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The Impact of Avian Influenza Outbreaks on the Poultry Industry in the Bono East Region of Ghana

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ABSTRACT

A study was conducted to determine the effect of the outbreaks of Avian Influenza on the current status of the poultry industry in the Bono East region of Ghana. The study employed both quantitative and qualitative methods using primary data gathered from the use of a questionnaire, from 37 poultry farmers in six districts of the Bono East region namely; Atebubu-Amantin (4), Kintampo North (4), Nkoranza North (1), Techiman South (24), Techiman North (3) and Sene East (1). To establish some sort of priority among the impacts of the outbreak on the poultry industry in the study area, the impacts were ranked in order of importance, using an Excel spreadsheet. The results revealed that the majority of the farmers (73%) have birds less than 10,000, thus into small-scale production whilst 21.6 % and 5.4 % are into medium and large scales respectively. Also, 60% of the farmers are very well conversant with the Avian Influenza disease, whilst 40% have little knowledge of the disease. The result further reveals that 11.1 % of farmers recorded outbreaks of the disease between July 2021 and May 2022, whilst 12.5 % of the respondents had their birds destroyed as a result of the outbreak. The study concludes that, the current outbreak of Avian Influenza had a negative impact on the poultry industry in the study area. By way of recommendation, we suggest a continuous education of farmers on the recognition of the disease, and an active surveillance by officials of the Veterinary Services Directorate.

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INTRODUCTION

Ghana has abundant viable land and a reasonably educated population that can support different types of agriculture including crop and animal production. Agriculture was the mainstay of Ghana's economy with cocoa as the dominant

foreign exchange earner**,** however, its contribution to GDP has reduced, falling behind the industrial and services sectors (Haligah, 2017).

Animal production which includes the rearing of poultry, plays a major role in the livelihoods of rural and poor households (FAO, 2002). According to the Ghana Statistical Service (2020), the country's livestock population is pegged at 17,709,547. Weeks and Nicol (2006) noted that chicken meat and eggs are very good sources of quality protein, and are very essential for the many millions of people living in third-world countries.

Poultry farming involves the husbandry and practice of raising domesticated birds including chickens, ducks, turkeys and geese to produce meat or eggs for food and other products (Appleby *et al*., 1992). Chickens raised for eggs are known as layers, whilst those raised for meat are called broilers. The demand for poultry products exceeds the supply with local production falling below 10% of total demand, even though local producers continue to struggle for survival (Adjei-Henaku, 2016). Other products aside from the meat and eggs produced by poultry are feathers, manure and blood meal making the venture a good one if well planned. The poultry sector in Ghana is said to have gone through a series of transitions from the 1970s and 1980s which was considered a golden age when investments were being made, with commercial producers nearly achieving the country self-sufficiency status in chicken, meat and eggs (Sumberg et al., 2013). However, the poultry industry in recent times is bedeviled with a range of challenges threatening the survival of the sector.

A major constraint to the poultry industry in Ghana is a disease, which includes parasitic, bacterial, fungal and viral diseases. Among these diseases of poultry is the Avian influenza also known as bird flu. It is a highly contagious viral disease affecting several species of birds including chickens, turkeys, quails, guinea fowl, etc., as well as pet and wild birds and occasionally mammals, including humans, (World Organization for Animal Health, 2021).

Avian influenza is an emerging disease that has threatened the already fragile poultry industry in Ghana in the last few years. The disease presents some semblance with other diseases such as Newcastle disease, Chronic respiratory disease (CRD) among others, requiring very technical expertise and robust laboratory techniques to diagnose. In furtherance of this, some knowledge of the disease including its clinical presentation, forms of the disease, and epidemiology is required to enable farmers and other stakeholders to report cases to appropriate authorities. However, there is still a gap of knowledge on the above factors in respect of the disease. Also, specific government support and policy are needed to strengthen the poultry industry, however, the needed data on the impact of the disease in order to justify such intervention is unavailable.

Therefore, this study aimed to determine the impact of avian influenza outbreaks on the poultry industry in the Bono East Region of Ghana.

Empirical Review

The disease is caused by avian influenza virus strains of the sub-types H5 or H7 with the viruses arising spontaneously from apathogenic progenitors by insertional mutation in the HA gene (Werner, 2006). The virus is a single-stranded RNA virus belonging to the Orthomyxoviridae family, and is classified as influenza types A, B and C (Ministry of Health, 2016). The virus is further divided into 16 hemagglutinin (H1-16) and 9 neuraminidases (N1-9) subtypes (Swayne, 2022).

