tools were set to the nearest millimeter (mm).



Figure 2. SECA measuring tape for HC measurement



Figure 1. SECA measuring tape for NC and WC measurement

Measuring the circumference of the head reflects the size of the brain. This measurement was taken slightly above the eyebrows, above the ears, and over the occipital prominence at the back of the head (*Centers for Disease Control and Prevention*). Measurement was recorded on the largest circumference possible. The measurement was taken with the participant standing and the head facing forward. In the case where the participant's hair was tied, the ponytail was removed and the hair was flattened downwards. Measurement was taken to the nearest mm.



Figure 3. HC measurement

The neck measurement was done on bare skin, to the nearest mm. The tape was placed around the neck at a point just above the larynx and perpendicular to the long axis of the neck. The child was standing upright with the head facing forward and the arms at the sides while the feet were together (Nagy et al. S15). Any jacket or sweatshirt that covered the neck was removed during the measurement.

Measuring the circumference of the waist reflects the amount of intra-abdominal fat present. The measurement was taken on bare skin with the measuring tape sitting right above the belly button. The values were recorded at the nearest centimeter (cm). The subject was standing with arms at the sides, feet positioned close together, and weight evenly distributed across the feet. The measurement was taken at the end of a normal expiration, when the lungs are at their functional residual capacity (WHO 2).

Sixty-four children under 12 years of age participated in this study (see Table 1). Each child of the second and first grades were measured by both Windy and I. Later, the measurements were repeated. Each child of the third and fourth grades were measured only by me. These measurements were also repeated. Table 1 shows three missing data for the second measurement. This was due to the pupils' absences during the second measurement day.

**Table 1 Numbers of children participating in repeated circumferences measurements**

Grade	First measurement	Second measurement
1	18	18
2	19	16
3	13	13
4	14	14
<b>Total</b>	<b>64</b>	<b>61</b>

Among the participants, 67%, 44%, 39%, and 43% of children were female in the 1<sup>st</sup> – 4<sup>th</sup> grades, respectively (see Table 2). The mean age of first grade was 7.6 years, the second grade was 8.8 years, third grade was 9.7 years, and fourth grade was 10.6 years. Among the first grade, the youngest age was 6 and the oldest was 10; among the second grade, the youngest age was 8 and the oldest was 11; meanwhile, third and fourth grade were the same with the youngest pupil being 9 and the oldest 12. However, the determination of age was not done based on birth certificate, but solely by asking the children how old they were.



Figure 4. NC measurement



Figure 5. WC measurement

**Table 2 Characteristics of children participating in circumferences measurements**

Characteristics	Grade 1	Grade 2	Grade 3	Grade 4
Female (%)	66.7	44.4	38.5	42.9
Age				
Mean	7.6	8.8	9.7	10.6
Min	6.0	8.0	9.0	9.0
Max	10.0	11.0	12.0	12.0

In this study, two statistical analyses were done to measure the precision of the measurements, namely repeatability (intra-observer reliability) and reproducibility (inter-observer reliability). This analysis was completed using Microsoft Office (Microsoft, Redmond, WA).

Repeatability assessed the precision of the closeness of agreement between a series of measurements under the same condition, where the only difference is the time of the measurements (Barnhart, Haber, and Lin 533). Repeatability tests were done by the same investigator measuring each child twice. The closeness of agreement between the results was calculated using paired-sample t-test.

Reproducibility assessed the precision of the closeness of agreement between independent test results with the same method and subjects or test items, but with different observers or equipment (Barnhart, Haber, and Lin 535). In this study, reproducibility was obtained by my partner and me each measuring the same children. The closeness of agreement between the results was presented with Pearson correlation coefficient and Lin's concordance correlation coefficient (CCC).

The highest repeatability, marked by the least mean difference, for circumference measurements taken by investigator 1 was found in head circumference (HC) among both third and fourth grade students, (see table 3). For investigator 2, the highest repeatability was found in neck circumference (NC) among both first and second grade students. The measurement with the lowest repeatability for investigator 1, marked by the highest mean difference with significant difference, was waist circumference (WC) for both third and fourth grade. The measurement with the lowest repeatability for investigator 2, marked by the highest mean difference with non-significant difference, was in WC among the first grade students.

