Global Scientific JOURNALS

GSJ: Volume 9, Issue 8, August 2021, Online: ISSN 2320-9186
www.globalscientificjournal.com

GROWER'S SATISFACTION IN USING CONTROLLED CLIMATE SYSTEM HOUSING FOR BROILER CHICKEN PRODUCTION IN THE PHILIPPINES

Thelma T. Franco (thelmafranco23@gmail.com)
Senior Broiler Farm Supervisor
Poultrymax Omnis Inc.
Barangay Balasing, Sta.Maria, Bulacan

Abstract

Broiler meat is popular because it is cheaper, more versatile, easy to cook and is perceived to give more health benefits not to mention lower calories than red meat. The demand outlook is positive for the Philippine broiler industry because of the continuing growth in population and household buying capacity in the country. Since the rise of African Swine Flu and lots of restrictions on transportation due to Covid 19, lower meat supply was noted especially on pork while higher demand for chicken meat can be perceived because of the lower supply and higher ongoing market price, higher supply can be a good attribute to lower inflation of the said commodity to benefit both growers and consumers.

Demand for broiler production is harder as time goes by, standards were at peak, demanding higher body weight in lesser market age. Management is the biggest challenge that it has ever been. Broiler growth, increased growth rate equals increased heat production that can be best managed by controlling micro-climate inside the house by using CCS.

Improvement and or development in animal genetics, breeding, nutrition, and animal husbandry has led to changes in modern poultry from the past. Accordingly, modern poultry particularly broiler chickens under intensive and massive production are susceptible to many disorders, stressors, and diseases more than ever before. Hence, poultry in unstable environmental conditions cannot show their true genetic potential, therefore, leading to economic losses. Providing the best place for raising the birds is one of the important and basic issues in broiler production.

Interest continues to build in tunnel ventilation by the commercial sector through a method of enhancing broiler performance and reducing mortality during warm weather. The perception that operating costs associated with this system may be high as concerned but as projected it gives better payback. The purpose of this study is to check Broiler performance when using tunnel ventilated houses to help growers decide or take into consideration, possible shift to automation in broiler raising to improve production. This paper identifies the advantages of operating controlled climate system broiler houses and how it can help sustain the increasing demand for chicken meat as well as giving more promising profits to the growers.

Index Terms

Broiler- is any chicken (Gallus gallus domesticus) that is bred and raised specifically for meat production. Tunnel Ventilated Houses / Climate Controlled System- in which, the entire environment is manipulated in such a way that is optimum for the bird's growth usually has a closed housing system, not elevated, concrete floor, with sidewall windows and steel trusses. Uses cooling pads, automatic feeders, waterers, tunnel fans, and sensors to control the equipment/climate inside the house.

Conventional Houses- monitor type roofing, an open side that uses curtains, elevated floor usually uses bamboo/wood, lumber on concrete columns and wooden trusses.
Feed conversion ratio- is a measure of how well a flock converts feed intake (feed usage) into live weight.

I. Introduction

The broiler market is highly competitive, with an increasing number of commercial producers like San Miguel, Bounty Fresh, GAMA, and Magnolia to name a few. They succeed by having a competitive pricing, aggressive marketing, coordinated supply chain, new product, and market development but on top of all of it is improving on-farm productivity by adapting the latest technology and more efficient management practices.

In Broiler production, the main fields we need to focus on for success were animal welfare and health, environment, and cost of production. As a grower and businessman getting maximized returns and or profits from our investment is the priority, which can be given by understanding and adapting to the best possible technology available in the market given its cost and production efficiency.

Genetics and nutritional improvements in broiler production have been very essential to the efficiency of poultry meat production; however, the full genetic potential of broilers can't be achieved unless the suitable environment is maintained in the broiler house.

