

ASSESSING INCUBATION AND PERFORMANCE DEFICIENCIES TO BOOST BROILER PRODUCTION

Djang-Fordjour, H., Hamidu, J.A. Adomako, K.

Department of Animal Science, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana
jahamidu@gmail.com

Abstract: The hatchery and hatching egg industry has performed minimally in Ghana over past two decades in Ghana. As a result, importation of day old chicks in Ghana has increased considerably. The objective of the current study was to provide inventory of actively operating hatcheries in Ghana and to discover opportunities on improvement in Ghanaian hatcheries. Survey was carried out on known and active hatcheries in Ghana to take inventory of human resource strength and qualification, hatchery output, capacity of operation, availability of parent stock, common hatchery practices maintained to increased chick quality, day old chick production and market outlets, rates of chick mortality, distance of hatcheries from breeding farms, hatcheries importation of eggs to hatch, types of incubators and the type of incubation systems in used and whether hatcheries provide any follow-up on farms that take chicks from them. Structured questionnaires administered to local hatcheries were assessed and all data expressed as percentage. The data collected showed that there are 9 hatcheries in Ghana operating actively in hatching broiler or layer chicks or both. While 7 hatcheries assessed showed averagely 29.9% utilization of their installed capacity, only two of these hatcheries were operating at 60 and 68.42% of their full capacity. The capacity of these hatcheries were 38,000 and 115,200 eggs respectively. The type of incubators used by all the hatcheries includes Chick Master, Buckeye, Asefac, Petersime, Westing and Beckier while the major incubation system practiced was the multistage incubation system. Only one hatchery had a single stage incubator. All these hatcheries reported using doing multistage incubation, all the incubators appeared to have single stage incubation principle. Three of the 7 hatcheries provided basic training for all staff members and additional three provided training for about 40 to 70 % of their staff. Only 3 hatcheries had their own parent stock, the rest bought or depend on other farmers or contracting them to supply fertile eggs for hatching. Major challenges reported were dead in shells, unsealed navels, twisted beak, wet chicks, and blind chicks among others. The study concludes that the major challenges confronting the hatchery industry in Ghana were more due to high incubation temperatures, low relative humidity, and lack of staff training on basic principles of incubation.

Keywords: Survey, hatchery, hatchery utilization, parent stock management, chick quality

INTRODUCTION

since the 1980s until now there has been persistent decline in poultry production in Ghana due to a number of reasons. These may include but not limited to high cost of production (feed, inputs and energy), lack of credit (Flake and Ashitey, 2008) and poor quality day old chicks which still appears unnoticed by many poultry stakeholders who are stewarding the sector. This may not be purely intentional but lack of specialized personnel who are needed to evaluate day old chick quality to the required standards. Information picked from a 2014 issue of the Daily Graphic, over the last five years showed that chicken imported into the Ghana cumulatively accounted for 74.2% of Ghana's total meat import. At the same time Ghana has imported over 4.2 million stocks of day old chicks annually (Sumberg and Thompson, 2013). These figures confirm the contribution of imported chicken to the near collapse of the broiler poultry sector in Ghana (Aning, 2006). FAO report (2014) also show that

Ghana imports large quantities of day old chicks and hatching eggs from the European Union, USA and Brazil. This caused hatcheries in Ghana to operate below their operating capacities or stop operations completely. The objective of the study was to provide inventory of actively operating hatcheries in Ghana and to discover opportunities on increasing and improving the day old chick quantity and quality from Ghanaian hatcheries and identify various stakeholder interventions that can be developed to sustain the poultry industry.

MATERIALS AND METHODS

Location of study and survey

This study was part of nationwide survey of all actively operating hatcheries in Ghana spanning within Ashanti, Greater Accra and BrongAhafo regions of Ghana. Questionnaires and interview schedules were used to gather information for the project. The hatchery owners/managers who were willing were issued with a structured type questionnaires, which they answered and a time was scheduled for it to be picked up. On the other hand hatchery owners/managers who would not personally fill the forms were also interviewed using the same structured questions. Most of the hatcheries when contacted willingly offered a tour through their facility for to ascertain firsthand information on their challenges. Information gathered included hatchery types (small, medium and large scale), capacity of operation, capacity of utilization, type of incubator and incubation system being used, human resource strength and qualification, parent stock population, hatchery output, challenges and availability of trained personnel consultancy on chick quality issues. Data collected were transformed into percentage and the rest qualitatively described.