**Table 3 Highest and lowest repeatability and reproducibility**

Investigator	Repeatability		Reproducibility	
	Highest	Lowest	Highest	Lowest
1	HC 3 <sup>rd</sup> & 4 <sup>th</sup> grade	WC 3 <sup>rd</sup> & 4 <sup>th</sup> grade	HC	NC
2	NC 1 <sup>st</sup> & 2 <sup>nd</sup> grade	WC 1 <sup>st</sup> grade		

On one hand, according to table 3, the highest reproducibility among both investigators was HC. This is marked by the highest value derived from Lin's Concordance Correlation Coefficient. On the other hand, the least reproducible among both investigators was NC. This is marked by the lowest value derived from Lin's Concordance Correlation Coefficient.

A few challenges were encountered during this study. The first of which was relaying the instructions to native Spanish speakers. I had practiced Spanish for four years beforehand whereas my partner only knew the basics. This became most difficult when measuring the waist. Since the waist circumference needed to be taken at the lowest point among natural breathing, we had to ask the children to expose their stomachs and relax. A majority of the girls wore traditional clothing. With the help of a translator, we asked them to take off the belt to loosen the skirt in order to do the measurements on skin. Another issue was that some of the children were holding their breath during the measurements. This could explain the results we received for repeatability.

If I had the opportunity to do this research project again, I would change the data analysis. Repeatability and reproducibility would still be performed, but instead of doing them among grades, I recommend analyzing by ages. There were no distinct cut-off for ages among grades in this school. Our results showed that several grades had the same ages included. At the time I did not understand much about analyzing data but now I realize that analyzing ages, with a small number of participants, would have given us more accurate results.

## 5. Stage 2: Incaparina® Testing

During the final four weeks of my internship, I was responsible for conducting likeability tests of Incaparina® with added whey protein. Incaparina® is a balanced protein supplement commercially made and fortified with vitamins and minerals ("Improved Formula" para. 1). The packaged dry mixture is made of corn and soy flour, iron, calcium carbonate, and vitamins A and B-complex ("Improved Formula" para 1). A gruel beverage is formed when adding water to the mixture. Adding whey protein to the diet of underprivileged and stressed lactating women could help improve nutrient status.

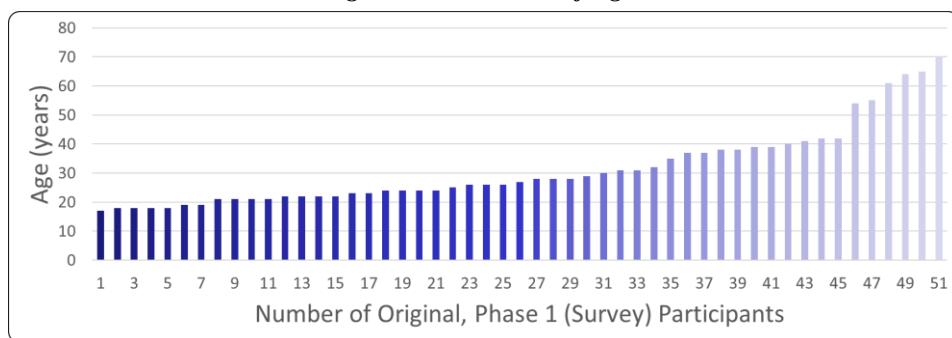


*Figure 6. Flavors of Incaparina®*

The purpose of this study is to determine the usage of Incaparina® and the likeability of the product with added whey protein by mothers from a poor community. I worked with Dr. Marieke Vossenaar, an affiliated associate of CeSSIAM with a PhD in Nutrition, in completing this project. The project was broken down into three phases: determining the usage, finding preferences, and testing likeability.

There were 51 volunteers in total ranging from ages 17 – 70 years (see figure 4). The median age was 27 years. In phase 1, there were 51 participants; phase two consisted of 36; and phase 3 included 35 women. All volunteers were a part of *Nuestros Ahijados*, a program designed to aid poor families.

