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Can Small-Scale Poultry Initiatives Alleviate Food Insecurity and Increase Empowerment for Women in Economically Disadvantaged Areas?

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by

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Overview

In the summer of 2019, I, along with 8 other students from the University of Arkansas departed the United States for the Central American country of Belize. Despite our limited knowledge of what Belize held in store for us, we were enthusiastic about the coming months. While we had different projects, we all set out with the same universal question in mind. How can we use the knowledge we have gained through education to make a positive impact on the lives of people living in an impoverished town? Some of the members of our team worked alongside local businesses to develop business plans to increase profitability and efficiency and others worked with the local tourism office to bring in more visitors, and therefore revenue, into the town. I worked toward establishing a stable source of nutrition for the most underprivileged in the community. Specifically, our group set out to solve two problems that we observed in the community. The first being "Can small-scale agriculture and poultry initiatives improve the lives of people living under the poverty line?" The second being "Can we implement a project that also empowers the local women to take a more active role in providing for their families in a highly patriarchal society?" After much planning and research into the nature of these projects, we devised a way to encourage the expansion of our project by working with established organizations and illustrating the benefits of the project. This thesis paper describes how we set about solving these problems while explaining the important factors that we took into account and how we framed our project be successful in practice.

Literature

Identifying and devising a plan to address an issue in a foreign nation requires thorough knowledge of the primary reasons for implementing the project and the factors that may influence the project at the commencement or further along in the process. Before beginning my project, I wanted to know the issues that may arise and how others around the world had seen the same problems. Because food insecurity is not specific to Belize or even the Western Hemisphere, my project was not the first to attempt at resolving the issue. Establishing self-sustaining poultry farms in impoverished areas has been a common practice and has been shown to be effective. In order to ensure that my project could take hold, I needed to understand the social and economic factors that would influence its success. With my two-pronged goal in mind, I set about to understand what had been done in the past in regards to women and food insecurity.

The USDA defines food insecurity as "the limited or uncertain availability of nutritionally adequate food or uncertain ability to acquire acceptable foods in socially acceptable ways" (Life Sciences Research Office, 1990). Food insecurity can be brought on by a variety of factors including loss of monetary means, drought or famine, or natural disaster. In this case, Dangrigans are most at risk of losing the streams of income that allow them to purchase the food and materials they need to survive. While Belizeans have access to markets and grocery stores, not every individual or family has the means to purchase highly nutritious foods on a regular basis. Oftentimes, the individuals I worked with could only identify where their subsequent meal would come from. Because of this uncertainty of funds, they are at risk of losing access to quality foods that promote good health and nutrition.

"The top three characteristics associated with higher likelihoods of experiencing food insecurity in Latin America and the Caribbean were low levels of education, limited social capital, and living in a country with low GDP per capita" (Smith and Meade, 2019). These three factors are all present in Dangrigan society. Belize's current education system is failing, with "more youth outside of the school system than in it and many failing to make the transition to the workforce" (Intern-American Development Bank, 2013). Furthermore, the social capital and GDP per capita in the region are low, with many families relying on remittances or living paycheck to paycheck. With these critical deficiencies identified, we had reason to believe that our project could have a substantial impact on the community.

"Poultry keeping is making an important contribution to the livelihoods of the most vulnerable rural households and… providing a source of income, improve nutrition, and helping to meet family and social obligations" (FAO, 2003). Poultry gardens have been widely successful around the world in bringing stability to the diets of historically undernourished demographic groups. They provide a much needed source of protein for people living under threat of malnourishment and even starvation. Around the world, "interest for using poultry as a means in poverty alleviation and food security programs is increasing. However, the accessibility to literature, documents, guidelines, manuals, etc. is the main constraint." (Jensen, 1998) While the people of Dangriga are not directly under these threats, the implementation of poultry gardens can have an beneficial impact on the women of the community. The challenge was providing the necessary resources for their success; most importantly, a manual, a model, and the tools necessary to carry out the construction process.

The Georgetown Institute for Women, Peace and Security's article of Belize's Performance on the Women, Peace, and Security Index reveals that the employment rate for Belizean women is only 53.1% in 2019, the same year that we began our project. (GIWPS, 2019) With almost 50% of the population of Belizean women being underutilized, our project aimed to empower women to take on more responsibilities in providing for their families. Though Garifuna culture encourages a more patriarchal society, we aimed to increase responsibilities for the local women while simultaneously respecting the culture of the Garifuna people.

Background

In order to understand the underlying reasons for how we carried out our project, one must understand the inner workings of Belizean and more specifically Dangrigan society. While Belizeans technically enjoy rights provided by a constitution, they rank 111 on the 2020 Index of Economic Freedom. (2020 Index of Economic Freedom, 2020) This index, which tracks the advancement in economic freedom, prosperity, and opportunity in each country of the world, is used to identify the countries with the most economic prosperity and mobility. Belize ranks in the "mostly unfree" category, denoting the problems that many people face in regards to economic success. Additionally, 5% of Belize's GDP is comprised of remittances from the USA according to BBVA research (BBVA Research, 2019). The reliance on remittances is stronger in more impoverished areas. In Dangriga, many families subsist on remittances sent from relatives in the United States because it is one of the least economically advantaged towns in the country. Since the families often do not know when to expect an inflow of money from a remittance, they are at risk of food insecurity. If the relative were to lose their job or be unable to work in the U.S., the stream of income would be staunched, leaving the family on their own in a suffering economy. Knowing this, we wanted to incorporate a way to provide a recognizable source of nutrition and a possible source

of income for the families who adopt our project. If the remittances were to run out, the families would be able to continue to reap the benefits of fresh produce and protein from the poultry and even sell their bounty at the market in order to purchase other necessities.

