Discovery, The Student Journal of Dale Bumpers College of Agricultural, Food and Life Sciences

Volume 23 Article 14

Fall 2022

Using Poultry to Enhance Food Security in Stann Creek, Belize

Emily Spatz
University of Arkansas, Fayetteville, efspatz@uark.edu

Lisa S. Wood
University of Arkansas, Fayetteville, lswood@uark.edu

Using Poultry to Enhance Food Security in Stann Creek, Belize

Cover Page Footnote

Emily Spatz is an August 2022 honors program graduate with majors in Poultry Science and Spanish. Lisa Wood, the faculty mentor, is the Assistant Dean for Honors and International Programs and a Clinical Associate Professor in the Department of Crop, Soil, and Environmental Sciences.

Using Poultry to Enhance Food Security in Stann Creek, Belize

Meet the Student-Author

Emily Spatz

Emily is working with a community partner named Pine during her May 2022 service learning trip to Belize. Pine previously received a U of A small business loan to expand his backyard hog operation.

I grew up in Farmington, Arkansas, where I participated heavily in Future Farmers of America and poultry evaluation, which opened the doors that led me to where I am today. I am an Honors College Fellow and graduated in August 2022 with a Bachelor's of Science and Arts in Poultry Science and a Bachelor's of Arts in Spanish. During my time at the University of Arkansas, I participated in honors courses while volunteering with the Center for Educational Access. I was a member of the Poultry Science Club and the Arkansas Poultry Federation. Outside of my coursework and community service, I worked at Magnolia Coffee House for three years. I also took an internship with Simmons Foods in research and development my senior year, and I will be transitioning to full-time after graduation. The poultry science department and the University as a whole have allowed me to grow both personally and professionally in many areas over the course of my time as a student, and I am so thankful for the impact that the department has left on me. I want to express my sincerest appreciation to my honors mentor, Dr. Wood, and my thesis committee members, Dr. Kidd, Dr. Miller, and Dr. Rochell. The guidance and support that they provided throughout the entire thesis process were crucial and pushed me beyond what I thought were my limits. I have been honored as a first-ranked senior scholar in both Fulbright and Bumpers Colleges and was named the outstanding senior of the Poultry Science department.

Research at a Glance

- Food insecurity is a growing issue globally, and lack of sufficient nutrition during childhood leads to a host of developmental problems, including stunting and cognitive delays.
- Although the poultry industry is a major contributor to the economy in Belize, poultry meat is not affordable in poorer regions of the country, and many children must drop out of school to provide for their families.
- A small-scale poultry farm at Saint Matthew's School will provide a sustainable source of meat and eggs for the students, which will incentivize completion through high school. By providing meat and eggs to take home to the students' families, students will be less likely to drop out to pursue work.

Using Poultry to Enhance Food Security in Stann Creek, Belize

Emily F. Spatz and Lisa S. Wood†*

Abstract

Food insecurity is a growing issue in developing and developed countries alike, and in countries like Belize, the prevalence of hunger has soared in recent years. Not having access to diets with sufficient calories and nutrients leads to a host of developmental issues, including stunting and cognitive delays. The purpose of this work was to create an all-encompassing manual for small-scale poultry production in order to provide nourishment for the students and staff of a school in Belize. After determining that the best way to meet the school's needs was through dual-purpose birds, background research was conducted to determine small-scale poultry facilities in developing countries. This involved designing the layout for the poultry houses (one for layers and one for broilers) given the space available, as well as sourcing materials both locally and abroad. The manual was written to include background information and step-by-step instructions for constructing the houses and caring for the birds. The researchers anticipate that this farm will positively impact the lives of the students and faculty of the school in that they will have access to poultry meat and eggs, which will increase physical and cognitive performance, provide hands-on education, and incentivize students to finish their schooling rather than quitting to work to provide for their families.

* Emily Spatz is an August 2022 honors program graduate with majors in Poultry Science and Spanish.
† Lisa Wood, the faculty mentor, is the Assistant Dean for Honors and International Programs and a Clinical Associate Professor in the Department of Crop, Soil, and Environmental Sciences.