**Figure 4 Distribution of Age**

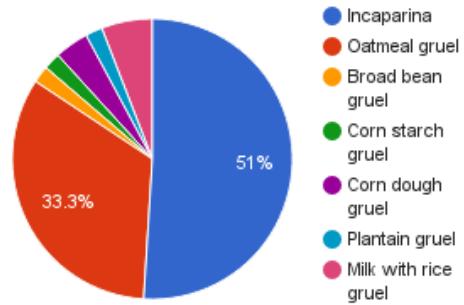


Gruel samples for this study were prepared in a uniform manner, following the instructions given on the Incaparina® packaging. Four tablespoons of the dry mixture were blended in a bowl with 4 tablespoons of sugar. Then, 4 cups of water were added. This mixture was boiled on the stove for eight minutes with constant stirring. When adding whey protein, 200 milliliters of the gruel was measured out and mixed with one prepackaged whey protein pouch containing 5 grams of concentrate. All preparations were stored in an insulated, thermos container to retain heat.

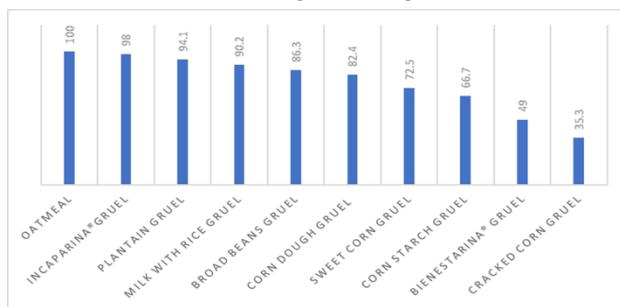
To analyze the data, all responses were collected on a paper questionnaire. Following the survey, they were entered into a Google Drive form, which generated the percentages and responses immediately. Some graphs were later generated in Microsoft Office Excel.

Phase one was presented to the volunteers in the form of a questionnaire. It asked simple questions about the usage of Incaparina®. For example: How often do you consume? Do you add sugar? Do you consume flavored Incaparina®? According to our study group, when asked which gruel they most frequently consume, Incaparina® is the most frequently consumed type of gruel out of the seven main types consumed in Guatemala (see figure 7). Figure 8 shows that it is very common for women to consume a variety of gruels. Roughly 73 percent of participants claim to consume gruels at least two times per day (see table 4). The most common way to consume would be medium in temperature, medium in thickness, and with added sugar (see table 4).

**Figure 7 Most frequently consumed type of gruel**



**Figure 8 Percentage of women consuming various gruels**

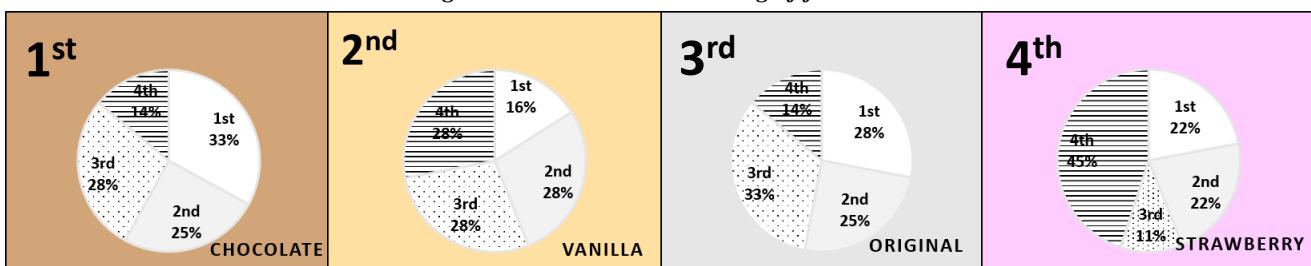


**Table 4 Questionnaire responses**

	n	%
Usually adds sugar to gruels		
Yes	49	96.1
No	2	3.9
Usual frequency of consumption of gruels		
1 time per day	14	27.5
2 times per day	17	33.3
More than 2 times per day	20	39.5
Usual temperature of the gruels consumed		
Hot	13	25.5
Tepid/lukewarm	35	68.6
Cold	3	5.9
Usual thickness of the gruels prepared		
Thin	11	21.6
Medium	31	60.8
Thick	9	17.6
Usually consumes flavored Incaparina®		
Yes	27	52.9
No	24	47.1
Would purchase flavored Incaparina® if able		
Yes	48	94.1
No	3	5.9

Phase 2 found which flavor of the commercially produced Incaparina® is most preferred. Strawberry, vanilla, regular, and chocolate were the flavors used in this phase. These four flavors of Incaparina® were prepared and poured into cups labeled A – D. The participants were asked to taste each flavor and rank them 1 – 4 with 1 being the most highly preferred flavor. Chocolate was most commonly ranked as the most preferred flavor, whereas strawberry was most commonly selected as the least favorite (see figure 9). The participants were then asked what they thought about the preparations. 67 percent of women said these preparations were just right.