Due to restricted economic mobility, Belizeans must create their own sources of income and find other ways to live economically stable lives. We believe that backyard poultry projects are a great first step in encouraging entrepreneurship and economic responsibility in the region. The gender roles and problems that the society faces are much different than the ones we see in the United States. "In Latin America, gender roles and societal expectations of men and women have been shaped largely by cultural-specific values and beliefs" (Zimmerman, 2015). The prominent culture in Dangriga is that of the Garifuna, a culture deeply rooted in African patriarchal values. The culture and societal norms of the region "serve to establish and reinforce the sexual division of labor" (Zimmerman, 2015) While males are expected to be dominant in the public sphere, holding a job and providing the monetary means to support a family, women are given responsibility of the household and children. This concept can be illustrated through the differing employment rates seen between women at 58.9% and men at 81.4% of men. (GIWPS, 2020) Knowing these facts and how they come into play in the daily life of Belizeans helped us chose a target group for our project.

This project was an ongoing project that was started in the summer of 2018 by students from the University of Arkansas. Their work on the project consisted mostly of working with a local man to develop the plan for implementing poultry and vegetable gardens in the community. From there, we put the plan into motion and actually constructed a functional poultry coop and garden. While we had an outline detailing the steps needed to construct the garden, we still needed to identify a group that would adopt our project and allow it to come to fruition. With women bearing the brunt of responsibility in the household, generally remaining at the home throughout the day, we wanted to tailor our project to be carried out by the women of the community. We conjectured that the added responsibility would not be overwhelming and the upkeep of the garden could be easily added to the responsibilities of the matron. Furthermore, the project could encourage and lead the women to take on greater projects for the betterment of the family and the community as a whole. Luckily, with the help of our advisor, Dr. Farmer, we were put into contact with the leader of a women's activism group, the Productive Organization for Women in Action or POWA. The very existence of POWA lent itself to the fact that the women are looking for outlets to become more active in their community and aid their families. After meeting with three of the most active women of POWA, we decided to choose POWA as the organization we were partnering with to bring about our project.

While my other peers focused on projects such as education reform, tourism, and consulting, our group sought to solve the most important issue, food insecurity. Without ready access to affordable and nutritious food, the people cannot benefit from the other projects. We wanted to establish a fully functional model to serve as an example for those wanting to build their own coops and encourage the autonomy of the group in future ventures.

The Project

In the summer of 2018, the year prior to our time in Belize, students from the University of Arkansas began planning project. The students worked alongside a local craftsman and backyard farmer, Derek Jones, to gather information about poultry farming and understand it's challenges and advantages. With Derek's knowledge and expertise, the students were able to develop a

detailed manual that outlined the construction of the coop and garden, the materials needed, and the raising process for the chickens. While the manual contained an abundance of relevant information about the project, it was disorganized and lengthy, making it hard to understand for us and even harder for the local women who were supposed to put it in action. Our mission was to take an incomplete manual created by previous students, make the necessary changes to make it understandable to our target audience, and construct a fully-functional model all while involving several women in the process so they could pass on the knowledge to others wanting to get involved after our departure from Belize.

The first thing that we had to decide on was a build site. We knew we wanted to build at one of the women's houses so they could easily join in on the process and be present during the construction and raising of the chickens. After a trip to the outskirts of town to a potential build site, we decided that it was too far away from the center of town and the POWA headquarters. We then evaluated another potential build site that was very close to POWA and Derek Jones' house. The site was the home of POWA member Mellonie and her brother and was suitable for our project. The homesite was well-protected from predators and outsiders and had a good amount of shade to ensure that the chickens stayed cool to maximize their growth. We agreed to build the model coop and garden in Mellonie's backyard.

Once we knew where we were building, we were ready to gather supplies and break ground. We worked with a hardware and lumber distributer, Hummingbird Distributers, and were able to secure a discount on all the materials and tools that we needed to purchase. We wanted to make sure to purchase all the necessary materials, use them to assemble the model, and donate them to POWA to be used in the future. We noticed that lumber was going to be the greatest expense of the project so after speaking with several local construction workers, we identified a new source of lumber that would be much cheaper and more accessible. We decided to use bush sticks, a popular building material that comes from an indigenous tree that was very common in the area. We were able to purchase an abundance of bush sticks from the Pelican Hotel and received assurance that the hotel would sell more bush sticks to the women that would carry on our project into the future. The equipment that we used can be found in the manual that is attached. The most important tool that we purchased was a drill. This would allow for an efficient construction process for the women. Now that the equipment and components for the build were purchased, we started on the building process. Most of the building process took place over a period of two weeks during which we decided we would work mostly in the morning and evening since it was sweltering hot in the middle of the day. In the afternoon, we worked on assembling the manual based on what we did that day. As the build progressed, so did the manual. As we accomplished steps in the building process, we would incorporate them in the manual while making them as simple and straightforward as possible. With frugality in mind, we focused on keeping costs low while still assembling a quality product. For a detailed overview of the building process, please see the manual attached.

After the coop and garden was constructed, we purchased the chicks, feeder, waterer, and seeds from another distributer in town, Reimer's Feed Mill. We chose broiler chicks for their ability to grow to maturity in a period of 6 weeks and yield the most amount of meat compared to other breeds of chickens. We chose the seeds based on the common vegetables and spices that the women used in the stable dishes of the culture. Since the women would have access to these common ingredients, they could save money at the market and instead just use their own vegetables. We settled the chicks in the coop and planted the seeds. We decided to come back and check on the

chicks at least once daily, but we left the responsibility of feeding and watering to the women. As the model was finished, we now needed to spend time scrutinizing and perfecting the manual to ensure its ease of use and accuracy.