Influenza virus A are also classified into low pathogenic (LPAI) and high pathogenic (HPAI) viruses based on their genetics and pathogenic characteristics, however, the low pathogenic virus can evolve into a high pathogenic virus (Mittal et al., 2007). Highly pathogenic avian influenza is a severe form of generalized infection that is noted for its rapid and severe course, with very high mortality and affecting all poultry species, especially turkeys and chickens (Werner et al., 2006). Influenza proteins can evade immune recognition while maintaining their ability to function and interact with host cellular factors (Taubenberger et al., 2010). A notable feature of the influenza A virus is its ability to change genetically, by two main processes: antigenic drift and antigenic shift (Shao et al., 2017).

Direct contact with infected and dead birds appears to be the most reported means of transmission to humans (Zhou et al., 2009). Besides the public health challenge posed by avian influenza, the disease comes with serious socio-economic effects on affected countries during outbreaks (Breiman et al., 2007).

The incubation period of the disease varies from a few days in individual birds to about 14 days in a flock (Swayne, 2022), with the high pathogenic strains taking a very short and severe course. This form of the disease usually presents suddenly, leading to high mortality, rendering infected birds with swollen heads, purple coloration of the comb and wattles, restlessness, anorexia, respiratory distress, and diarrhoea (Animal Health and Welfare of the Scottish Government, 2021). At this stage, there may be a marked reduction in egg production in laying birds. Other signs of the disease include tremors, twisted necks, paralyzed wings, laying down and pedaling (University of Minnesota Extention, 2023).

Avian influenza (AI) was first described in 1878 in northern Italy when Perroncito described a contagious disease of poultry accompanied by high mortality as fowl plague (Lupiani et al., 2009). The spread of the avian influenza virus in recent years began in eastern and south-eastern Asia from 2003 to 2004 (Gilbert et al., 2006). Between 2005 and 2006, the HPAI crossed Asia into Europe, the Middle East and

Africa (Gilbert et al., 2006). However, the first report of the disease in Africa was in Nigeria in 2006 (Adene et al., 2005).

These outbreaks cumulatively from 2003 to date are accompanied by over 120 confirmed human cases, of which more than half have died, with the majority of the cases occurring in previously healthy children and young adults (Musa et al., 2009). With an increased understanding of the epidemiology of the disease, chicken raised under extensive conditions are noted to pose less of a threat than intensively raised poultry of homogeneous genetic stock with poor biosecurity (Alders et al., 2014).

MATERIALS and METHODS

Study Area

The study was conducted in the Bono-East Region of Ghana. The Bono East Region covers a total land area of 39,557km^2 and is bordered on the north by Savanna Region, west by Bono Region, on the south by the Ashanti Region and on the east by the Volta Lake, and has a population size of about One million people.

Research Design

A descriptive research design was used, and this involved the collection of data, in order to make meaning out of it. Descriptive research design aims predominantly at observing, describing, and documenting aspects of a situation as it naturally occurs rather than explaining them (Darko et al., 2016). Both assigned and random selection were used to select the respondents.

Instrumentation

Questionnaires were used as the instrument for the collection of data in this study. The questionnaire consisted of five parts, including the respondent's profile, business operations, farmer's knowledge of the avian influenza disease, the current overview of the poultry industry and the measures taken by the government in the wake of the avian influenza outbreak in the country.

Data Collection

A total of 37 poultry farmers from six districts in the Bono East region responded to the questionnaire which was administered between the period of July 2021 and May 2022. The districts are as follows: Atebubu-Amantin (4), Kintampo North (4), Nkoranza North (1), Techiman Municipality (24), Techiman North (3) and Sene East (1). Even though over 60 farmers were targeted to participate in this study, the rate of response was rather low, giving rise to the number above. Also, Techiman municipality is one of the known poultry hubs in the former Brong-Ahafo region hence the larger number of respondents from there (Table 1).

Table 1. Location of farms

District	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Atebubu	4	10.8	10.8	10.8
Kintampo North	4	10.8	10.8	21.6
Nkoranza North	1	2.7	2.7	24.3
Techiman South	24	64.9	64.9	89.2
Techiman North	3	8.1	8.1	97.3
Sene East	1	2.7	2.7	100.0
Total	37	100.0	100.0	

Data Analysis

The data gathered from the questionnaires were coded into a form that could be understood by Microsoft Excel software. The coded data were then analyzed using descriptive statistics in Statistical Package for Social Science (SPSS) version 26. The statistical tool grouped the data into frequencies and percentages and presented in tables in accordance with the variables used in the study, for easy interpretation.