**Figure 9 Most common ranking of flavor**



Phase 3 is where the whey protein was added. The same participants from phase 2 were included in this phase. Two cups were prepared and labeled E and F. One cup contained the favorite flavor chosen in phase two and the other contained the favorite flavor with the added protein. The participants were asked to taste from each cup and determine if they were the same or different. Eighty-six percent of women noticed the difference between the preparations and 62 percent said they prefer the preparation with added whey protein (see table 5). The participants were then asked for their opinions on the preparations. Twelve of the thirty-five participants mentioned the preparation with added whey protein had a milky taste. When asked if they would consume the less preferred flavor if offered, all women responded yes. One mother responded, “Because I am a mother, I must eat everything.”

*Table 5 Phase 3 responses*

	n	%
<b>Guels with and without protein supplement were considered</b>		
The same	5	14.3
Different	30	85.7
<b>The preferred gruel was preparation*</b>		
E (favorite Incaparina® flavor)	11	37.9
F (favorite Incaparina® flavor with protein supplement)	18	62.1

Overall, this study showed that all offerings of gruel, by flavor and preparation, were liked. It was found that the protein supplement was well accepted and even valued for its milky taste.

Minor challenges were encountered at the start of the study. Due to limiting amounts of prepackaged whey protein pouches, only 24 women were expected to be surveyed. On the first day of the study, we had over 40 women present. My partner and I quickly learned how to organize the setup to make it a quicker and more efficient process. We also learned how to ration the portions of Incaparina® to allow more participants. My partner and I were far more prepared for the second day of the study after this.

If I were to conduct this research survey again, I would change a few aspects. The first change would be how the Incaparina® is prepared. In phases 2 and 3, we asked the women to give their opinions on the how the gruels were prepared. Even though, in phase 2, 67 percent of participants said it was “just right”, the other comments were not in favor of the temperature of the gruel. The same responses were received in phase 3. In the future, I suggest that temperatures be taken and monitored for each preparation for the sake of uniformity such that women do not choose their favorite based on which temperature made the gruel more appealing. The second change I would make would randomize the order of flavors presented to the women. When giving the preparations, we always set them in a straight line in the same order for every participant. In the future, I would set the flavors in a square, changing the flavor order every time. The randomness of this change will allow the results to be truly based on preference.

## **6. Stage 3: Project Spammy®**

I had the opportunity to spend one week with Hormel Foods employees in Guatemala City. This was a part of Project Spammy®. The vision of this ongoing project is to improve lives through nutrition, educational programming, and leadership development (“Spammy History” para 2). During this week, I got the opportunity to see and learn all about these factors.

To improve nutrition, Hormel Foods designed a product with the nutrients that are often lacking in the diet of Guatemalans. They spent a lot of time working on the product to make it flavorful, easy to prepare and to mix into the traditional diet of any culture (“Spammy History” para 4). This product, called Spammy®, is distributed free of charge to children in need in Guatemala each month. Spammy® has reached over 8,300 families which totals to over 30,000 children (“Spammy History” para 4). The children using Spammy® are monitored in weight, height, and circumference. There has been a positive impact among the recipients.

To improve education, Hormel Foods has worked with families, retirees, and Caritas Archdiocese in Guatemala to develop “Chispa” centers. The focus of the centers is on basic skills – math, reading, nutrition, and motor skills – which will benefit the children in their day to day lives (“Spammy History” para 5). This includes education curriculum that can easily be distributed by local communities. Hormel Foods sends four groups of employees and family members each year to help establish a new center and work at existing centers. During my week, I helped establish the very first Junior Chispa center. This center operates like a regular center, but with a fewer number of children.