Introduction

Food insecurity is defined as the state of being "unable to consistently access or afford adequate food," and this is a global problem (Merriam-Webster, 2020). According to the Food and Agriculture Organization of the United Nations (FAO), the global number of undernourished people in 2018 was 821.6 million (FAO, 2019). The world population is predicted to increase to 9 billion people by 2050, which is approximately a 35% increase from the current population (Foley, n.d.). As this global population continues to increase, demand for sustainable food sources will proportionally increase as well.

In Belize, 15% of children under five are affected by stunting, while 1.8% suffer from wasting (Global Nutrition Report, 2020). Researchers have determined that when children do not consume diets rich in the necessary nutrients, including protein, they have worse overall health, poorer academic performance, fewer social skills, and even suppressed immune system function (Thomas et al., 2019).

Several groups have offered technical knowledge and resources to create sustainable farms and sources of nutrition to support these communities and ensure that the citizens do not go hungry. Many works and former manuals did not include sufficient information concerning biosecurity, so practices that would eliminate the potential spread of infectious diseases had to be included. Students from the University of Arkansas previously volunteered at Saint Matthew's Anglican School in Belize to create a school garden to provide produce for the school's canteen. Because of the success of this project, the school requested a poultry farm to add a sustainable source of protein to its menu. The school currently has about 300 students and 11 faculty members. It is challenging to keep students in school due to the price of education and because families often need their children to help them work in the orchards as a source of income (pers. comm., St. Matthew's). To combat this, creating a smallholder poultry farm is an effective way to teach students valuable skills about raising birds and animal husbandry so that eventually, the students will be able to create their own farm as a source of income and nutrition for their families and themselves if they choose to do so, while also providing meat and eggs to meet their immediate nutritional needs.

Those associated with the poultry industry who have the necessary technical knowledge of properly raising chickens have a unique opportunity to help those in developing countries raise flocks and manage them in the most efficient ways possible to provide a source of nutrition. The gaps that were observed in the other manuals provided a starting point to improve and add information to further assist St. Matthew's as the school seeks to add sustainable protein to their students' diets.

The purpose of this study was to expand upon the manuals provided by other organizations and then apply the best practices to implement a school farm for Saint Matthew's in Belize. This study sought to explore the availability of resources in Belize and create a small-scale poultry production facility to provide nourishment for the students and staff.

Materials and Methods

The first step in this process was identifying a population in need. Dr. Lisa Wood of the University of Arkansas pointed out that Saint Matthew's of Pomona Valley in Stann Creek, Belize was the ideal candidate, as they had requested a small-scale poultry farm to provide a source of protein for the school canteen. The school currently has about 300 students enrolled and 11 staff members. It was determined that this population would benefit from the addition of an onsite poultry farm because it would not only provide a sustainable and affordable source of protein for those affiliated with the school but also because it would be a practical way to introduce students to animal husbandry, which could serve as a potential source of income for the students and their families in the future.

To write a manual that encompassed all of the necessary factors of poultry production, manuals such as the "Guide to Starting Your Own Poultry Business in Dangriga, Belize C.A." (Dangriga Neighborhood Chicken Association, n.d.), "Backyard Poultry and Vegetable Garden Manual" (University of Arkansas Business Students, 2019), and the "Poultry Multiplication Initiative Brooder Unit Manual" (World Poultry Foundation, 2015) were referenced, and important features about poultry production in developing countries were then compiled with technical knowledge and personal experience into one comprehensive end product. Crucial technical information was added from scholarly sources and colleagues in the poultry industry to ensure that the growers in Belize would be able to grow flocks to their full potential and that the flocks' health would continually be of the utmost priority. This information was then used to create a step-by-step guideline to construct two fully functioning small-scale poultry production houses for dual-purpose birds, as well as a step-by-step guideline to train students and staff on proper animal husbandry practices and poultry basics. After all necessary prior research was conducted and the manual was written, it was reviewed by three faculty members in the Dale Bumpers College of Agricultural, Food, and Life Sciences at the University of Arkansas from the Poultry Science and Agricultural Communications departments. Copies were then printed along with posters and record sheets to take to Belize so that the school members would have continued access to these invaluable resources.