One of the automations made in broiler production is shifting conventional broiler houses to tunnel ventilated houses or using a controlled climate system. The main reason for building CCS houses for poultry is to protect them from the ever-changing weather. Weather conditions is one of the key parameters affecting the poultry house environment. It has been indicated that any deviation from ideal environmental conditions controlling can have detrimental impacts on poultry welfare, health, and performance. Some negative consequences of these variations from natural amplitudes are heat stress, cold stress, wet litter, weaker immunity, ammonia emissions, etc.

Listed below were the importance of providing a controlled climate system housing to the birds:
-comfort and protection
-scientific management in a controlled manner
-easy, convenient, and economic operations
-reduces the total cost of production
-maximizes flock performance
-ensuring better health and welfare
-proper micro-climatic conditions
-increased stocking density
-optimum and uniform growth rate

II. Discussion

What is Controlled Climate System / Tunnel Ventilation?

The controlled climate system is now the trend and big companies' grower requirement in the modern broiler production industry. CCS is a system where tunnel and exhaust fans are located at one end of the house and two large openings (tunnel doors) or small windows (inlets) are installed at the opposite end or sidewalls. Air is drawn through these openings, down the house, and out the fans. Fans are placed at one end of the house or in the middle of the shed, and the air is drawn through the length of the house, removing heat, moisture, and dust. Evaporative cooling pads are located at the tunnel doors. The energy released during evaporation reduces the air temperature, and the resulting airflow creates a cooling effect, which can reduce the shed temperature by 10 °C or more, depending on humidity. Maximum evaporation is achieved when water pumps are set to provide enough pad moisture to ensure optimum water evaporation which is greatly needed on the terminal age of the flock. CCS is also an effective system to give warmth to the chicks when they need it to by using minimum ventilation which gives enough fresh air while using a heater to support the chick's ideal body temperature.

If the terminal aged birds cannot get rid of all the heat it is producing, they will be experience 1. Increase in body temperature, 2. Decrease in feed consumption, 3. Decrease in growth rate, 4. Increase in growth rate, 5. eventually mortality will increase.

Controlling House Environment

Almost all modern broiler houses rely upon electronic controllers and computers.

The controller monitors house environmental conditions and adjusts the heating, ventilation, and cooling equipment as necessary to keep temperatures constant. Today, controllers can monitor the temperature in six or more locations throughout and outside the house. Humidity can also be monitored inside, although adjustments to heaters and fans are usually done on a temperature basis. As the house temperature deviate from what is needed, the controller will turn on the brooders or fans as needed. The controller operates equipment in the house including radiant heater, fans, inlets, tunnel doors, evaporative cooling systems, and lights. Many controllers also allow house conditions to be monitored remotely using applications that can be opened anywhere using electronic gadget with internet connection. Even historical data of feed, water consumption, temperature, humidity, ventilation level can be collected.

Modern broiler housing can provide the environment needed to produce high broiler performance, but this is entirely dependent on electricity, and the proper operation of house equipment.

Generators and Alarms were also installed, essential together with the controllers to monitor and save the farm in cases of emergency. Alarms are used to notify if there is a loss of power or any deviation from the set up in the controllers in terms of target water pressure, static pressure, temperature, humidity etc. The alarm system will activate a siren, usually located at the facility, to alert anyone close by and an automatic phone dialer to notify the farm manager while he or she is away from the farm. In the case of power loss, emergency generators are used to operate ventilation, feeding, and watering systems to prevent catastrophic losses. In house technician and or supervisor that is trained in operation of this equipment's are also essential in the farm all the time.

Raising broilers in CCS allows lower bird density and is reported to have improved feed conversion ratio, higher growth rate, and livability. However, CCS requires higher initial investment and operating costs for building houses than the conventional system. The extra operational costs for tunnel ventilation must be balanced against the increase in weight gain and reduction in mortality that can be achieved during extremely hot weather.

