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Observations and Applications of Husbandry Methodologies on a Backyard Poultry Farm in Dangriga, Belize

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Cover Page Footnote

Bailey A. Carpenter is a Spring 2019 honors program graduate with a major in Animal Science and a minor in agribusiness. Dr. F.D. Clark, the faculty mentor, is a poultry veterinarian on extension and professor in the department of Poultry Science.

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Meet the Student-Author



Bailey Carpenter

Research at a Glance

- There is a need to produce a manual for backyard poultry that can be easily accessible to those in developing regions attempting to improve their nutritional and economic standing.
- Biosecurity protocol, temperature regulation, and water and feed accessibility were the major factors observed regarding efficient poultry production.
- Improvement in biosecurity management and housing preparation could result in an overall increase in the productivity of poultry in a backyard setting with limited resources.

I grew up in Marine, Illinois showing horses and running cross country, while cultivating a love for the animal sciences. I graduated from Triad High School in the Spring of 2015 and began school at the University of Arkansas as a major in animal science with a pre-professional concentration. In the summer of 2016, I carried out poultry research in Nampula, Mozambique, and continued my research in the summer of 2018, where I spent two months in Dangriga, Belize collecting data for my honors thesis. I have also been an executive member for Hogs for Hope, a campus organization that benefits Arkansas Children's Hospital, by serving first as the marketing chair and later as overall director. I graduated Summa Cum Lauda and was recently accepted into the University of Pennsylvania's School of Veterinary Medicine for the Fall of 2019, where I plan to receive my DVM degree and Ph.D. in avian pathology. I am beyond grateful for the guidance of Dr. Clark while I developed my passion for poultry medicine as a means to improve global development. I would also like to thank Dr. Rosenkrans and Dr. Farmer for the support they have shown me while pursuing research abroad and developing my honors thesis. Finally, I'd like to thank Dr. Ken Coffey, my academic advisor, for constantly pushing me to be the best version of myself.



Bailey in Nampula, Mozambique in the summer of 2016 working at the local poultry hatchery, New Horizons. Her research in Mozambique was where she developed an interest in improving poultry health as a means to improve global development.

Observations and applications of husbandry methodologies on a backyard poultry farm in Dangriga, Belize

*Bailey Carpenter** and *Fred Dustan Clark*[†]

Abstract

This study explores the husbandry methodologies on a backyard poultry farm in Dangriga, Belize, with the purpose of producing a set of guidelines for backyard poultry growers that have limited resources in similar regions. The majority of data collection occurred through survey questions approved by the Institutional Review Board (IRB)—which is responsible for protecting the rights and welfare of human research subjects—necropsies approved by an Institutional Animal Care and Use Committee (IACUC), and general observations. There has been a steady increase in poultry production in developing regions due to its positive effects on income and relative nutrition. However, due to a lack of accessible communication and education regarding effective and safe poultry production, these operators typically see poor productivity and/or profitability in their operations. Data were collected over biosecurity, vaccination protocol, water quality, feed quality, temperature regulation, housing set-up and preparation, and behavior for broilers and layers. Overall, the major factors that appeared to have the greatest impact on the birds were low biosecurity measures, low levels of clean available water, and consistently high temperatures experienced in the broiler pens. The results for each factor are discussed and it was suggested that if small adjustments were made, the birds would experience better health and therefore increased productivity. Additional studies regarding *E. coli* presence in water sources, trends in broiler weights, nutritional make-up of feed, and observations of trends in post-mortem findings should be conducted.

* Bailey Carpenter is an honors program May 2019 graduate with a major in Animal Science with a Pre-Professional concentration.

[†] Fred Dustan Clark is the faculty mentor and a Professor in the Department of Poultry Science.