Leadership is a crucial element throughout this project. The employees that attend are provided opportunities to develop leadership qualities (“Spammy History” para 6). Another way Hormel Foods promotes leadership is by raising money to sponsor boys and girls of poor communities to attend boarding schools (“Spammy History” para 6). Children who have this opportunity are able to graduate with a high school degree and return to their communities to make a difference.

Through home visits, working at Chispa centers, distributing Spammy®, and learning more about the Guatemalan culture, my week spent with Hormel employees was unforgettable. I met people, who have faced significant challenges, with the biggest smiles on their faces. I heard a family in struggle say they are the happiest people on earth. I could not wrap my head around it at first, but then I realized the reason. Life is so much more than belongings and money. Life is about the memories made with the people around you and how they make you feel. This one week changed my outlook on life immensely.

## **7. In my free time**

Throughout my stay in Guatemala, most of my free time was spent sightseeing and trying new foods. When I created my schedule for the Incaparina® project, I had more room for free time than anticipated. This was because my project was dependent on the schedules of local women. To fill my extra time, I decided to volunteer at *Nuestros Ahijados*, the school where my project was held.

According to their website, *Nuestros Ahijados* is a school system to benefit very poor families. Families pay 15 quetzals (\$2.50 USD) per year to send their children to a high quality school. With the 15 quetzals, they are provided with school supplies, clothing, shoes, and two meals every day. The students are at school each day for a longer amount of time compared to others schools to lessen the time the children have at home alone while their parents are working. The fee also ensures that these families have access to a medical clinic, dentist, psychologist, lawyer, hospital for malnourished babies, and education groups (“About Us”). On the weekends the families are sent home with fresh vegetables so the children will have something to eat. This is only a small glance at everything the organization has to offer.

I was introduced to this program by my host mother who works there as the school’s lawyer. She brought me to work one day to tour the facilities and I instantly fell in love with the place. The next day, I signed up to volunteer on a regular basis. I was assigned to work with the second- grade class for six hours each day. I did this for three weeks.

I was responsible for helping the teacher with any tasks that needed to be done. I prepared work books, helped make posters, answered students’ questions about math, and taught English. Teaching English was my favorite classroom activity. I could see the eyes of the students light up as they started to understand the sounds of English words. Their excitement fueled my passion for helping them. I was also responsible for giving the students love and attention. In order to do this, I played with them during recess, gave them frequent hugs, and let them braid my hair. Each of the students of the second grade left an imprint on my heart. I hope to visit them again someday!

## **8. Improving Food Security**

The three stages of my internship were designed to take small steps towards improving food security. Measuring circumferences allows for us to assess the need for better food quality, whereas distributing Spammy® and adding whey protein to Incaparina® play a hands-on role. Due to learning more about food security issues and methods to improve them, I can now advocate for the cause and encourage others to do so as well. I can help expand the army that fights for this problem.

## **9. A Whole New World**

It is very hard to put into words everything that I have learned and how I have changed as a person during this experience. On the scientific side, prior to this experience, I had little to no knowledge on research and data analysis. My two research projects taught me how to think deeper and outside of the box. I became fluent in organizing a project in a foreign place, a task which required understanding the culture and practicing the language. Along with organizing, I learned the importance of practice and preparation. Through trial and error, I learned the methods that worked for my projects and which ones did not. A major learning experience in my internship was analyzing the data and using the information to write a scientific report. This was accomplished by asking several questions and listening to the advice of my mentors.

Learning and growing in the academic field was not the only form of learning this experience gave me. Before I left for the exchange-experience, I was warned that I would not return home the same person. I did not believe this. I did not realize that spending two months in a foreign place could flip my entire view on life. The first thing I learned, was the importance of a smile. My Spanish seemed to be shy at the start of my experience, which showed me that communication in another language without being fluent is extremely difficult. I had to learn to communicate through my smile and energy so others could trust me.

Most importantly, I learned how to live in the moment, take nothing for granted, and love life. Two months in Guatemala was the longest I had been away from my family and farthest I had ever been from home. I was the most independent during that time than ever before. This experience caused me to grow up very quickly. I had to trust others, manage my time and money, and hold myself accountable.