Description of the Problem

The Philippine broiler sector was found to be internationally uncompetitive because of higher input costs, below-par on-farm productivity, and an inefficient marketing system. Therefore, threats from foreign competition and a higher need for imports surfaced as a major concern in the Philippines. Improving both production and marketing efficiency is necessary to become more competitive internationally and will require coordinated efforts from both the private and public sectors. Investors / Integrators who have the capacity to put up massive broiler production using tunnel ventilated houses and supply meat in the market can play a major role in augmenting high demand while lowering market prices.

The average farmgate price in commercial farms for every last quarter of the year were recorded as 2018 at Php77.46/kg, 2019 at Php91.24/kg, 2020 at Php87.44/kg, while the growth rate in percent were -11.1 in 2018, 17.8 in 2019 and -4.2 in 2020 (Source: PSA) which shows a negative growth rate.

Philippine Chicken Meat Market Prices at last quarter of 2020 prices were, prevailing: Php 140-170, Low: Php120-150, High: Php 160-180 while on the first quarter of 2021 prices were, prevailing: Php160-170, Low: Php 140-160, High: Php190-200, prices went high especially this pandemic time.

Materials and Methods

In doing an in-depth study about this we cited different researchers, one outside the country and one domestic who actually conduct growing of birds in both conventional and tunnel type of housing in broilers.

Birds grown Domestically
Broiler Grower has Farm A that uses a conventional type of housing and Farm B that uses controlled climate system or tunnel ventilated houses both were located at Neva Ecija, Philippines.

The cost of housing and other facilities sums up the high investment in broiler production, whereas the cost of day-old chicks, man power, feeds, medication, vaccine, power and water, and house repair and maintenance constitute the high operating cost. The CCS is more expensive to put up than the conventional housing, calculated at PHP 382 per bird vs PHP 250 per bird, respectively. However, the latter has a shorter life span, so it needs repair and maintenance after five years, and bi-yearly or yearly thereafter. Conversely, CCS housing has a longer life span of 15-20 years and requires less maintenance and operating cost. It has a higher bird capacity that makes the cost per unit area less expensive. Moreover, the use of CCS has higher productivity gains for broilers. A good atmosphere for growth improves broilers' feed efficiency, growth rate, and livability.

Performance of Broilers in conventional and tunnel ventilated houses in the Philippines for Conventional versus Tunnel Ventilation is at Average Live Weight 1.63 vs 1.65, Feed Conversion 1.9 vs 1.78, Livability 93.49% vs 96% and Net Income Per Birds 2.86 vs 5.68.Net income was higher in Farm B than in Farm A. ALW is higher in Farm B but did not differ a lot.

This is attributed to higher grower's fee and lower operating cost in Farm B. Depreciation cost and interest on capital are higher for Farm B due to the higher cost of investment. Nevertheless, net income over total expenses was still higher in Farm B at PHP 5.68 than in Farm A at PHP 2.86 per bird. In essence, investing in CCS to raise broiler under contract scheme is profitable and could generate higher income than in conventional housing system.

Livability.

Livability or the number of live birds at harvest is a good indicator of the degree of comfort the birds experienced during the entire growing period. The climate-controlled system enabled Farm B to attain 96% livability at Week 5, whereas, in Farm A, the harvest recovery was only 93.49%.

The tunnel ventilation in Farm B promoted higher livability because it provided the birds with better environmental protection against unstable temperature, humidity and other environmental problems. On the contrary, broilers in Farm A are predisposed to higher stress due to fluctuations in temperature and humidity that directly influenced FCR and livability.

Feed conversion efficiency.

Feed Conversion Ratio (FCR) is the indicator of feed conversion efficiency. This means that in Farm B, the birds consumed only about 1.78 kg of feed to produce a kg of meat, whereas in Farm A about 1.90 kg was consumed to produce the same amount of meat. The difference in FCR of about 0.12 was highly significant ($P<0.01$). In broiler production, brooding is very important. According to Arbor Acres (2011), the brooding period is a critical time for gut development, hence the efficiency of feed utilization. The controlled environmental temperature in the entire growing period in Farm B contributed to lower mortality, hence better FCR. In Farm A, the fluctuating environmental temperature caused birds to expend more energy to maintain normal body temperature. There is higher mortality in Farm A particularly during the later stage of production which may be caused by inefficient cooling system. The incidence of high mortality directly relates to poor FCR. The feeds consumed by the lost birds were also included in the computation of the total feed consumed, thereby raising further the FCR value in Farm A.

