

Effect of the Management of Mortality (Chicken Death) Risk on the Production of Commercial Broiler Farms in the City of Douala, Cameroon

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Abstract

This research sought to assess the effect of the risk of chicken death on the production of commercial broiler farms in Douala, the economic capital of the Republic of Cameroon. More specifically this work aimed to assess the effect of (the risk of disease outbreak, the risk of heat or thermal stress and the risk of technical errors) on the production of commercial broiler farms in Douala and to make some suggestions to stakeholders of the poultry industry on how to monitor and control this risk. A sample of 254 poultry farm managers and their assistants in the city of Douala were selected using the purposive sampling technique to take part in this study. Primary data was gotten through the use of a structured questionnaire, interviews and non-participant observations, while secondary data was gotten through magazines, newspapers, published articles and official reports. Statistical Package for Social Sciences (IBM SPSS 20) was used to run the major statistics from the data collected. The coefficient of multiple determinations (R²) was used to assess the relationships between risks management and broiler production. The results of this study revealed that, there is a negative effect of (the risk of disease outbreak, the risk of heat or thermal stress and the risk of technical errors) on the production of commercial broiler farms in Douala. The study therefore recommended among others to the farmers that, they should make sure that strict hygienic conditions and biosecurity rules are implemented in the farm in order to avoid disease occurrence and spread and to equally follow the instructions of the animal health professionals concerning vaccination, preventive treatments and density of birds per meter square.

Keywords: Risk of mortality • Risk of disease outbreak • Risk of heat or thermal stress • Risk of technical errors • Production of commercial broiler farms

Introduction

Empirical data of poultry production reveals that the first evidence of poultry farming was in the year 1800 in the United States of America (USA). During the period ranging from 1800 to 1900 poultry production was done in small quantities by individual households. At that time it was essentially backyard farming, and the meat obtained was used for family consumption and any surplus was sold to the neighbors. The years 1920 to 1930 saw the beginning of broiler production which is a type of chicken specialized for meat production only [1]. This evolution was spurred by an increase in the demand for meat birds [1]. Farmers began to notice that, some birds were better suited for laying eggs while others were better producers of meat. They began to raise single purpose chickens used for one reason either egg or meat production, as opposed to dual purpose chickens that were used for both egg and meat production, but just average in performance [1]. In the 1940s, the poultry industry began to modernize with the beginning of processed chicken [1]. Producers began to sell their birds already processed that is killed and cleaned. There was a separation among stakeholders involved in the production stages that is hatcheries, feed-mills, farms and processing units that were built in different locations. 1950 to 1960 saw the development of a real commercial broiler industry with vertical integration at every stage of production, processing and marketing. This integration had the advantage of more efficiency, responsiveness and profitability. Then came the 1970 to present date era that is characterized by the following developments: Research in animal nutrition with nutritional discoveries, disease eradication programs, genetic improvements, and new technologies. A major contributor during this era is the mechanization of processing and the introduction of

automation technologies [1].

Despite these great improvements, over the last centuries, the poultry industry worldwide is still faced with a number of difficulties. According to Yegani [2] despite substantial qualitative and quantitative progress in different sectors of the poultry industry, the industry still continues to face numerous challenges on a global basis. Some of these major challenges include: Feed cost, Disease outbreaks, Issues about the inclusion of antibiotics in poultry feed and also the use of alternatives to antibiotic growth promoters, The Safety of poultry products for human consumption, Poultry welfare-related issues, Nutrition-related environmental issues, Issues related to water in terms of both quality and quantity.

These challenges are important factors that can hamper efficient and effective poultry production. In other words, the occurrence or absence of these challenges/risks can have an effect on the performance of the poultry industry.

Globally, the study of risk management began after World War II. Risk management has for ages been limited to the use of market insurance to protect individuals and companies from various losses related to accidents. International risk control began in the 1990s, and financial organizations developed internal risk management models and capital calculation formulas to hedge against unanticipated risks and reduce regulatory capital [3]. Risk and uncertainty have always existed in all business ventures. However, with the globalization of businesses, risk is now playing a preponderant role in the performance of organizations [4]. Jurgen and DeVreede [5] state that risk management is a powerful tool that supports management in making major business decisions. Risk Management helps to prevent business failures, rework and overkill, but more importantly, it stimulates win-win situations.

Risk management practices (RMP) are often considered as appropriate tools to cope against these uncertainties, but their adoption can also absorb resources meant for the production activity, resulting in a controversial impact on the overall farm productivity [6].

Therefore, in this global context, a wrong decision can have a huge economic, financial and social impact on the activities of an organization. As

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a consequence, risk management is now standing out clearly as an aspect to consider in the daily life of a company, and the poultry sector is not exempted from this trend.