One small example of change: When growing up, I had a hard time sympathizing with others. I rarely cried even in the toughest of moments. I had always thought that crying was a sign of weakness; therefore, I never did it. My family often joked that I “had no heart.” During my time in Guatemala, I cried for what seemed to be the first time in my life. This may not seem like a big deal to others, but for me it meant the world. My heart was finally opening up to feel the pain or joy that other people were feeling. For me, it was the best moment in the world. I am no longer ashamed to cry in front of other people because I understand it shows that I care. Such a small change has made such a large difference in my life.

This has not been one of those experiences where upon arrival back home everything is forgotten and back to normal. I have been back home for quite some time now and my arrival has been nothing like that. It is like I live in a whole new world. My everyday tasks and outlook on life are completely changed because of everything I learned in two short months. My family and friends have even commented on the difference. Tiny worries and stresses that used to be of high importance to me no longer matter. I am more focused on my goals and bettering myself than letting small mishaps bring me down. It helps that I was able to see people living in struggle have such a positive energy. I have become very thankful for the life I have been given and the people I have met.

## **10. Acknowledgements**

I would like to extend a very LARGE thank you to all who helped me along my journey. Without all of you, I would not have been able to have an experience of a lifetime and learn so much. Throughout this process, I have grown as a person. My eyes are now open to many more possibilities, my mind is much clearer, and my heart is ready to continue serving.

To the World Food Prize Foundation, Ambassador Kenneth Quinn, and Lisa Fleming: Thank you for all of your hard work in organizing an amazing program for eager learners like me. I appreciate your efforts in making my experience safe and worry-free, and always keeping in touch. Thank you for seeing the potential in me and selecting me to serve as a 2016 Borlaug-Ruan International Intern.

To Hormel Foods: Thank you for allowing me to be a part of the Hormel Employee Engagement Trip. Dan Hernandez and Becky Lubensky did a wonderful job at organizing this eye-opening experience. I am very blessed to have met Melissa Bonorden who worked very hard in helping plan my trip and introducing me to the work of Hormel. I appreciate Hormel's support in making my internship possible!

To CeSSIAM: I owe many thanks to Noel Solomons, Claudia Arriaga Godoy, Monica Orozco, and Marieke Vossenaar for hosting me this past summer. Thank you for answering my questions and teaching me the process behind a research project. I learned more in that two-month time frame than I could have ever imagined. I am so grateful to have had the opportunity to work with such caring and successful people!

To Kimberly Shiu: I never imagined I would meet a fellow Iowan and become such a close friend with her while I was away in Guatemala. Thank you for serving as my mother by answering my questions, lending an ear, and giving me advice. You made me feel comfortable in such a foreign place!

To My Host Families: Thank you for introducing me to the Guatemalan lifestyle. I loved getting to try new foods, practice Spanish, and see new places with you. I appreciate your support and hospitality. Not many people can say they are a part of two foreign families!

To Ellen Doese: I am so grateful to have such an influential role model in my life. Thank you for introducing me to new things. You played a major role in helping me obtain this once in a lifetime opportunity. I will never forget your support!

To My Family and Friends: Thank you for always encouraging me to chase after my dreams. Being away from everyone for two months was a struggle at times but with the messages of love and kind words, I felt closer to home.

Thank you again. I appreciate all of you much more than you will ever know!

## 11. Picture Page



*Distributing Spammy®*



*Making New Friends*



*Hosting Incaparina® Surveys*



*Measuring Circumferences*



*Visiting Mayan Ruins*



*Teaching English*

## **12. Works Cited**

“About the Prize.” *The World Food Prize*. World Food Prize Foundation, n.d. Web. 02 Oct. 2016.

“About Us.” *God’s Child*. The God’s Child Project, n.d. Web. 17 July 2016.

Barnhart HX, Haber, MJ, and Lin LI. An Overview on Assessing Agreement with Continuous Measurement. *J Biopharm Stat*. 2007;17(4):529-69.

Centers for Disease Control and Prevention (CDC). National Health and Nutrition Examination Survey (NHANES): Anthropometry Procedures Manual. CDC, 2008.

“CeSSIAM.” *International Nutrition Foundation*. International Nutrition Foundation, n.d. Web. 26 Sept. 2016.