Among the indicators of performance, FCR is the most affected by the type of housing. There is better FCR in Farm B brought about by higher livability as a result of a better growing environment.

These results accepted the hypothesis that CCS housing has better productivity and is more efficient than conventional, by having higher FCR. Birds' performance in controlled environment houses is generally superior to that in naturally ventilated houses, as the conditions can be maintained in the birds 'thermal comfort zone' thus giving better results.

Birds grown outside the Philippines

The study's data were from a commercial broiler farm that has both tunnel and conventionally ventilated house existed side by side.

Results

Inside the house, temperature was reduced by 2-4F in conventional houses while it is 7-12F in tunnel ventilated houses. In addition to the greater reduction in temperature due to fogging /cooling systems, the increased air movement using tunnel fans further enhanced the amount of heat loss from broilers in the tunnel ventilated house.

Performance of Broilers

In Conventional vs Tunnel Ventilated Houses, Body weight (lb) 5.13 vs 5.35, Feed Conversion 2.05 vs 2.03, Livability % 94.6 vs 94.8, Production Cost $1631 vs $1616, Water Consumed (gal) 156, 358 vs 152,744.

The parameter FCR was used as the indicator of productivity in the study. The feed conversion ratio is a measure of how well a flock converts feed intake (feed usage) into live weight. Lower FCR means higher profit. The Average body weight was 5.35 lbs. in the tunnel-ventilated house and 5.13 lbs in the conventional house. During this particular grow-out, it appeared that birds in the tunnel ventilated house began to outgain those in the conventional house at 28 to 35 days of age. Results on both houses only have a little difference, in feed conversions 2.03 and 2.05 while livability's of 94.8% and 94.6% respectively. Production costs were .15 cents/pound lower in the tunnel ventilated house.

The broiler producer who grows this bird profits more from the tunnel ventilated house than from the conventional house due to higher weight and slightly better feed conversion.

Outside temperature was not extremes during this grow out, no heat-related mortality was recorded on both houses during the study. It is highly likely that if temperatures had been experienced late in the grow out more dramatic differences in performance, production costs, and grower pay would have been observed. Electricity usage in tunnel house was consistently higher than in conventional house given that it uses a lot of electric equipment compare to the latter. Power cost in the conventional house is almost 50% lower than tunnel house, however, on hot days, electricity usage was only at 20 to 30% higher in tunnel house.

III. Summary

-Broiler production requires (1) feed and water; (2) environmental protection; and (3) health protection which is managed by farm managers and employees. Environmental protection that has a lot of variables which is exhibited in conventional would be minimized if CCS is used, this is the area that broiler producers will have the greatest opportunity to manage for improved livability and performance.

-Controlled climate system housing and equipment make it possible to control the microclimate provided in technologically advanced commercial broiler production. The combination of high air velocity and evaporative cooling can be used by producers to increase feed consumption, increase growth and reduce mortality when growing heavy birds.

-Proper training and management practices of both equipment and animal raising are crucial in operating the controlled climate system while lots of manpower, hard work, and years of expertise is needed to operate in conventional housing as there is a lot of variables the grower needs to control and consider.

-In general CCS houses had better average FCR / productivity than conventional and can be concluded from both grow out, CCS improved the performance of birds as indicated by better FCR and livability.

-The key to profitability is to attain the desired harvest weight at the shortest possible time when birds are still efficient in utilizing feed for gain in weight. Practically, this means attaining the genetic potential for efficient growth in the most favorable environment which can be highly achieved by using tunnel ventilated houses.