Introduction

The United States poultry industry has served as one of the leading influences in commercial operations due to its advanced technology and overwhelming level of resources. According to a report generated by Marin Weaver, the U.S. “is the largest poultry producer in the world, accounting for approximately one-quarter of global poultry production during 2006–12” (Weaver, 2014). Therefore, it is integral that production processes for broilers and laying hens be optimized to uphold the utmost level of efficiency. Because of this standard set for poultry management around the world, the United States is a major player in exports to countries such as China, Canada, Mexico, Indonesia, and Thailand (Weaver, 2014). In addition to this, the U.S. has also become the natural reference point to developing countries, such as Mozambique, that need to increase the level of nutrition in its inhabitant's diet and kick-start a stagnant economy through the production of chicken.

After spending just one month in Nampula, Mozambique, a general theme for developing countries became apparent: there is an increasing reliance on and significance of poultry. One Egg, a company run by Johnwayne Kennedy in Nampula, teaches people in the community that one egg a day can prevent severe malnutrition, an issue that is prevalent in one of three children in developing countries (Smith and Haddad, 2000). This concept of increasing protein in the diet is one that should be presented and stressed to all societies struggling to meet minimal standards for quality of life. Many individuals throughout these countries have begun to produce chickens in their backyards; however, it has come at a larger cost due to a lack of training and education (Fred D. Clark, pers. comm., 2018).

Derek Jones, a resident of Dangriga, Belize, is a trailblazer in the production of backyard poultry in his community. He has been working with the University of Arkansas for several years in an attempt to improve the economic, nutritional, and educational development of his community. However, this has come at a cost as he has not had the opportunity to evaluate an improve upon his own business. Mr. Jones produces and sells both broiler chickens and layer hen eggs, but he has recently seen a decline in his productivity. There is a rising prevalence of disease along with a subsequent rise in mortality, which appears to be a direct result of improper management protocols.

The problem Jones is facing is likely similar to those also attempting to produce chickens in their backyard. Instead of simply giving individuals from growing countries compensation to produce more birds, it would be much more practical to provide these communities with

useful instructions and proper education regarding poultry husbandry. Education would include topics such as biosecurity, vaccination/disease prevention protocols, egg temperature regulation, water quality, feed quality, and chick-housing preparation. Because the United States, and even more specifically Arkansas, is a leading producer of poultry, expertise is available to produce an instruction manual that could be accessible to those who have never before grown chickens. Not only would this manual seek to establish a stronger foundation for Belize, but if translated across several languages, it would also act to bridge the gap between the first and third-world countries.

Materials and Methods

The primary factors affecting poultry production were addressed by observing biosecurity protocol, water quality, feed quality, temperature regulation, and housing set-up and preparation. Each topic was evaluated through a series of survey questions approved by the Institutional Review Board (IRB), which were later administered to Derek Jones as a means to perform an in-depth analysis of his biosecurity and vaccination protocols, water and feed quality, temperature regulation, and housing set-up and preparation for the broilers and layers. Because Jones was the only individual responsible for his backyard operation, the survey was only given to him. Additionally, any observations that were pertinent to each subject matter were also recorded. To determine the relative effectiveness of the feed the chicks were receiving, 4 flocks of 8 birds each were weighed on their day of arrival, and on days 3, 5, and 10 of production. Each bird was weighed individually using a scale with the weight of the basket being subtracted from the total weight. For recording purposes, flocks were distinguished between each other through a color-coding scheme. Temperature regulation was analyzed using 4 Lascar EL-USB-2-LCD USB Data Loggers (Lascar Electronics, Inc., Erie, Penn.), which were placed in different locations throughout the yard at the beginning of the study and remained there until the end. The loggers collected temperature (in degrees Celsius) in 1-hour intervals throughout each day, and these data were then uploaded to a computer in the form of a graph to be analyzed later (Table 1). The temperature was monitored throughout June on 14 separate days for 24-hour intervals. To determine the possible prevalence of disease, or any other issues related to stunted growth and mortality, 8 necropsies were performed with a necropsy kit. Two broilers were necropsied on the 8th of June and both were from separate flocks. One of the birds was necropsied due to its inability to use its right wing, while the other bird was necropsied, because it was not gaining

weight like the others in its flock. The birds necropsied on the 12th and 20th of June were also incapable of gaining weight like the others in their flocks and were thus considered “throw-aways”. These birds were also from separate flocks. Two layers were necropsied on the 27th of June due to one layer being attacked by the owner’s dog and the other having an injured leg. Age of the layers could not officially be determined, but it was believed by Jones they were about two years old. Two broilers, both from the same flock, were necropsied on the 19th of July as a result of them being deemed throw-away birds. As instructed by F.D. Clark, each necropsy was performed with the same, methodical approach as a means to develop consistencies between the birds.