Again, the overarching goal that we kept in mind throughout the writing process for the manual was simplicity. When going over the manual from the previous year, we had an incredibly difficult time understanding the steps needed to complete the project. Over the final two weeks of our time in Belize, we worked on perfecting the manual and overseeing the growth of the chicks at the garden. Each day, we would depart for Mellonie's to check on the chicks and ensure they were being fed and watered. When the chicks were accounted for, we would return home and work on the manual. During one of our evaluations of the coop, we noticed an error in our build process. We constructed a coop that was much higher than necessary, leading to rain being able to get into the coop and get the chicks wet. Any kind of stress on the chicks such as excessive moisture causes stunted growth so we needed to make an adjustment to our build and verify that the chicks would be protected from the elements. Thus, we added a tarp around the coop that could be pulled up during a downfall. However, we wanted to ensure that the women would not run into the same problem so we edited the manual instructions to create a shorter coop with less height. We decided that the old manual was not user-friendly so we had to rework the entirety of it to be more suited for its users, the women of POWA and Dangriga in general. We were able to cut out the majority of the bulk and confusion from the manual and break it down in an easy-to-understand outline complete with steps for the building process and as well as an expenses breakdown and a guide to rearing the chickens from chicks to full-grown broilers.

Evaluation

The overall mission of our project in Dangriga was to design a manual for the efficient production of poultry in a domestic setting that would alleviate the problems caused by food insecurity and encourage women to be active in the community through entrepreneurship and increased responsibility. While we tried to identify and address the problems that were apparent, we faced many unforeseen challenges during our time in Belize. With the help of locals, advisors, and experts in the field of cultivation and poultry production, we were able to successfully develop the manual and introduce it to the community. Many of the approaches we used for the project worked, but we also faced challenges that took some ingenuity to overcome. In reflection, there were some things we could have done differently but in the end we accomplished our goal. Due to factors such as communication barriers and a global pandemic, we have not been able to evaluate our project since our departure.

In order for our project to work, we needed to choose right group that would be able to take on the full responsibility of carrying on the project after our departure. Our decision to work with POWA was arguable the best choice we made. However, we could have taken further steps to ensure that the women were comfortable with moving forward on their own. Of the three main women that we chose bring in on the project, two were available throughout our time but one was absent for the majority of the project. This could have had a potentially negative effect on the success of our project because there was one less person who was well versed in the creation and maintenance of the coop. Personally, I would have rather worked with no less than five women in order to create a group that was passionate and educated enough on the project to bring in more women on their own. Additionally, the leader of POWA was not present for the eight weeks we were in Dangriga. Luckily, we were able to communicate with her through phone calls and emails

but this was not the preferred method of communication and our relationship could have been stronger. With respect to the cultural norms and gender roles in Dangriga, we observed these in action.

The systematic barriers that we were aware of did have an effect on our project. While two of the women were involved in the project from start to finish, we observed the third woman as a victim of restricted gender roles. She was unable to participate due to her responsibilities at home with her family. Each time we called or visited her home to encourage her to join us for the day, she would attest that she had other obligations for the day. We hypothesized that either she was not passionate about the project or was inclined to decline our invitations by an outside force. This was one example of one woman in the community was impacted by the strict gender roles in the society.

Finally, the most concerning aspect of our project is the lack of continued communication with the women and the locals in general. In the waning days of our time in Belize, we did meet with all the women at POWA and discussed the continuation of the project. We agreed that a new project would be started immediately at Carla's house and more projects would be started soon after that. Unfortunately, the method of communication had to be email since international calls from the US to Belize were not feasible. While we were in Belize, we used mobile phones on a local plan and used email as a secondary source. Looking back, we should have devised a more reliable source of communication since our emails have gone unanswered and communication has been lacking in general. My original plan for my thesis was to gather more information about to continued success or failure from the next group of University of Arkansas students to work in Belize and then create my thesis with this vital information. Admittedly, we do not know how the project is faring at this point but if the University of Arkansas continues to work in Dangriga these questions can be answered.

We faced many challenges during our project, both foreseen and unseen, but we were successful in accomplishing our end goal. We delivered a complete manual and constructed a functional model for raising backyard poultry. We worked alongside women from our target group and make our project known in the community. We not only designed a sustainable process for raising poultry for personal nutrition, but we also included instructions on how to turn a profit on the production of poultry. Thus, we created an avenue for entrepreneurship among a historically marginalized demographic in Belize and we hope that this will encourage other ventures from the same group. Working alongside local workers and farmers was instrumental developing our knowledge in construction and cultivation in order to create a manual for the most efficient and inexpensive coop. Throughout the project, those we met were happy to help and I believe this can help the growth of our project since departure. With many community members aware of our efforts, they may be more keen to advise and support more project. However, this is only a conjecture. I believe that the women were passionate about the project and saw the benefits that it could show in their family's lives.

Moving Forward

In order to ensure the continued success of the project, we need to know how the project is faring in the current climate. With a global pandemic present, the University of Arkansas suspended study abroad in Belize for the summer of 2020. Due to this, we were unable to gather further information about the status of the project. This project needs oversight to ensure it's continuation. Hopefully, the program will be reinstated in 2021, allowing more students to carry on with the

expansion of the project. I think that, with continued guidance from the University of Arkansas, the project can be entirely self-sustained by the members of POWA if they have the right motivation. We outlined the potential benefits and illustrated them to the members in an effort to create enthusiasm in the community. We donated all of the tools we used to POWA for them to use in future endeavors. Admittedly, communication between ourselves and the POWA women has been lacking and we do not currently know the status of the operation in Dangriga. I can only hope that the program is reinstated so we can decidedly know to what extend the project was a success.

Personal Evaluation

As I near the end of my time at the University of Arkansas, I look back to my experiences in Belize with great nostalgia and appreciation. Not only did I learn vast knowledge about the country, it's people, it's culture, and it's beauty, I also learned a great deal about myself. Countless tourists would say that Belize is a tropical paradise, full of breathtaking experiences and scenic views, but I would doubt their appreciation of the beauty of Belize's people. For eight weeks, I was welcomed into a community that was completely different than those I was familiar with and yet I felt at home. The passion for life and positivity in Belize abounds among its people. From receiving critical advise from farmers and builders around Dangriga to playing basketball with the local kids, the community accepted us. I honestly believe that Dangrigans want the absolute best for their town and their people. The people are more inclined to help each other than to only look out for themselves. It is because of this that I believe that our project will fare well into the future. The benefits are there and the Dangrigans are keen to take up initiatives that will aid themselves and their neighbors.