Poultry production in Cameroon unlike in the United States, for example, is still a relatively young industry. However, there are a few similarities in the evolution of the industry. At its beginning, it was traditional with very little inputs and the birds used were exclusively less productive breeds. Over the years, the situation has changed with the introduction of improved breeds of chicken that have higher performances, the modernization of rearing techniques and the birth of new stakeholders. In the last decade, a truly commercial poultry industry has evolved characterized by a clear organization of the stakeholders into separate aspects of the sector [7]. These improved organization of the sector, as well as the ban of importation of frozen chicken in 2006, has led to rapid growth of the industry [8]. The increase in production has led to the exportation of poultry products especially eggs to other countries in the Central African sub region and in Africa as a whole [8]. Experts state that about 80% of the products of the poultry sector in Cameroon is exported and consumed out of the country. Nowadays, the poultry sector is organized into hatchers, farmers, feed producers and equipment providers, veterinarians, chicken and egg distributors. Three types of breeds are used by the poultry industry notably the white table birds, the brown egg-laying breeds and the "local birds". Production is mostly done on the floor as compared to cages elsewhere [9]. Poultry houses or farms are usually built with a mixture of material such as cement blocks and plank [9]. It is also possible to see houses that are built with bamboos. Poultry production in Cameroon is in the hands of small producers that constitute the majority with a few big producers who lead the market. The poultry industry is polarized.

Also, the Government has shown a lot of interest to this sector and has taken important measures to boost its development. In 2013, a subvention of 600 million F CFA was injected into the sector through the support of day-old chick producers. Corn which is the main ingredient in chicken feed because it makes up 80% of it has been imported and distributed at very low rates to farmers in an attempt to bring down the cost of production. The Government has suspended the importation of chicken since 2006 so as to avoid competition in the local market with heavily subsidized chicken from Europe. In 2014, in order to improve the organization of the sector and bring in new investors the Government organized the first International poultry forum (SAVI) in Yaounde. The second edition was held from the 24th to the 28th October 2016 and the third edition from the 3rd to the 5th of May 2018.

Today, poultry products represent 14% of all animal protein sources to Cameroonians [7]. In 2015, the poultry sector contributed about 5% to the Gross Domestic Product (GDP) of Cameroon [10]. The poultry industry plays a very important role in the development of the country, and the Government considers that Poultry farming is a secure employment sector for the youth of the country [7]. Private investments are encouraged. Reports from, The "Interprofession Avicole du Cameroun" (IPAVIC), show that, as of 2013, there were 9,000 poultry farms and the poultry sector alone created about 320,000 jobs. The production figures stood at 46.43 million broilers per year or 69,650 tons of poultry meat and 119,340 tons of table eggs. A close look at these statistics reveals that each Cameroonian in an estimated population of 20 million from the last census of 2005 consumes 3.48 kilograms of chicken per year. The Food and Agricultural Organization (FAO) reports state that in 2009, poultry consumption stood at less than 10 kg per person in Africa and around 50 kg per person in the United States. The average world consumption was 13.6 kg per person. A close look at these figures shows that there is a huge gap in terms of consumption per person that has to be filled through national production. Indeed, the poultry industry has a lot of factors that are favorable to it. Notably suitable temperature appropriate for poultry farming, the possibility of importing inputs that are not available locally without customs duties and taxes and a huge sub regional market [8]. Unfortunately, this potential is still not exploited fully because of a number of setbacks.

The advent of the COVID-19 has affected the local production of broilers. Though it is essential to note there is no scientific evidence so far that

suggests that chickens are susceptible to intranasal infection by the SARS-CoV-2 (COVID-19) virus, the COVID-19 pandemic is affecting poultry industry notably disrupting the supply chains, consumption, transport, and the economics of commercial poultry enterprises. It is also taking into consideration economic, ethical, social dimensions, and the sustenance of the accomplishment of high environmental security. The production of poultry farms is also negatively affected by the risk of an increase in treatment cost [11].

According to the Government, Cameroon hopes to reach a chicken consumption rate per inhabitant of 12kg per person per year by 2035 [12]. To achieve this objective, experts are of the opinion that, the poultry industry must experience continuous and steady growth for several years. Unfortunately, the industry is plagued by several setbacks that hamper investment, production, marketing and consequently the growth of the sector. Some of these issues are the lack of financial resources, lack of quality inputs, lack of trained professionals in quantity and quality, disorganized markets, frequent disease outbreaks, etc. For instance, Cameroon has experienced two outbreaks of bird flu, a serious poultry disease that has huge sanitary and economic impact, over the last twelve years. The first outbreak was in 2006 and the most recent in 2016. The recent episode lasted for more than one year and had a huge impact on the poultry industry. Experts in the poultry sector declare that the recent bird flu outbreak caused an estimated loss of 66 billion francs CFA to the industry. At the same time, its contribution to the GDP slowed down to 1% [13].