“Guatemala.” *World Food Programme*. World Food Programme, 2009. Web. 15 June 2016.

“Improved Formula Incaparina.” *Incaparina*. Incaparina, n.d. Web. 25 Sept. 2016.

Magalhães EI, Sant'Ana LF, Priore SE, FranceschiniSdo C. [Waist circumference, waist/height ratio, and neck circumference as parameters of central obesity assessment in children]. *Rev Paul Pediatr*. 2014 Sep;32(3):273-281.

McCarthy HD. Body fat measurements in children as predictors for the metabolic syndrome: focus on waist circumference. *Proc Nutr Soc*. 2006 Nov;65(4):385-392.

“Mission & Values.” *Hormel Foods*. Hormel Foods Cooperation, n.d. Web. 3 Oct. 2016.

Nagy P, Kovacs E, Moreno LA, Veidebaum T, Tornaritis M, Kourides Y, Siani A, Lauria F, Sioen I, Claessens M, Marild S, Lissner L, Bammann K, Intemann T, Buck C, Pigeot I, Ahrens W, and Molnar D. Percentile reference values for anthropometric body composition indices in European children from the IDEFICS study. *Int J Obes*. 2014;38:S15-S25.

Natale V, Rajagopalan A. Worldwide variation in human growth and the World Health Organization growth standards: a systematic review. *BMJ Open*. 2014 Jan 8;4(1):e003735.

“Spammy History.” *Food for the Poor*. Food for the Poor, Inc, n.d. Web. 23 Sept. 2016.

WHO. WHO STEPwise approach to surveillance (STEPS). Geneva, World Health Organization (WHO), 2008.

### **13. Apéndices**

#### **ACCEPTABILITY OF FLAVORED INCAPARINA IN ADULT WOMEN OF THE SACATEPEQUEZ DEPARTMENT**

Created in 1959, as a consequence of the various research activities with complementary vegetable materials with high content and high quality of protein, Incaparina it's a gruel preparation that functions as a protein and vitamin supplement, very popular and known in Guatemala. It owns its name to the fact that was created as part of various research projects carried out by Dr. Ricardo Bressani at the Instituto de Nutrición de Centroamérica y Panamá (INCAP).

Incaparinas main ingredients are corn and soy flour, calcium carbonate, iron, vitamin A and vitamins B. Nowadays it's produced on a large scale in different presentations and flavors.

The current project's main objective is to explore certain attitudes and practices of a group of women from Sacatepequez around the consumption of gruels. It's of special interest, to know the perception of this particular group of women about Incaparina, as well as the acceptability of the different flavors of Incparina

In addition, the study also wants to inquire about the impact on the acceptability of Incaparina, due to the addition of a whey protein supplement, which is designed to fulfill the nutritional protein requirements of women during the lactation stage.

The project is divided into two stages. During the first stage or phase, it is required that the participant answers the first questionnaire which was designed to get information about the gruel consumption patterns they practiced. On the second stage of the project, participants are going to be asked to taste various samples of flavored Incaparina and to again ask a new questionnaire about their preference of what they drink during the sensory evaluation.

The current project doesn't represent any harm to the participants; all women who have legal age as adults and are willing to respond to the questionnaires and taste the different preparations of flavored Incaparinas, are welcome to participate in the study.

## PRELIMINARY QUESTIONNAIRE: PHASE ONE

Subject Code			
Date of the interview	<input type="text"/>	<input type="text"/>	<input type="text"/>
	day	month	year
Place of interview	<hr/>		
Name of interviewer	<hr/>		

**1. How old are you?**  O Doesn't know  
years

**2. Do you drink one or more gruels of the following list? Mark with an X the answer.**

- O Oatmeal
- O Incaparina
- O Bienestarina
- O Sweet corn gruel
- O Masa gruel
- O Broken corn gruel
- O Rice and milk
- O Fava vean gruel
- O Plantain gruel
- O Maicena