IV. Conclusion

Conventional and climate-controlled systems can produce broilers with good performance if given proper management and nutrition accordingly.

Commercial broiler production inside the country and outside has the same findings with the Controlled Climate System housing that improved the performance of birds as indicated by better feed efficiency and livability. It makes the birds to stay in their thermal comfort zone, with the ideal range of temperature, relative humidity, and air quality throughout the entire growing period. The favorable condition under CCS provided the birds with lower stress, thereby enabling them to utilize energy intake more efficiently for growth.

Investment for CCS is relatively higher than in conventional housing. But production under CCS was found to be more profitable. The high cost of investment was offset by lower total operating costs. Under CCS, the major cost in operation was on power while for conventional housing, labor accounted for the major cost. However, biogas production from manure could be the source of power, thus reducing its cost.

Moreover, a distant alarm system for changes in temperature and relative humidity inside the system could be very helpful to the management to ensure sustained performance.

References

Chang, Hui-Shung (2007), Overview of the World Broiler Industry: Implications for the Philippines. Cited 12-2007.pp.1, http://ageconsearch.umn.edu/record/166013

Chang, Hui-Shung (Christie) (2007), Analysis of the Philippine Chicken Industry: Commercial versus Backyard Sectors, School of Economics, University of New England, Australia, Cited pp. 1-16, https://www.researchgate.net/publication/24049842_Analysis_of_the_Philippine_Chicken_Industry_Commercial_versus_Backyard_Sectors

M.P. Lazy, M. Czarick (2019), Tunnel-Ventilated Broiler Houses: Broiler Performance and Operating Costs. Cited December 11, 2019. Pp 1-6, https://www.sciencedirect.com/science/article/pii/S1056617119319117

Levy, Kachilei, Tuitoek, Daniel (2017), Comparative Productivity Analysis of Broiler under Climate Controlled System and Conventional Housing in Selected Municipalities of Nueva Ejica: Philipines. Cited July, 26, 2017. Pp 1-10, http://www.iosrjournals.org/iosr-jef/papers/Vol8-Issue4/Version-2/F0804023948.pdf

Salas, Ramon Cesar D., Orden , Edgar A., and Orden , Maria Excelsis M., (2016) Productivity and Financial Viability of Commercial Broiler Farm Using Climate Controlled System: The Case in a State-Owned University in Nueva Ecija, Philippines , The CLSU International Journal Of Science & Technology , Volume 1, No. 1: 32-45 (2016) Cited https://www.researchgate.net/publication/306363130 Productivity_and_Financial_Viability_of_Commercial_Broiler_Farm_Using_Climate_Controlled_System_The_Case_in_a_State-Owned_University_in_Nueva_Ecija_Philippine

Chicken Situation Report (2021) Cited https://psa.gov.ph/sites/default/files/Chicken%20Situation%20Report_.signed_0.pdf

Chicken Situation Report, October-December 2020, Cited, https://psa.gov.ph/livestock-poultry-iprs/chicken/prices

R. A. Bucklin, J. P. Jacob, F. B. Mather, J. D. Leary, and I. A. Naas2, Tunnel Ventilation of Broiler Houses., University of Florida IFAS Extension, Cited 2018. Pp 1-3, https://edis.ifas.ufl.edu/pdffiles/PS/PS04100.pdf

5M Editor, Climate Change and Poultry Production, Cited August 10, 2009, https://www.thepoultrysite.com/articles/climate-change-and-poultry-production

5M Editor, Basic Introduction to Broiler Housing Environmental Control, Cited August 8, 2005 https://www.thepoultrysite.com/articles/basic-introduction-to-broiler-housing-environmental-control Chicken Meat Prices, Cited https://www.da.gov.ph/price-monitoring

Oloyo, Ayodeji and Ojerinde, Adedamola, Feb 26, 2019, Poultry Housing and Management, Cited https://www.intechopen.com/books/poultry-an-advanced-learning/poultry-housing-and-management