RESULTS AND DISCUSSION

Table 1. Major hatcheries in Ghana and their performance measurements

Hatchery	Years in operation	Capacity (eggs)	Utilization (month)	Utilization (%)	Type of incubator	System of Incubation
A	20	120000	10000	8.33	Chick Master	Multi-stage, single-stage
B	40	45000	9000	20.00	Buckeye	Multi-stage
C	33	38000	26000	68.42	Asefac	Multi-system
D	15	420000	60000	14.29	Petersime, Westing, Beckier	Multi-system
E	20	400000				
F	16	120000	10000	8.33	Buckeye, Petersime	Multi-system
G	11	115200	69120	60.00	Petersime	Multi-system

NB: For confidentiality, these hatcheries have been identified by letters

The data collected showed that there are 9 hatcheries in Ghana operating actively in hatching broiler or layer chicks or both. These hatcheries include Asamoah and Yamoah Farms, Akate Farms and Trading Company Limited, Akropong Farms Limited, Bamfo Farms, Darko Farms Company Limited, Mfum Farms, St Charles Farms, Besease Farms and Top man Farms. Some of them had been in the business of incubation for well over 30 years. Therefore, their machines were also very old and part of the whole machine had not seen replacement for a long time. In addition the operation and the types of machines are obsolete or are out of touch with meeting modern incubation standards. This can present a lot of problems to hatchery managers who would struggle to make good production output. Only two of these hatcheries were operating at 60% and 68% of their full capacity based on the quantities of eggs that can fully fill available incubator space (Table 1). The rest were

operating at 8, 14 and 20 percent of their capacity. The study agrees with report from Ghana Business News (2013) assertion that most of our hatcheries in Ghana operate below 60%. Our study showed that the smallest hatchery had a capacity of 38,000 egg incubator space while the largest hatchery had 115,200 eggs incubator space. The type of incubators used by all the hatcheries includes ChickMaster, Buckeye, Asefac, Petersime, Westing and Beckier while the major incubation system practiced was the multi-stage incubation system while only one hatchery had a single stage incubator. The incubators used by all the hatcheries are different from one hatchery to the other. However, almost all the hatcheries claimed to practice the multistage incubation system, where eggs of more than one embryo age are present in the incubator at the same time (Hamidu et al., 2007). However, a typical multistage incubation system would not mix eggs on a single setter rack but multiples racks are moved along as new eggs are pushed into the incubator. It is clear that these hatcheries lack knowledge on the main principles behind the different incubation systems and therefore are operating giant single stage machines and multistage machines. Even though they are putting eggs of more than one age and different breeds/strain in the same machine at any point in time and adopting it as multistage incubation system, it is evident that that is main problem that most Ghanaian hatcheries are facing to optimize hatchability and chick quality. Single stage incubation system against the multistage system is the current and probably suitable standard incubation system (Hamidu et al., 2007). This could be because of its advantages ranging from improved day old-chick quality, improved hatch rates and fewer cull birds which then provides viable, well hydrated and healthy birds from day one to the time they grow (Bennet, 2010). The single stage system is expected to reduce embryonic mortality particularly in the first and last week of incubation, increase embryo growth rate and increased feed conversion during broiler grow out (Molenaar et al., 2010). The variation in the types of incubators/setters used in Ghana could have its own bigger problem that may have added to already ailing Ghanaian poultry industry due high feed cost that account for about 70 to 80% (Benabdeljelil et al., 2001) of current production cost (Durunna et al., 1999). According to information found at the Poultry Site (2014) currently, Ghana's poultry sector is having challenges which include hatcheries operating below expectations due to unrestricted trade liberalization that permits the liberalization of avian products to be imported helps to support the industry in Ghana. For a country that could produce 90 per cent of its poultry needs as of 1993, according to MoFA figures (MoFA, 2013), Ghana can now produce a trivial 10 per cent of its poultry products and also the amount of money channeled into the importation of poultry product increases considerably from one year to another. There is a new need to increase local production and capacity to increase training of high level technical experts especially in the hatchery sector. Currently in Ghana, the Veterinary Services Directorate is in charge of hatchery operations and certifications, however, beyond diseases these experts lack the basics of hatchery operations and therefore a new taskforce should be developed nationally to take charge of matters concerning incubation and chicks production to help the industry as needed.