Going to a foreign country always has some alien qualities that comes along with it, but interacting with the people of that country each day, working alongside them and communicating in a business format, was a complex task. The most vital aspect that allowed for the efficiency and effectiveness of our project was the attitude of those we worked with. I never met someone who was uninclined to offer advice or just a casual conversation about our time in Belize. After eight weeks in Belize, I can confidently say that the country is united through it's people's shared love of their country and their community.

Personally, my time in Belize was an opportunity to use my abilities for the betterment of others. When it came time to choose a study abroad program, I knew that I didn't want to just go to Europe and see the Trevi Fountain or the Eiffel Tower like so many others have done. My educational career has blessed me with the ability to use my knowledge to help others. When I learned about the opportunities that the Belize study abroad program held in store, I immediately decided to join the group. Not only was I able to admire the beauty of diverse region of the world and meet people with different experiences than myself, I was able to help. I hope that my efforts made an impact on the people I worked with and that their lives were improved by even just a fraction.

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Appendix A

POWA

PROTECTING OURSELVES, OUR FAMILIES, OUR COMMUNITY

Backyard Poultry and Vegetable Garden Manual

For the Women of POWA

Dangriga, Belize

Table of Contents

Introduction

This manual will demonstrate a step-by-step method of building a chicken coop with instructions for how to care for chickens in your backyard. When first starting your backyard poultry business, it's best to begin with 16 chickens in one coop. This way you process (butcher) all of them at the same time, then buy another set of 16 chickens every 8 weeks and repeat the cycle. The small number of birds in the rotation allows for an inexpensive start. If you wish to expand your business, instructions to do so are found later in the manual.

This manual will focus on raising 16 chickens over 8 weeks of time. Once you fully raise and butcher the chickens, deciding what to do with them is up to you. We recommend keeping half of them to feed yourself and your family as you raise the next batch of chickens. You can keep 8 chickens and sell the rest to recover costs from feed, building materials, and the next round of chicks.

The building portion of this project can be accomplished in as little as 1 to 2 weeks, depending on how much time and help you have. Working together will allow you to complete more projects in a shorter amount of time so that others can share in the benefits of the coop. We have created a fully functioning model at Miss Bina's house, mother of POWA member Mellonie Velasquez, very close to POWA. This model can help you design your own coop and help you if you do not understand some parts of the manual. Most businesses that you buy from will offer delivery, however, access to transportation such as a truck or trailer will allow you to cut costs. We have included the telephone numbers of a few trucks for hire that charge a small fee to pick up and deliver supplies. Some materials that you will need to build the coop are available at POWA, such as screws, drill bits, washers and wire cutters. We have provided a drill for the women of POWA. This will make the building process quick and simple. The drill is for all members, so please return it when your construction is complete.

This project is an investment in your future as the chickens will provide healthy meals for your family as well as a source of income. Don't let the cost of getting the operation running discourage you! You will have the opportunity to make the money back once your business is off the ground.

Materials Needed for Poultry Coop

In order to create a sustainable poultry farm, a coop must be constructed to house the chickens. To keep construction costs low, keep in mind certain materials can be repurposed and recycled. Some materials can be reused for free or purchased at a discounted price. Don't try to buy all the materials at once, as it may be overwhelming. Instead, follow the steps and buy them as instructed.

The area of the coop will be roughly 4x6 ft. Each chicken needs about 1.5 ft^2, so if you start with 16 chickens, the area of your coop should be about 25 ft^2. A slanted roof will cover the area, connected by 6 ft posts in the front with the door and 4 ft posts in the back. Chicken wire will be wrapped around the perimeter to create a secure living space for the birds. Some measurements that you make may not be exactly precise. However, perfection is not absolutely necessary. You may have to work your way around different problems that arise, but there is always a solution to the problem.

Item	Unit Cost	Location	Quantity	Total Cost
Cinder blocks (6”)	$1.35	Z-Best Blocks	18	$24.30
Bush sticks	$1	Pelican Resort	15	$15.00
2x2” Lumber (12 ft) for door	$9.60	Hummingbird Distributors (HD)	1	$9.60
2x10” Lumber (10 ft) for baseboards	$44.85	HD	2	$89.70
4 ft. Chicken wire	$3.20/m	HD	16 meters	$51.20
R-Panel Roofing (8 ft)	$28.40	HD	2	$56.80
2” Deck Screws	$10.76/lb	HD	0.5 lb	$5.38
2.5” Deck Screws	$10.14/lb	HD	0.5 lb	$5.07
2” ST Hinge	$2.22	HD	2	$4.44
1” Roofing Screws	$11.56/lb	HD	2 lb	$23.00
¼” Flat washers	$0.09	HD	130	$11.70
Wire Tying Galv 1 Kilo 20 Gauge	$7.56	HD	1	$7.56
Sand	$5/bucket	Z-Best Blocks	10 buckets	$50.00
Wood chips	$0	Tropical Wood Carving	3 bags	$0
6x8 ft Tarp	$7.11	HD	3	$21.33
20’ Zip Ties	$0.27	HD	18	$4.80
Bungee Ball	$0.67	HD	12	$8.00
Cone	$20.00	HD	1	$20.00
Chick feeder	$12.95	Reimer’s Feed Mill	1	$12.95
Chicken feeder	$35	Reimer’s Feed Mill	1	$35
Waterer	$25.50	Reimer’s Feed Mill	1	$25.50
10 ft Chain for hanging	$9.50	Reimer’s Feed Mill	1	$9.50
Chain fastener hook carabiner	$3.80	Reimer’s Feed Mill	4	$15.20
			TOTAL	**$506.03**

Chicken House Construction

Step 1: Find a good location

- For each coop, the space must be bigger than 4x6 ft. But, if you wish to expand your business in the future, make sure there is extra space available to add extra coops.
- The space must have shade and a nice breeze.
- The space must have some form of security from other animals or people.