**3. From the latter list Which are the two gruels you drink the most? Write the answers.**

1	
2	

**4. When you prepare gruels at home, do you add sugar to the recipe? Mark with an X the answer**

Yes       No

**5. How many times a day, do you drink gruel? Mark with an X the answer.**

Once a day       Twice a day       More than two times a day

**6. How do you usually drink gruel, hot warm or cold? Mark with an X the answer. If the participant responds, "It depends", let her describe on what depends on.**

Hot       Warm       Cold       It depends

It depends on what? Specify \_\_\_\_\_

**7. Do you prefer to drink gruel when it's thick, watery or somewhere in between? Mark with an X the answer**

Thick       Intermediate thickness       Watery       It depends

It depends on what? Specify \_\_\_\_\_

**8. Do you drink flavored Incaparinas? Mark with an X the answer.**

Yes       No

**9. If you could access or buy the flavored Incaparinas would you drink them? Mark with an X the answer.**

Yes       No

## **INSTRUCTION MANUAL ABOUT THE PREFERENCE AMONG FLAVORED INCAPARINAS: PHASE TWO**

### **1. From the following flavored Incaparinas, that you will taste ¿Which one do you prefer?**

- Original
- Vanilla
- Chocolate
- Strawberry

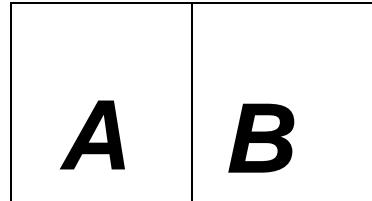
*Small 50-70 mL sampler volumes of each of the four flavors will be distributed to women and they will be asked to take small initial sips of each flavor. Then a forced-choice preference ordering will be requested. A paper sheet with spaced numbers 1 – 2 – 3 – 4 will be on the table. The women will be asked to place the one they like the best of all beside the number one. Then, she will be asked to place the one she preferred second to go beside the number two. If she can go that far to a first and second preference, the test will be valid. However, if she can go to the third choice (the fourth would obviously be the remaining one), this would be a better performance. The order of preferences are recorded on the data sheet.*

### **2. What do you think about the flavored Incaparinas you just tasted? Try to find out her opinion about flavor and taste, aroma and thickness**


*The subjects then will be allowed to finish drinking any of the samples they would like to. At the same time, the question about the flavored gruels will be asked. Finally, the subject will be thanked for her participation, and requested to participate in Phase THREE. (Which may be performed later on the same day – or on another day). If she agrees, a date and time for the final phase will be made.*

## **INSTRUCTION MANUAL ABOUT THE DETECTION OF DIFFERENCE BETWEEN PROTEIN-SUPPLEMENTED VS UNSUPPLEMENTED FLAVORED INCAPARINAS: PHASE THREE**

**Preamble:** This study will be performed in women veterans of Phase Two who are willing to continue their participation. The flavor of gruel for this presentation will correspond to the flavor most preferred (rated number one), in Phase TWO.



- 1. Hand out the participant two cups with Incaparina marked as:**

*Ask the participant to look, smell and taste them. Soon after, ask her to take a sip, to establish if the temperature of the Incaparinas it's the ideal for her. Do this with both cups she is testing.*

*The following questions inquire about two main elements: noting a difference in taste and selecting the preference between two preparations of the selected flavored Incaparina in question No. 1. Ask the participant to look, smell and taste the cups again.*

- 2. Do you think these two cups contain the same preparation of Incaparina or are they distinctly different one from the other? Point out that she can taste the two cups again, in this question it's essential that she gives a definitive answer between the options below.**

They are the same

They are different

*When the participant responds “**They are different**” proceed with questions 4.A 4.B and 4.C then thank her for participating and finish the interview.*

*If the participant responds “**They are the same**” proceed with question 5, then thank her for participating and finish the interview.*

- 3. A. Of the two, which one do you prefer? (Select the one she likes the most)**

Preferred Cup of Incaparina:

An empty rectangular box, likely for the participant to mark their preferred cup of Incaparina.

**3. B. Why did you prefer this cup of Incaparina?** Try to find out her opinion about flavor and taste, aroma and thickness of the selected cup of Incaparina.

**3. C. Even though you didn't choose the other cup of Incaparina as the preferred one, tell me would you be ok in drinking it if it was offered to you as beverage? Try to find out if she finds the it to be ok, tolerable or disgusting.**

Yes

O No