Apart from the less frequent events with a national impact that seem to occur every ten years or so, more troubling to the sustainable growth of the poultry industry in the littoral region and the city of Douala, in particular, are the daily difficulties concerning access to capital, improving production, transformation and marketing. For example, as far as production is concerned, the mastery of some production parameters like mortality (chicken death), weight gain and treatment costs are important day-to-day factors that can inform decisions that farmers have to take. Suppliers of day-old chicks, an important input in production, state that the normal death rate by the end of the production cycle (a production cycle lasts 45days) should be less than 5%. However, the figures coming from the field seem to evaluate mortality per production cycle at between 15 to 20% averagely. Therefore, this study is carried out to determine the effect of the management of chicken death on the production of commercial broiler farming in the city of Douala.

Research Objectives

Table 1. Servant Leadership Dimensions Predicting Integrating.

Predictor Variables	B	SE	B	t	Sig.
1. Emotional healing	.240	.033	.437	7.317	.000

Note: Model 1, F (1,227) = 53.539; (EV) represents variables excluded from the model; $p < .05$

Table 2. Servant Leadership Dimensions Predicting Compromising.

Predictor Variables	B	SE	B	t	Sig.
1. Emotional healing	.128	.033	.390	3.824	.000
2. Putting Subordinates First	-.072	.036	-.206	-2.024	.044

Note: Model 2, F (2,225) = 8.433; (EV) represents variables excluded from the model; $p < .05$

Table 3. Servant Leadership Dimensions Predicting Avoiding.

Predictor Variables	B	SE	B	t	Sig.
1. Helping subordinates grow and Develop	-.202	.043	-.301	-4.739	.000

Note: Model 1, F (1,226) = 22.461; (EV) represents variables excluded from the model; $p < .05$

The main purpose of this research is to assess the effect of the management of the risk of chicken death (mortality) on the production of commercial broiler farms in Douala

More specifically this work aims to:

- Assess the effect of the management of the risk of disease outbreak on the production of commercial broiler farms in Douala ;
- Assess the effect of the management of the risk of heat or thermal stress on the production of commercial broiler farms on Douala ;
- Assess the effect of the management of the risk of technical errors on the production of commercial broiler farms in Douala.

Research Questions

This work has as key research question: what is the effect of the management of the risk of chicken death(mortality) on the production of commercial broiler farms in Douala, Cameroon?

More specifically, it will address the following issues:

- I. What is the effect of the management of the risk of diseases outbreak on the production of commercial broiler farms in Douala?
- II. What is the effect of the management of the risk of heat or thermal stress on the production of commercial broiler farms in Douala?
- III. What is the effect of the management of the risk of technical errors on the production of commercial broiler farms in Douala?

Methodology

The research adopted the survey research design. A sample of 254 broiler farms managers and assistants were selected. The primary data collection instruments were a questionnaire, an interview guide and an observation guide. The well-structured questionnaire was addressed to the poultry farm managers and their assistants. Data was also collected from some animal health and production experts using the interview and observation guides. The research instruments were validated and their reliability ensured using cronbach alpha reliability coefficient. The Data gathered was analyzed using the statistical package for the Social sciences (SPSS) version 20 and Microsoft excel 2013. Pearson moment product correlation was run on Anova to show the effect of the independent variables on the production of commercial broiler farms in Douala.

Findings

Research Question 1: What is the effect of the management of the risk of disease outbreak on the production of commercial broiler farms in Douala?

Hypothesis one: There is no significant relationship between risk of disease outbreak and the production of commercial broiler farms in Douala. The independent variable in this hypothesis is risk of disease outbreak and the dependent variable is the production of commercial broiler farms in Douala. Pearson product moment correlation coefficient statistical technique was used to test this hypothesis. The result is presented in Table 1.

Table 1. Pearson product moment correlation coefficient statistical analysis of the relationship between the risk of disease outbreak and production of commercial broiler farms in Douala.