Step 2: Gather tools and materials

- Ask family, friends, neighbors, and POWA to borrow any tools you don't already have.
    - Check with POWA to see what tools are available to borrow.
- Remember that it is less expensive to buy repurposed materials.

Step 3: Dig a trench

- Measure a rectangle about 4 ft wide by 6 ft long.
- Dig a trench around the rectangle about 14 inches deep.
- Place cinder blocks in the trench and make sure they are even and touching.



Step 4: Construct the base structure

- Decide which side you want the door to be on.
    - This should be one of the 7 ft tall sides. Place a 7 ft tall bush stick (make sure they are the same height) in both corner cinder blocks on the same side and fill with dirt until sturdy.
- Place a bush stick around 6 ft tall (make sure they are the same size) in opposite corner cinder blocks on the same side and fill with dirt until it won't move side to side.
- At this point, there should be four bush sticks resting in each of the four corners.

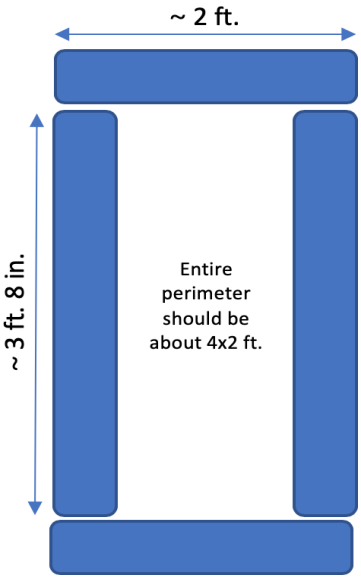
- In order to create the doorframe, cut two bush sticks which are the same size as the tallest front two (your preference) and place them in the cinder blocks on the tall side of the coop.
    - Measure the distance between the outside of the two bush sticks and saw another piece to screw in as the top of the door frame. The height of the door should be about 4 ft from the top of the baseboard; it should be equal in height to the opposite side of the coop. The door itself will be created after the chicken wire is attached in Step 7.

- For each of the sides, make 20” long bush sticks and place them in every other hole of each cinder block.
- Fill in with dirt so they are sturdy. The base boards will be screwed into these shorter bush sticks in the next step.
- Base boards will be placed on the outer rim of the coop, spanning the perimeter and connecting all the sides.
- Cut the 10 ft tall 2x10” board down to 4 ft in order to begin attaching it to the front of the coop.
    - Screw in the board to each of the tall bush sticks using wood screws as seen to the right; use two screws for each stick.
    - Next, use the remaining 6ft of the 2x10” and secure it to one of the sides of the coop. The ends will be attached to the tall bush sticks and the middle will be attached to the shorter ones.
    - Repeat these steps for the back and remaining side of the coop.
- Build a wooden frame to support the roof.
    - Measure and cut two bush sticks to attach horizontally across the inside of the front four and back two vertical posts.

- Next, you will place four bush sticks across the top of the frame, one at the top of each of the four front posts, spanning the length of the coop and connecting to horizontal stick connected across the rear posts.
- When you are finished, you should have four slanting sticks connecting the back frame to the front frame.
- Finally, add a fifth stick that connects the back frame to the horizontal top of the door frame, this stick should be perfectly horizontal.

Step 6: Chicken wire

- Take the 4 ft chicken wire and wrap it around as tightly as possible around the bottom of the coop.
- Use flat washers and 1” roofing screws to secure the chicken wire onto the baseboards and the bush sticks.
- Ask for assistance in holding the wire tight as you drill the washer and screws.
- Measure out the chicken wire for the remainder of the coop that needs to be covered and secure them onto the bush sticks with the washer and roofing screws.
- Use metal wiring to connect sheets of chicken wire.



Step 7: Construct the door

- Measure the height and width of the door frame. It should be around 4x2 ft.
- Saw the 2x2” lumber to fit the door frame.
- Lay the pieces of wood so that they form the shape of the door. Use 2.5” deck screws to screw the pieces together in each corner from the top of the door and from the bottom of the door.
- Measure out and cut enough chicken wire to cover the door.
- Screw the chicken wire to the door using flat washers and 1” roofing screws.
- Screw hinges into the bush sticks first, then screw the door to the hinges. Have a friend help hold the door in place during this process.

Step 8: Roofing

- You will secure the roof to the roof frame using roofing screws.
- Place the first sheet of r-panel roofing so that it hangs about 1 ft off one side of the coop.
- Screw the r-panel into the first two frame sticks from above, one near the tall side and one near the shorter side for each stick.
- You may need to stand on an elevated surface to get leverage.
- After you have secured the first panel, place the second on top so it overlaps the first by about 6" near the middle, while it hangs over the opposite side by 1 ft.
- Repeat the prior steps to secure the roof to the roof frame.

Step 9: Fill with sand and wood chips

- Once the chicken wire is complete, fill in the area with ten buckets of sand.
- Cover the sand with the three large feed bags of wood chips.
    - The wood chips should be at least 2" deep.

Step 10: Tarp

- A tarp is used to protect the chickens from rainstorms.
- Before tying anything down, lay out the tarps to plan where you want them to hang from the coop.
- Using zip ties, go through each hole on the top of the tarp and where possible loop through the top bush stick, otherwise loop through the chicken wire.
- Do not zip tie the sides of the tarp. This way the tarp can be rolled up during good weather and held in place using the bungees.
- Feel free to cut the remainder of the zip tie off.