RESULTS

The data was obtained from thirty-seven (37) commercial poultry farmers/farms in six districts of the Bono East region, as shown in Table 1. The results of the descriptive statistics are presented in the following subsections:

Demographics

Out of the total of 37 respondents, 5 were females representing 13.5% whilst 32 representing 86.5% were males. This is far less than what was reported by Adams et al. (2022). Commercial poultry production requires some capital investment including land and other capital resources which often may not be readily available to women due to some socio-cultural practices.

Respondents aged between 51 and 60 years constituted 43.3% of the total 37, whilst 23.30% were between 31 and 40 years. The age groups of 20 – 30, and 41 – 50, represented 13.3% each, whereas respondents above 60 years represented 6.7% of the total respondents (Table 2). The data suggests that the youth are not involved in the business as much, either due to a lack of interest or a lack of the needed capital required to invest in it. The results further suggest that people in the pension bracket may not want to take the risk of going into the business due to the high risk associated with it.

On the number of years spent in the poultry business, 50% of respondents had been in the trade for between 6 and 10 years, whereas those from 1 – 5 years, and above 15

years, accounted for 20% each, with those from 11 - 15 years, accounting for 10%. These statistics affirm those of the age group distribution of respondents, suggesting that as farmers age in the business, they tend to fold up. The statistic also reveals that the majority of the farmers have been in the poultry industry for well over 5 years, suggesting they may have very useful experiences in managing their farms.

The study also revealed that 73% of the respondents had a flock of less than 10, 000 chickens, whilst 21.6% had chickens ranging between 10,000 and 50,000, with, 5.4% of the respondents having a stock of over 50,000 chickens. According to Boschloo (2020), the production of poultry in commercial quantities can be grouped into large-scale (over 50,000 birds), medium-scale (10,000 – 50,000 birds) and small-scale (less than 10,000 birds) enterprises. Thus, commercial poultry production in the study area can be described as largely small-scale. Achieving a medium or large-scale status of poultry production in Ghana requires serious investments and risks, which probably is a barrier for expansion by most of the farmers.

The study also reveals that 67.6% of respondents employ the services of workers on their farms, whereas, 32.4% operate solely by themselves. This contributes to the employment creation drive of the economy and is an indication that, with some support from duty-bearers and a concerted effort by stakeholders, the sector can employ more people.

Of the 37 farms covered in this study, 62.1% have on-farm accommodation for farmhands, whereas, 37.9% rely on off-farm accommodation. Even though farmers in Ghana set and operate their own biosecurity standards based on their experiences as cited by Ayim-Akonor et al. (2020), housing farm hands on the farm could be a strategic biosecurity measure as it can help minimize the risk of disease importation.

Furthermore, of the total respondents, 63.3% have other businesses/sources of income, thus depending partially on the poultry business, whereas, 36.7% rely solely on the poultry business. This justifies the number of respondents who employ the services of workers, as they may require helping hands to shuffle between their poultry and other businesses. Poultry farming is a major source of complementary income for farmers because of its quick returns, minimum space and investment requirement, as well as easily practiced by ordinary farmers as cited by Anang et al. (2013). Therefore, the role of poultry production in rural livelihoods, food security, poverty reduction, as well as a supply of protein requirements is enormous (Yevu and Onumah, 2021).

Table 2. Demographics of respondents

Variable	Respondent/Affected	Percentage %
Age groups	20 – 30	13.3
	31 – 40	23.3
	41 – 50	13.3
	51 – 60	43.3
	61 and above	6.7
Sex	Females	13.5
	Males	86.5
Number of years of poultry production	1 – 5 years	20
	6 – 10 years	50
	11 – 15 years	10
	>15 years	20
Level of production	< 10, 000 (small scale)	73
	10, 000 – 50, 000 (medium scale)	21.6
	> 50, 000 (large scale)	5.4
Farm operation	Sole management	32.4
	Uses the services of employees	67.6
	On-farm	62.1
Workers' residence	Out of farm	37.9
Level of dependency on poultry production	Partially	63.3
	Entirely	36.7

Level of Awareness on Avian İnfluenza

From the study, about 60% of the respondents are very well conversant with the avian influenza disease, whilst 40% are somehow aware of the disease (Table 3). The level of awareness of the disease in this study is close to the finding of Asare et al. (2021) who reported 69%. This suggests, that the majority of the farmers may be able to recognize the occurrence of the disease based on signs and symptoms. Awareness of disease contributes to the formulation of efficient measures for its reduction/control (Funk et al., 2009). Even though Ayim-Akonor et al. (2020) observed that veterinary knowledge and its associated predictive factors did not necessarily influence farmers' preventive practices on the farm.