Variables	$\sum x$	$\sum x^2$		
	$\sum y$	$\sum y^2$	$\sum xy$	rx_y
Risk of disease outbreak	1817	26841	31639	-0.32
Production of commercial broiler farms	2237	40939		

* $p < 0.05$, d.f =125, critical $r = .196$

The result in Table 1 revealed that the calculated r-value of .32 was found to be greater than the critical r-value of .196 needed for significance at 0.05 level of significant with 125 degree of freedom. With this result, the null hypothesis is rejected in favour of the alternate hypothesis. The negative r-value obtained here revealed that there exist an inverse relationship between the risk of disease outbreak and the production of commercial broiler farms in Douala. This means that as the risk of disease outbreak increase the production of commercial broiler farms deceases and vice versa.

Research Question 2: What is the effect of the management of the risk of heat or thermal stress on the production of commercial broiler farms in Douala?

Hypothesis two: There is no significant relationship between risk of heat stress and the production of commercial broiler farms in Douala. The independent variable in this hypothesis is risk of heat or thermal stress and the dependent variable is the production of commercial broiler farms in Douala. Pearson product moment correlation coefficient statistical technique was used to test this hypothesis. The result is presented in Table 2.

The result in Table 2 revealed that the calculated r-value of .45 was found to be greater than the critical r-value of .196 needed for significance at 0.05 level of significant with 125 degree of freedom. With this result, the null hypothesis is rejected in favour of the alternate hypothesis. The negative r-value obtained here revealed that there exist an inverse relationship between the risk of heat stress and the production of commercial broiler farms in Douala. This means that when the risk of heat stress increase the production of commercial broiler farms deceases and when the risk of heat or thermal stress decreases the production of commercial broiler farms increases.

Research Question 3: What is the effect of the management of the risk of technical errors on the production of commercial broiler farms in Douala?

Hypothesis three: There is no significant relationship between risk of technical errors and the production of commercial broiler farms in Douala. The independent variable in this hypothesis is risk of technical errors and the dependent variable is the production of commercial broiler farms in Douala. Pearson product moment correlation coefficient statistical technique was used to test this hypothesis. The result is presented in Table 3.

The result in Table 3 revealed that the calculated r-value of .36 was found to be greater than the critical r-value of .196 needed for significance at 0.05 level of significant with 125 degree of freedom. With this result, the null hypothesis is rejected in favour of the alternate hypothesis. The negative r-value obtained here revealed that there exist an inverse relationship between the risk of technical error and the production of commercial broiler farms in Douala. This means that when the risk of technical errors increase

Table 2. Pearson product moment correlation coefficient statistical analysis of the relationship between the risk of heat or thermal stress and production of commercial broiler farms in Douala.

Variables	$\sum x$	$\sum x^2$		
	$\sum y$	$\sum y^2$	$\sum xy$	rx_y
Risk of disease outbreak	1547	20253	26594	-0.45
Production of commercial broiler farms	2237	40939		

* $p < 0.05$, d.f =125, critical $r = .196$

Table 3. Pearson product moment correlation coefficient statistical analysis of the relationship between the risk of technical errors and production of commercial broiler farms in Douala.

Variables	$\sum x$	$\sum x^2$		
	$\sum y$	$\sum y^2$	$\sum xy$	rx_y
Risk of disease outbreak	1562	20452	27020	-0.36
Production of commercial broiler farms	2237	40939		

* $p < 0.05$, d.f =125, critical $r = .196$

Table 4. Regression result of the effect of risk of mortality on the production of commercial broiler farms in Douala.

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.241	1.885		2.781	.006
	RDO	-.222	-.048	.186	-4.597	.000
	RHS	-.244	-.050	.214	-4.934	.000
	RTE	-.250	-.028	.437	-9.027	.000

Source: Field survey, 2021

a. Dependent Variable: production of commercial broilers

R = .74

R² = .62

Adj. R2 = .58

F-value = 82.7

DW-statistics = 1.65

the production of commercial broiler farms decreases and when the risk of technical error decreases the production of commercial broiler farms increases.

Hypothesis four: There is no significant effect of the risk of mortality on the production of commercial broiler farms in Douala. Multiple regression statistical technique was used to test this hypothesis. This hypothesis has to do with the main research objective and the result is presented in Table 4.

The overall fitness of the model as measured by both R and R square is good. R has a value of .0.74 elucidating the well representation, Similar, the value of R² is 62, this shows that three independent variables can explain the variation in the production of commercial broilers farms in Douala. In other words, in the attempt to explain the variation in the production of commercial broilers farms in Douala, we can look at the variation in the risk of disease outbreak (RDO), risk of heat stress (RHS) and risk of technical error (RTE). This can provide 62% of the response but the rest requires looking into other factors as 38 % of the variation in the production of commercial broiler farms in Douala cannot be explained by the identified risk elements.