Step 11: Water and Feeder(s)

- Use the chick feeder for feeding chicks. This can be placed on the ground. Use this until chicks grow big enough to reach the regular-sized chicken feeder.
- Suspend the regular-sized chicken feeder and waterer high enough off the ground so that the chickens are reaching to eat and drink. This will prevent them from kicking chicken litter and wood shavings into the food and water.
- To do this, cut the 10 ft. chain to get your desired length. Use a carabiner to connect the waterer to the chain. Use another carabiner to suspend the waterer to the overhead horizontal stick that runs the length of the coop. Repeat these steps with the regular feeder. As the chickens grow, you will need to adjust the height of the waterer and feeder.
- Refill the waterer manually.



Step 12: Processing Station Construction

- Materials:
  - Surface to clean the birds - A table is recommended because it is easiest to clean.
  - Cone (plastic or metal) - Must be big enough to fit a chicken in with a hole in the bottom so the head can come out. You might need to saw off a top section of the cone to make it large enough for the chicken.
  - Pot - Must be big enough to fit a chicken.
  - Cooler - It is recommended to place cleaned chickens in ice bath while processing other chickens.
  - Basin
  - Firewood
  - Gravel
- Selecting an area:
  - Choose an area with a sturdy wall that you can screw a cone to.
  - The area must be within reach of a hose. This will make it easier to clean surfaces before and after processing.
  - There must be an area that you can set up a fire nearby for boiling water.
- Construction:
  - Place gravel under all processing surfaces so water can drain after cleaning and sanitization.
  - Screw cone to wall and place basin underneath to catch the chicken's blood.
  - Place metal table and fire pit nearby to speed up processing.
  - Processing instructions are found on page 11.

Broiler Feed

Item	Unit Cost	Location	Quantity	Total Cost
Broiler chicks	$1.50	Reimer's Feed Mill	16	$24.00
5 lb. Broiler Starter	$3.65	Reimer's Feed Mill	2 (varies)	$7.30
50 lb. Broiler Grower	$25.45	Reimer's Feed Mill	1 (varies)	$25.45
50 lb. Broiler Finisher	$22.75	Reimer's Feed Mill	1 (varies)	$22.75
			TOTAL	**$79.50**

- It is extremely important that the chickens always have food available. When the birds aren't eating, they aren't growing!
- Check their feeders every morning, afternoon, and evening. If it looks like they are about to run out, fill it up to the halfway point.
- Food should *not* be recycled or transferred to the next flock because this would violate biosecurity. Instead, fill the feeders in small amounts to reduce wasted feed.
- Feed Regimen for flocks on a 7-Week Grow-Out Cycle:
    - **For birds 0-2 weeks of age, fill their feeder with Broiler Starter.**
    - **For birds 3-5 weeks of age, fill their feeder with Broiler Grower.**
    - **For birds 6-7 weeks of age, fill their feeders with Broiler Finisher.**
- Feed Storage:
    - Use stainless steel or thick plastic containers.
        - This prevents moisture buildup, which can lead to mold formation and cause respiratory problems in the birds.
        - It also prevents rodent infestation, which can lead to disease transmission.

Biosecurity and Vector Control

- Keep different flocks separated at all times. ***Never*** mix the flocks for any reason. At the very least, each flock should be separated by chicken wire.
- After handling the birds from one flock, wash your hands before handling the birds of another flock.
- A few outfits should be designated to wear during broiler handling. Do not wear these off the farm.
- Have a designated pair of shoes for when you are handling the birds. Do not wear the shoes off the farm. Doing so could endanger your chicks and other chicks in the community.
- Make a foot bath if you have more than one flock, and step in it between handling birds of different flocks.
    - The foot bath should be a pan large enough for both feet to fit in.
    - It should consist of water and a disinfectant (usually bleach) and should be changed weekly.
- Other poultry operation owners should *never* be allowed to enter the farm, as they have the potential for transmitting disease from their flock(s).

- If this can't be avoided, the visitor should shower thoroughly on your farm, and should change into clothes and disposable shoes provided by you.
- Do not allow any visitors that have been around other poultry flocks within 72 hours to touch your birds.
- Do not bring any sick birds home.
- Be able to recognize the signs of the common diseases of poultry under A Checklist for Healthy Birds on page 16.
- If a bird appears to be showing some symptoms of disease, isolate the bird ***immediately*** from the other flocks even if you aren't able to identify the disease yourself.
    - Disinfect the waterers and feeders and replace the wood chips to keep any harmful bacteria from spreading.
    - Contact the local vet to confirm if a disease is present in the birds.
- Before you get a new flock, remove the old wood chips by shoveling them out and replace them with new and clean chops. This will prevent disease from spreading.
- Vector Control
    - Vectors are species that are capable of transmitting a disease to another species.
    - Vectors in Dangriga include tarantulas, iguanas, opossums, rats, mice, dogs, and mosquitos.
    - Maintain a clean, secure farm to prevent the attraction of these disease transmitting organisms.
    - Store feed in secure containers.
    - Secure the birds from these vectors using chicken wire and other fencing materials.

Butchering Process

1. Catch the chicken, making sure not to cause it distress (stress will toughen the meat). Cover the chicken's head if the chicken is panicking.
2. Quickly flip chicken upside down into the cone, pulling its head out of the hole in the bottom far enough to expose the neck.
3. Firmly holding the chicken's head in one hand, use the knife to quickly cut the chicken's head off just below the head. Place head in bucket/trash.
4. After the head is removed the chicken will still move. Keep the chicken in the cone for 5- 6 min to drain until it stops moving.
5. If processing more than 1 bird, set the chicken to the side and repeat the same process with the remainder of chickens.
6. Grab the chicken by the feet and place it in a pot of boiling water that was prepared earlier. Rotate bird back and forth for approximately 5 seconds then pull out of water for a second. Repeat two or three more times.
7. To defeather, choose method 1 or method 2:
    - Method 1 (faster and easier):
        - Use a plucker machine if you're able to obtain or construct one.
        - Place in plucker machine for 15 seconds.
        - Remove remaining feathers by hand.
    - Method 2 (cheaper):
        - Remove all the feathers by hand.
        - Use a knife to help pluck some of the coarser feathers at the back of the bird.