Table 2: Inventory of Ghanaian hatcheries and steps to maintain high performance

Hatchery	Hatchery workers	Trained Workers	Training (%)	Place of Training	Manufacturer Training	Association
A	5	2	40	In-service	No	Ghana Poultry Farmers
B	5	5	100	In-service	No	Ghana Poultry Farmers
C	4	4	100	In-service	No	Ghana Poultry Farmers
D	20	15	75	In-service	Yes	Ghana Poultry Farmers
E	6	4	67	In-service	Yes	Ghana Poultry Farmers
F	5	5	100	In-service	No	
G	15	3	20	In-service	No	Ghana Poultry Farmers, World Poultry Science

NB: For confidentiality, these hatcheries have been identified by letters

Out of the 7 hatcheries interviewed, only 3 of them provided basic training to all their staff. An additional 3 hatcheries provided training for about 40 to 70 % of their staff (Table 4.02). These training were however in-service, meaning the experience of older hatchery personnel was passed on to the new ones. This is to support Pas Reforms (2015) assertion that whether for new employees or as a routine for existing hatchery personnel, training motivates people to do a great job. Two hatcheries indicated they had staff that received training from the manufacturers of their machines. This step was more important to help staff understand the operation of the incubators because it is important for employees to understand what they do and why they do it and not just to follow Standard Operating Procedure(SOP's) (Pas Reforms, 2015). The survey results reveal that 6 of the hatcheries were associated with the Ghana Poultry Farmers Association and one was additionally a member of the World Poultry Science Association. Such association is important to help pass appropriate knowledge and new information to hatchery personnel. However, majority of hatcheries hardly attend workshops or conference to learn about new idea of incubation. In agreement Pas Reforms (2015) encourages that to have a good hatchery manager or employees, professional development must be involved in their work in order to grow into their jobs and build experience, while staying up-to-date by reading relevant articles and attending seminars. In addition hatchery management training is paramount for managers to share ideas and experiences with specialists and managers from other hatcheries. Mabbett (2012) has reported that in successfully managing a hatchery for long period, the right tool and technical know- how is needed to monitor the requirement of the eggs and developing chicks including having workers trained properly to measure, and monitor incubation parameters such temperature in the hatchery. In spite of the technological advance in current incubation industry, some of the best tools available to workers at the hatchery are their ability to observe and use their instincts to figure out issues of the sight, hearing and smell. Prompt identification of any problems will depend on the individual's ability to recognize some warning signs and accepting that there is a need to investigate (Mabbett,2012).This is where the new technologies learnt is made useful to the worker and will add value by applying them in the whole incubation processes. The work of the veterinary concerning hatcheries in Ghana includes chick quality assessment which is not diseases related. However, the engagement of veterinary service after hatcheries problems have escalated to full level yolk sac infections in Ghana is common and this practice alone cannot cure the diseases of the chicks leading to high mortalities. Proper training of hatchery staff is one of the success paths of a hatchery success (Pas Reform,

Table 3: Inventory of Ghanaian hatcheries and steps toward quality assurance and reduce low performance

Hatchery	Own parent Stock	No. broiler parent stock	No. layer parent stock	Type of Breed	Storage duration (days)	Storage temperature (°C)	Hatch Challenges
A	Yes		6000	Lohmann	6-7	16-17	fore-hatch, dead in shells
B	Yes				6-7	20	
C	No				4		unsealed navel, blind chicks
D	Yes	10000	20000	Hyline, Lohmann, Harco, Cobb	4-7	18.5-19	
E	Yes				7		
F	No				4		
G	Yes	10000	55000	Lohmann, Boman	4	17	twisted beaks, wet chicks, heavy navel

NB: For confidentiality, these hatcheries have been identified by letters

The current hatchery inventory showed that five hatcheries kept their own parent stock while the others obtained eggs from other farms or depended on farmers who contracted them to hatch their eggs for them. The larger number of parent flocks were layers, indicating a very low attention on broiler production in Ghana. This is in support of Ghana Poultry Report Annual (2013) that showed that the demand for layers from hatcheries is over 80 percent of total capacity. In this same report, only three hatchery companies maintained their own broiler parent stocks with the others importing fertile eggs or depending on farmers to bring in their eggs to hatch. The main breed kept by these hatcheries was the Lohmann with other hatcheries complementing this with other breeders which may be in small numbers. Major hatchability challenges reported were dead in shells, unsealed navels, twisted beak, wet chicks, and blind chicks among others.