The prediction capacity of the model is also in good front as witnessed by the F-ratio and the associated significance value of that F-ratio. The utilized data with, F=82.7, is significant at p < .001. Therefore, there appears a less than a 0.1% chance that an F-ratio this large would happen if the null hypothesis were true. Therefore, we can conclude that our regression model results in significantly better prediction of the production of commercial broiler farms in Douala.

Risk of Disease Outbreak (RDO):- the risk of disease outbreak remains a significant factor affecting the production of commercial broiler farms in Douala. This can be shown with a negative B value of relatively large and a significance level of less than 0.05. The negative B value found in this equation indicates that there exist an inverse relationship between the risk of disease outbreak (RDO) and the production of commercial broiler farms in Douala. In other words when the risk of disease outbreak increases the production of commercial broiler farms decreases and vice versa. This result is in line with economic a priori expectation and significant at 1% level of significance.

Risk of heat or thermal stress (RHS) the risk of heat or thermal stress is found to have a statistically negative and significant relationship with the production of commercial broiler farms in Douala. This implies that as the risk of heat stress increases the production of commercial broiler farm decreases and when the risk of heat or thermal stress decreases the production of commercial broiler farms will increase. This result is significant at 1% level of significant and in line with a priori expectation.

Risk of technical error (RTE):- the risk of technical error also established a negative and significant relationship with the production of commercial broiler

farms in Douala. This shows that when the risk of technical error increases, the production of commercial broiler farms will reduce and when the risk of technical error increases the production of commercial broiler farms in Douala will increase. This result is significant at 1% level of significant and in line with economic theories.

Discussion of Findings

From objective one finding, it appeared that, as the risk of disease outbreak increase the production of commercial broiler farms decreases and vice versa. These findings are corroborating the findings of Delabougli et al. [14] who investigated on « Poultry farmer response to disease outbreaks in smallholder farming systems in southern Vietnam » and found that, in small broiler flocks (≤16 birds/flock) the estimated probability of harvest was 56% higher when an outbreak occurred, and 214% higher if an outbreak with sudden deaths occurred in the same month.

From objective two findings, it appeared that heat or thermal stress is negatively affecting the production of commercial broiler farms in Douala. These findings are in line with the findings of Lara and Rostagno [15] who have investigated the detrimental effects of heat stress on poultry production in their paper entitled « Impact of Heat Stress on Poultry Production » and they found that, heat stress negatively affects the welfare and productivity of broilers and laying hens.

Another study conducted by Nyoni, Grab & Archer [16] on « Heat stress and chickens: climate risk effects on rural poultry farming in low-income countries » is corroborating these findings, while indicating that, it appears that some losses experienced in rural poultry farming may be a direct or indirect consequence of climate-related stresses.

From Objective three findings, it appeared that technical errors are negatively affecting the production of commercial broiler farms in Douala. These findings are in accordance with the findings of Mendes who in the study; « Factors that impact the financial performance of broiler production in southern states of Paraná, Brazil » found that, technical service have a significant impact on the performance of broiler production in southern states of Paraná, Brazil.

Conclusion

From the result of the research, the researchers can say that the risk of chicken death (mortality) exerts a negative effect on the production of commercial broilers in Douala. In other words, poor management of chicken death rate affects production negatively. Therefore, its causes should be identified, constantly monitored and controlled in commercial poultry projects. The objectives of the research were achieved because the results showed that improving the management of risk related to chicken death can improve the performance of commercial broiler farms. Overall, there is a significant relationship between chicken death management practices and production in poultry farms in Douala.

Recommendations

Due to the challenges faced by the commercial broiler farmers in Douala and the impact of these constraints on the attainment of their production objectives on the one hand and the sustainability of their enterprises on the other, we suggest the following recommendations.

To Policy Makers

It is recommended that the Government should write a policy on issues concerning the quality of day-old-chicks that are acceptable in the market. These standards should be enforced by regular control of hatcheries to make sure the regulations are respected.

It is recommended that the Government should organize training and capacity building sessions for new and old poultry farmers and other stakeholders of the poultry industry.

To Poultry Farmers' Association

It is recommended that the poultry farmers' association executive should seek for partnerships with other poultry organizations that can assist its members in improving and modernizing their production methods and tools.

It is recommended that they should assist their members in obtaining funding from financial organizations like banks and micro financial institutions by helping them in writing bankable business plans for example.

To The Commercial Poultry Farmers In Douala

It is recommended that the farmers should ensure that the heating process of chicks during brooding is properly done by training the farm workers;

It is recommended that the farmers should make sure that strict hygienic conditions and biosecurity rules are implemented in the farm in order to avoid disease occurrence and spread;

It is recommended that the farmers should follow the instructions of the animal health professional concerning vaccination, preventive treatments and density of birds per meter square.

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