8. Before moving the defeathered chicken to the metal table or cleaning surface, use the knife to cut the feet off at the joint. Set aside for later.
9. With the chicken's legs still facing upwards, pull the skin just above the chicken's anus tight and make a single cut directly above the anus until you penetrate through the fatty layer. Once again, locate the chicken's anus, and cut approximately 3 centimeters to the right and left of the chicken's anus, cutting in a downward "U" shape to remove the anus.
10. To clean the inside of the chicken, start by removing the intestines and all dark areas to avoid fecal contamination. If the gizzard does not come out at the same time, remove it next and set it aside with the feet. Throw intestines in the trash.
11. Remove other organs: liver, kidneys, heart, and gallbladder. Be careful while removing the gallbladder (a small green organ) to not break it. If broken it will ruin the bird and you won't be able to sell it.
12. Lungs are the last organ to remove.
13. After all organs are removed, make a small 1" cut in the side of neck, removing any excess fat and skin from the neck.
14. Remove the trachea (long, white, ribbed tube attached to neck) by reaching your hand in towards the breast bone and grab the trachea where the two breast bones meet. Pull the trachea out. If the end of the trachea is slightly harder than the rest, then the entire trachea has been removed. This is the last step in processing the body of the chicken. Set aside to process feet and gizzard.
15. In the boiling pot, hold each foot in the water for approximately 15 seconds, until the skin is soft enough to remove.
16. Holding an almost dull knife near the end of the blade, use the knife to skin the chicken's feet one at a time.
17. Once the feet are skinned, cut the toes off just above the nail. Set aside.
18. After turning the gizzard on its side, cut it in half lengthwise but stop before it's completely separated.
19. You will find a yellow layer on the inside with some rock and sand. Brush all the sand and rocks out.
20. Carefully peel away the yellow layer on the inside of the gizzard.
21. Place the gizzard and the feet inside the processed chicken. Place the chicken inside a plastic bag.
22. After weighing the chicken on the scale, write the weight on the bag.
23. Stick the bagged chicken in the cooler filled with ice to help preserve the chicken while you process the others.
24. Once processed, the chicken can be sold for around $3/pound.

Expansion Opportunities

Remember: before you expand, you need to have already paid off all the money that you had to borrow in order to first start your business. When you've earned enough profit to start reinvesting in the business, you can decide which of the following ways you want to expand your business: increase the number of broilers (32, 48, or 64), add egg laying hens, or create a garden.

Increase the Number of Broilers

Regardless of the number of birds, expansion of broilers requires, the construction of a new pen to avoid the introduction of diseases from a new flock. You will need to build an additional pen for 16 more birds.

For this reason, you can expand to either 32, 48, or 64 chickens. **To avoid taking out another loan, save enough money from profit for the construction of another pen before building one.**

When you expand, it's most efficient to start a rotation process. For this process, it's easiest to buy the birds on the same day of every week and kill the birds on the same day of every week.

Adding Egg Laying Hens

Adding egg laying hens is a cost-effective way of getting more nutrients with eggs and also being able to sell extra eggs for money. It's important to closely follow the instructions listed below in order to produce the healthiest birds so that they can reproduce and lay eggs as efficiently as possible.

- **Housing/Yard Layout**
    - Because hens and roosters will likely be free range, the average sized yard in Belize should be sufficient, as long as the chickens are not too crowded.
    - The yard should be fenced in with chicken wire to prevent them from escaping and from other animals killing or injuring them.
    - Don't place sharp objects in the yard that the chickens could potentially cut themselves on. Injured chickens will be singled out by the rest of the flock, making it less likely they'll survive for very long.
    - **Shade Availability**
        - Shade should always be available for the birds. Because Belize is such a hot climate, shade is very important and will help them cool down.
        - You can also place the waterers under the shade to prevent it from evaporating so fast. Keeping the birds as cool as possible will decrease heat stress and allow them to reproduce and lay eggs in efficient levels.
    - **Nesting Houses**
        - To prevent the eggs from being destroyed or eaten by other birds, dogs, or cats, a nesting house will be necessary for the layers and will serve to regulate temperature and provide protection and comfort.
        - It should provide enough space/nests for each bird to lay eggs.
        - If possible, artificial lighting should be added inside the nest boxes in case a layer leaves her eggs. The artificial lighting will allow the egg to continue incubating/growing, which is important if you are attempting to hatch new birds.
    - **Roosting Structures**
        - Roosting structures are designed for birds to perch on (usually) during the night hours.
        - They allow the birds to avoid predators
        - Roosting structures can be made from anything but are usually constructed from tree branches, bush sticks, or wooden posts.
- **Layer Feed**
    - Layers do NOT need to be fed *ad libitum.* Instead, they should be fed twice a day.
    - For every 20 birds, there should be one feeder.
    - If there are multiple feeders, they should be spread throughout the farm. This will distribute the feed more evenly and allow more birds to receive an adequate amount.

- A three-pound scoop of "Laying Mash," purchased at Reimer's Feed Mill, should be added to each feeder twice a day – in the morning and in the evening.
- Do **NOT** feed the birds scraps off the table or from the trash.
- **Feed Storage:**
  - Just like the broilers, the layers' feed should be stored in a stainless steel or thick plastic containers.
    - This will prevent moisture build-up and rodent infestation.
  - **Note:** If you're trying to hatch chicks from the laying hens, make sure there's a place for feed that the chicks can access. Because the first three days of a chick's life is the most important, they need adequate food and water to prevent any stunting of growth.