According to the hatcheries, they store eggs not more than 7 days and storage temperature did not exceed 20°C. According to Tona et al. (2003) the duration of storing eggs before incubation affects chicks. The effect of storage has both positive and negative implications depending on how long it is stored (Reijrink et al., 2008). Wilson (1997) reported that the reproductive performance of the parent stock is important for the hatchery to determine the amount of saleable chicks at a minimal cost. It is important that uniform chicks be attained to get better production. It is important that the setters and hatchers attain an optimum level so the uniformity of chicks does not suffer. According to Wilson (1997) many factors affect hatchability which includes egg size and age of breeders, season of the year and nutrition, egg handling and storage, temperature and humidity throughout the incubation and hatching period. Therefore hatcheries that had their own parent stock had higher capacity of controlling variation in these factors to optimize hatch.

CONCLUSION

Poultry farmers in Ghana have often complained about the availability of quality day-old chicks to ensure a sustainable meat and egg production to meet national needs leading to over dependence on foreign day old chicks. The problem has both quantitative and qualitative implications but the sector that is able to solve this problem is the hatchery industry, which is not well organized in Ghana as suggested in our survey. The current research has been done to extensively cover major existing hatcheries in Ghana that are operating as business entities. In addition, the impact of their activities on the entire poultry industry has been assessed. The information presented is very timely in the current state of the poultry industry and will help in developing policies by stakeholders to increase poultry productivity through the hatchery sector.

ACKNOWLEDGEMENT

The authors wish to thank all the hatcheries that made their facilities available and reserved time for this information gathering. We are also grateful to Miss Jocelyne Okyere Darko for auditing the manuscript.

REFERENCES

- Aning KG. The Structure and importance of commercial and village based poultry in Ghana. Poultry Review: www.fao.org, 2006.
- Bennett B. The advantages of single stage versus multi stage incubation. International Hatchery Practice. 2010; 24:7-9.
- Bokpe SJ. Poultry and livestock import policy to be enforced. <http://graphic.com.gh/news/general-news/20584-poultry-and-livestock-import-policy-to-be-enforced.html>. 2014.
- Daily Graphic. Government to support local poultry industry. Daily Graphic March. www.graphic.com.gh. 2014; Page 43.

- Durunna CS,ABI Udedibie, GA Anyanwu. Combination of maize/sorghum dried brewers' grain, cocoyam cob and cassava tuber meal as substitute for maize in the diets of laying hens. *International Journal of Agriculture, Environment and Biotechnology*.1999;2: 1-7.
- FAO. Poultry sector Ghana. FAO, Animal Production and Health Livestock Country Reviews. No.6.www.romere.com.2014.
- Flake L, AshiteyE. Ghana's Poultry and Products Annual Report. USDA, Foreign Agriculture Services GAIN Report. www.thepoultrysite.com/articles.2008.
- Hamidu JA, Fassenko GM, Feddes JJR, O'Dea EE, Ouellette CA, Wineland MJ, ChristensenVJ. The effects of broiler breeder genetic strain and parent flock age on eggshell conductance and embryonic metabolism. *Poultry Science*.2007; 86:2420-2432.
- Mabbett T. Tips for successful hatchery management. www.fareasternagriculture.com.2012.
- Poultry site. Livestock import policy to be enforced in Ghana. www.thepoultrysite.com.2014.
- USDA Cooperating and SDSU, South Dakota countries. Coping with high priced corn. www.agbiopubs.sdstate.edu/ExEx2060.pdf.2007.
- Molenaar R, Reijrink IAM,Meijerhof R, Van den Brand H.Meeting embryonic requirements of broilers throughout incubation: A review. *Brazilian Journal of Poultry Science*.2010. 12:137-148.
- Wilson HR. Effects of maternal nutrition on hatchability. *Poultry Science*.1997. 76:134-143.

Citation: Djang-Fordjour, H.,Hamidu, J.A., Adomako, K, "Assessing Incubation and Performance Defficiencies to Boast Broiler Production". *American Research Journal of Agriculture*, Volume 3, 2017; pp:1-6

Copyright © 2017 Djang-Fordjour, H.,Hamidu, J.A., Adomako, K, This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.