The next step was to begin designing the layout of the house. As the school had a fairly large plot of land available,

it was determined that two houses would best suit the needs of the school. The possibility of dual-purpose birds was explored, and it was determined that by sexing the chicks and raising them in sex-separate houses, they would be able to be raised as "broilers" and "layers," which would provide a diverse protein source for the school, as they would produce both eggs and meat. It was determined that it would be beneficial to create a hybrid housing system for the hens by allowing access to outdoor runs, as this would allow birds to forage, which will reduce the amount of feed that must be purchased for the flock. As layers have longer productive lives than broilers, the first flock of both "layers" and "broilers" would be sexed, while subsequent flocks of "broilers" would be raised straight-run or not sexed. This eliminated the need to cull male chicks in a layer operation while also minimizing costs and the amount of downtime that the school would face between flocks. A materials and cost sheet was included in the Backyard Poultry and Vegetable Garden Manual, which was used to determine where supplies could be purchased and to create a budget, although the referenced materials list was for a much smaller house. A step-by-step guide was also developed to ensure that those involved with the care of the school farm would know how to properly raise the flocks, with the intention of it being presented to the faculty before chicks were placed to ensure that they would have the opportunity to ask any pertinent questions. The third phase of the project, the implementation and application of all of the plans that had been made, was postponed for two years due to COVID-19 and the inability to travel internationally, but was completed in June 2022. The largest components of the third phase were building the facility, setting up the house, and ensuring that it would be suitable and safe for live birds. This involved sourcing the materials, constructing the roof, adding chicken wire to the windows, and preparing the litter for bird arrival. Before birds were placed, locals were trained on the next steps of the process and guided through what the next days would look like. Supplemental feeders were placed, and waterers filled to ensure that they reached the proper temperature before bird placement. The final biosecurity measures were then set up on the farm. Once the birds were placed, more training was performed, this time more focused on animal husbandry, animal welfare, and how to care for the birds on a day-to-day basis, as well as the importance of observation to determine animal well-being. Through the guidance of the steps described above,

Fig. 1. Emily standing in the 200 sq. ft. hen house at Saint Matthew's Anglican School in Pomona, Belize, as it nears completion.

the research objectives were accomplished, resulting in the creation of a manual to construct a fully-functional small-scale poultry production facility for the members of St. Matthew's of Pomona Valley in Stann Creek, Belize (see Fig. 1).

Results and Discussion

Through extensive research, the manual (which can be found at https://scholarworks.uark.edu/poscuht/12/) was created to outline the steps required to build a small-scale poultry production facility consisting of two houses, as well as step-by-step instructions for placing chicks and their daily care.

As previously discussed, undernutrition leads to a host of chronic and acute health issues, including both physical and cognitive developmental delays, especially during the crucial years of childhood. As the nutritional and environmental needs of poultry have become better understood, they are an increasingly efficient source of protein that can be grown with less space and time than other livestock. Due to these factors, among others, poultry meat is often more affordable and accessible than other meats, which makes poultry the ideal candidate to combat food insecurity within the school community. The manual was created with the most up-to-date information available, including information from recent small-scale poultry production manuals, industry guidelines, and poultry scientists in academia. The manual discusses the importance of feed and water quality in poultry production, as this is one of the factors that surveyed farmers in Belize generally believed was relatively unimportant—although it significantly contributes to the health, well-being, and productivity of the flock (Carpenter, 2019). Likewise, referenced materials lacked sufficient information on proper biosecurity practices, so this information was included to ensure that the proper steps are taken to care for the health and safety of the flock. The manual and the plans contained therein, which include step-by-step guides for constructing the poultry houses as well as daily care and management of the birds, will be used in the near future to implement a small-scale poultry farm for Saint Matthew's of Pomona

Table 1. Topics covered in small-scale poultry production manual for Saint Matthew's of Pomona Valley.