- **Water Maintenance**
  - The same principles regarding water maintenance for the broilers applies to the layers.
  - Refer to page 8 for instructions on providing water for your birds.
    - **Note**: If rain water is being collected for the birds to drink, it should be filtered before draining into the waterers. This will keep out harmful bacteria and prevent disease.
- **Hen: Rooster Ratio**
  - For every 10 hens, there should be 1 rooster.
  - This prevents overuse/overstimulation of the rooster.
  - Maintaining this ratio could also improve reproductivity and egg productivity.

Creating a Garden

While raising chickens, you'll have the opportunity to collect chicken litter when cleaning out the chicken pens weekly. Chicken litter is the combination of chicken waste from when you clean out the pens, and any left over chicken remains after processing. It's easiest to use the chicken litter if you've created an open air compost box to place the litter in every time you collect it.

Raised Half Blue Barrel Garden

Item	Unit Cost	Quantity	Location	Total Cost
Chemical Blue Barrel	$50.00	1	Hummingbird Distributors (HD)	$50.00
Cinder Blocks (6")	$1.35	4	Z-Best Blocks	$5.40
2x6" Wood (8 ft)	$17.02	1	HD	$17.02
Mesh Netting	$20.00/10 ft.	1	HD	$20.00
¾" Diameter Rocks	$0.00	1	Gather on your own	$0.00
Sod Mixture	$15/bag	2 bags	Agricultural Development and Services – Tel. 501-522-3898	$30
			TOTAL	**$122.42**

Construction

1. Level the ground slightly with a shovel.
2. Place 2 cinder blocks facing parallel to each other about a foot apart.
3. Use a level to ensure the blocks are level on the ground as well as with each other so the bin is not leaning.
4. Once level, place another cinder block on top of the first set for added height.
5. Saw the barrel in half.
6. Cut a drainage hole near the bottom of each barrel half so that heavy rainwater can drain out without drowning the plants.
7. Each barrel needs two U-shaped 2x6" wood for support.
    - Derek Jones at Tropical Wood Carving can help with the U-shaped cut.
        - Tel. 661-9240
8. Saw the 8 ft plank into four pieces, each two feet long.
9. Use the barrel to trace a U-shape into each of the two foot long 2x6" wood planks.
10. Saw the U-shape and repeat for the remaining three. Place the U-shaped cuts into the crevices of the cinder blocks to hold the blue barrel.
11. Collect a bucket full of rocks (no more than 2" in diameter) and add them to the bottom of the barrel.
12. Fill with water and add more rocks until the top of rocks is consistent with the top of water.
13. Place a mesh screen on top of the rocks and add soil mixture.
14. Use leftover chicken wire for vine plants to grow on.

A Checklist for Healthy Birds

You can evaluate the efficiency and productivity of a poultry operation by looking at the health of the flock. Use the checks below to see if the birds are healthy and if there is disease on the farm. This list was developed by Dr. F.D. Clark, an extension poultry veterinarian with a Ph.D. in avian pathology.

Eyes - The eyes should be free of discoloration, scars, and any discharge.

Eyelids - There should be no swelling, reddening, discharge, or dry crusty areas.

Facial skin - This should be free of discoloration, swelling, and dry crusty areas.

Nostrils - These should be checked for indications of swelling, odor, discharge, accumulations, discoloration, and the diameter of the nostrils' openings (symmetry). To determine if any accumulations are developed within the nostril, listen to the bird's breathing. If air flow is being blocked, the bird may be producing noise when it breathes. When looking at the nostrils, the skin surrounding them should also be checked for dryness, swelling, and redness.

Beak - The beak should be free of damage, discoloration and accumulations. The beak's shape, length, texture, and alignment should also be observed.

Oral Cavity - Hold the beak open with your thumb and forefinger to look in the oral cavity. It should be free of accumulations, discolorations, odors, discharges, and growths. Additionally, check the roof of the mouth- the cleft or choana- for any discharges, discolorations, accumulations, etc. Any abnormalities associated with the cleft can indicate a problem with the respiratory tract.

Ears - Check the ears for discharges, swelling, and evidence of feather destruction (caused by rubbing or scratching).

Respiration - Once the bird has been picked up, the handler should allow it to relax before he/she evaluates the breathing rate/effort. If the bird is breathing with its mouth open or tail bobbing, which is characterized by the fluffing of feathers, then it may have an infection in the lungs, air sacs, or both.

Heart - The heart can beat up to 250 times a minute in chickens, so it's difficult to evaluate abnormalities associated with the heart. Place the hand on the body wall to feel for the heart and determine if it speeds up when the bird is initially picked up and slows back down after the bird has relaxed.

Skeletal System - Check the keel bone, spine, and the extremities for any twisting or other deformations, which are typically due to a nutrient problem or some form of trauma.

Wings - The wings should be free of swelling, fractures, discoloration of the feathers or skin, bone deformation, plumage (changes in feathers), wing paralysis, and skin dryness. The wings should also be checked by evaluating if the birds is holding them in the correct position.

Legs - The legs should be free of swelling, fractures, discolorations of the scales, bone deformation, paralysis, and dryness. The legs should also be observed by evaluating if the bird has any trouble walking.

Feathers (Plumage) - The feathers should be free of damage, color changes, soiling, fraying, parasite damage, etc. Sick birds will typically have fluffed, unkempt feathers on its head/neck, wings, and legs.

Vent - The vent should be free of parasites, soiling of feathers, diarrhea, swelling, reddening, blood, and any other abnormalities. The handler should also check for any evidence of laying eggs when checking this area. The feces should also be checked for condition, amount, color, and consistency.

Appendix B


UNITED STATES
GULF OF MEXICO
CUBA
MEXICO
JAMAICA
BELMOPAN
BELIZE
CARIBBEAN SEA
GUATEMALA
HONDURAS
EL SALVADOR
NICARAGUA
COSTA RICA
PACIFIC OCEAN
PANAMA
COLOMBIA
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