Results and Discussion

There was no separation of flocks from one another, other than a layer of chicken wire. From the time they entered and left the farm, each flock was in direct contact

with 2 other flocks within Jones’ operation. When rearing multiple flocks, they should be completely separated, from ceiling to floor, by the chicken wire, and should never share the same pen. Because each flock carries its own set of flora and potential-disease-causing pathogens, it is very important that they do not interact with other groups of birds (Swayne, 2019). Additionally, it could not be determined if the birds were being vaccinated prior to being sold to Jones. One flock, however, had injection marks for vaccines on their necks (Fig. 1) and were, on average, smaller than the birds that did not show signs of vaccination. It is believed that the birds showing no signs of vaccination were consistently larger because they were being shipped on day-of-hatch and were reaching farms immediately, allowing them to consume food and water. Alternatively, the birds being vaccinated were kept at the hatchery for a couple of days without adequate levels of food and water, thus decreasing their growth rate in the first couple of days and for the rest of the production period (F.D. Clark, pers. comm., 2018).



Fig. 1. Injection marks on the neck of a recently delivered chick.

Table 1. Average minimum and maximum temperatures recorded (in degrees celsius) for the four loggers placed throughout Derek Jones’ farm.				
	Logger 1- large nest box	Logger 2- Central Broiler Pen	Logger 3- Eastern-Most Broiler Pen	Logger 4- Western-most Broiler Pen
Average minimum temperature (°C)	28.0	28.4	30.2	27.9
Average maximum temperature (°C)	35.8	32.6	34.8	32.6

Throughout the study, it was observed that each Plasjon Breeding Drinker contained a thick layer of mahogany shavings/litter (Fig. 2) where the birds would otherwise be able to access the water. The birds 0-1 week of age would reach up for the water, while those birds that were older than 3 weeks would have to bend their neck down to do so. Raising the waterers to a specific level (based on the flock's overall age) prevents the birds from kicking chicken litter into them. Chicken litter/feces can be covered in infectious pathogens and/or parasites and would, therefore, act as a very effective source for disease transmission. The constant maintenance and up-keep of water is crucial to the survival and successful production of broilers, as dehydration could otherwise result in such a hot and humid climate.

Typically, all of the feeders were checked (and possibly filled) around 9:00 AM each day and would not be checked/filled again until the subsequent morning. Because of this, 50% of the recorded instances showed the birds were without food. When the birds are constantly eating, they are also constantly growing. Thus, when Jones would leave some of his flocks without food (especially the chicks) for even a couple of hours, they were not growing in that period. Overall, this lowered the rate at which his birds were growing and the final weight they

would reach before harvesting (F.D. Clark, pers. comm., 2018). To ensure the birds always have feed available to them, the feeders should be checked every morning and every evening.

The lowest average minimum temperature recorded by a logger was 27.9 °C, which was located in the western-most broiler pen. Thus, on average, the birds were experiencing a climate of at least 8.0 °C higher than recommended (Hulzebosch, 2005). Because of this heat stress, birds will consume less feed, as well as experience a reduction in egg weight and shell quality (Bell and Weaver, 2002).

Conclusions

The results of the study indicated that the major factors affecting efficient backyard poultry operations were biosecurity protocol, water quality, feed quality, and temperature regulation. If the backyard growers in Dangriga, Belize simulate the methodologies implemented in the United States and in other leading countries for poultry production, they should see an increase in productivity of their operation. By reaching an optimal range for poultry productivity, it is possible for these operations to provide a sufficient level of income and nutrition required to sustain a household.



Fig. 2. Plasjon Breeding Drinker filled with bedding in broiler nursery pen.

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