Topics Covered	Page Number
Comparison of broilers and layers	3
Options for small-scale poultry housing	5
Determining needed materials to construct the poultry house	6
Poultry house management	7
Litter management	7
Ventilation options and management	8
Lighting programs, sources, and management	8
Managing temperature and humidity	10
Incubation and brooding	11
Characteristics of healthy chicks	12
Feed and importance of feed quality	13
Water and importance of water quality	14
Importance of biosecurity	18
Diseases, symptoms, and vaccination	19
Processing	20
Record keeping	21
Constructing the poultry house	22
Preparing the house for chick arrival	27
Daily bird management	28
Cleaning the house between flocks	29

Valley. Furthermore, the manual includes valuable information and resources, such as record logs, biosecurity posters, charts to determine chick health, phone numbers to call, and websites to visit for additional questions. The manual explores various housing types and production sizes, from large-scale, closed-wall houses to small-scale, open-sided, and hybrid houses, and highlights the benefits of each system before concluding that a small-scale operation would be more cost-effective while still sufficient for the needs of the school. Table 1 lists an overview of topics covered and their location within the manual.

Conclusions

The manual and the farm created using it will provide a sustainable source of nutrition for the students and faculty members of the school, with a long-term goal of providing meat and eggs on a rotational basis for students to take home to their families. This will not only provide nutrition for the students but also for their family members, which will significantly reduce the need for students to drop out of school to pursue full-time work, allowing them to reap the benefits of formal education. Above all, this project will significantly enhance food security in the region of Stann Creek, Belize.

Acknowledgments

I would like to especially thank the following groups and individuals for their support of this project. Without them, it would not have been possible: The University of Arkansas Honors College for pushing me outside of my comfort zone and providing resources to make this project possible. The Walton family for donating to the Honors College and awarding me with a fellowship, which has enabled me to make the most out of my education and my time at the University of Arkansas. Bumpers College of the University of Arkansas for awarding me with a research grant for purchasing feed for this operation. Ms. Tami Strickland for her generous support of this project, as it truly would not have been possible without her.

Literature Cited

Carpenter, B. 2019. Observations and applications of husbandry methodologies on a backyard poultry farm in Dangriga, Belize. (Publication No. 26) [Undergraduate honors thesis, University of Arkansas]. ScholarWorks.

Dangriga Neighborhood Chicken Association. n.d. Guide to starting your own poultry business in Dangriga, Belize C.A.

FAO. 2019. Food and Agriculture Organization of the United Nations. The state of food security and nutrition in the world. Retrieved from http://www.fao.org/state-of-food-security-nutrition/2019/en/

Foley, J. n.d. A five-step plan to feed the world. Feeding 9 Billion - National Geographic. Retrieved from https://www.nationalgeographic.com/foodfeatures/feeding-9-billion/

Global Nutrition Report. 2020. Country Nutrition Profiles. Available at: https://globalnutritionreport.org/resources/nutrition-profiles/latin-america-and-caribbean/central-america/belize/

Habet, O. 2009. Belize Poultry Association. Belize ag report (4). Retrieved from https://agreport.bz/wp-content/uploads/2022/02/Belize-Ag-Report_Issue-04-Nov-2009.pdf

Merriam-Webster. 2020. Food insecure. Merriam-Webster.com dictionary. Retrieved from https://www.merriam-webster.com/dictionary/food%20insecure

Stann Creek Agriculture Department. 2015. Manual on improved best practices in rearing free-range chickens.

Thomas, M.M.C., D.P. Miller, and T.W. Morrissey. 2019. Food insecurity and child health. Pediatrics Official J. Amer. Acad. Pediatrics. 144(4). https://dx.doi.org/10.1542/peds.2019-0397

University of Arkansas Business Students. 2019. Backyard poultry and vegetable garden manual.

World Poultry Foundation. 2021. Poultry multiplication initiative brooder unit manual. World Poultry Foundation. Available at https://poultryunion.org/f/wpf_brooder_unit_manual_final_2021.pdf