The study further revealed that 11.1 % of the 37 farms covered under the current study, recorded outbreaks of avian influenza. One may argue that the outbreak may not have affected many farms due to the awareness of the farmers, and the preparedness of veterinary authorities in the affected area. On the other hand, suffice it to say that, with better biosecurity measures and awareness, the affected farms may not have recorded the outbreaks at all. Tasiame et al. (2020) explain that, a lack of knowledge of avian influenza among farmers, accounted for the delays in

reporting the disease to the appropriate authorities for confirmation and effective control measures.

Table 3. Level of awareness and Perception of Severity of Avian Influenza

Variable	Respondents	Percentage %
Level of awareness on AI	Somehow	40
	Very well	60
Perception about the severity of Avian influenza	Extremely fatal	75.7
	Fatal	21.6
	Not fatal	2.7

Operations/Activities Affected Most by AI Outbreak

From the results of this study, the most affected farm operation/activity by the avian influenza outbreaks was marketing, according to 55.6% of the respondents, followed by production and transportation of inputs and products both of which were confirmed each by 22.2% of respondents (Table 4). Avian influenza is a scheduled disease on the Ghana Veterinary Services and the World Organization for Animal Health (OIE) diseases list. The announcement of outbreaks of scheduled diseases is often accompanied by a ban on the movement of susceptible species, therefore affecting marketing. Even though sales of live birds and poultry products also do occur at the farm gate (Ayim-Akonor et al., 2020), media publication of outbreaks and zoonotic association of the disease scares people from patronizing poultry products during periods of outbreaks. Generally, once marketing declines, production activities and for that reason production declines.

Table 4. Incidence of Avian Influenza

Variable	**Respondents**	**Percentage %**
Outbreak of AI in the study area	Affected farms	**11.1**
	Non-affected farms	**88.9**
Operations/activities affected most by AI outbreak	Production	22.2
	Marketing	55.6
	Transportation of inputs and products	22.2
Stamping out program	Affected farms	12.5
	Non-affected farms	87.5
Input supply in the period of AI outbreak	Partially declined	72.4
	No change	24.1
	Drastically declined	3.4
Economic impact of AI on farm business	Negative	61.3
	Indifferent	38.7

Stamping out Program

The government of Ghana's avian influenza control strategy is the stamping out approach. This is seen in the current study, as the program was implemented in 12.5 % of farms which either directly recorded outbreaks, or had some form of contact with infected farms. The stamping-out approach involves the destruction of poultry and poultry products directly or indirectly in contact with infected birds, products, inputs and other inanimate objects. In 2015, the outbreak of avian influenza in Ghana was controlled by the destruction of 96, 784 birds (Tasiame et al., 2020). This approach despite the cost involved by way of compensation to the affected farmers, has proven to be effective.

Effect of Avian Influenza on the Input Supply

The supply of inputs and goods for poultry production during the AI outbreak period partially declined as confirmed by 72.4% of the respondents (Table 4). This could partly be attributed to the ban on the movement of birds, their products and related inputs in affected areas during outbreaks. Also, a decline in marketing and general production processes will affect demand in input supply.

Effect of the Avian İnfluenza Outbreak on Poultry Production (Qualitative Analysis)

From the current study, the following constraints of poultry production were revealed;

Economic Losses

From the data, 64% of the respondents aver of negative impact on their finances as a result of the outbreak of avian influenza. The outbreak of the avian influenza disease in the Bono east region has resulted in financial losses, resulting from the deaths of infected birds and also from measures fashioned to control the spread of the virus by farmers and the government through the use of medical resources, especially the destruction and disposal of bird flocks (Kumar et al, 2008). In addition to immediate losses from bird fatality, production in most farms as related by some poultry farmers in the study, was interrupted for a period of time and subsequent financial losses resulted from foregone poultry and egg sales.

Reduced Income

Generally, outbreaks of scheduled diseases of poultry and livestock are often associated with movement restrictions of the affected species and its products. This automatically reduces or restricts sales resulting in economic losses. Even though only about 11% of farms in the current study recorded the disease, the anxiety of the general public upon media reportage of the disease was enough to reduce sales from even unaffected farms. This has left some farmers in unstable and uneasy financial positions. This therefore has been deemed to have a negative and severe impact on

the livelihood of poultry farmers in the study area due to the reduction of income attributed to loss of produce, decreased production and low earnings.

Loss of Jobs

The current study also revealed a number of job losses due to the avian influenza outbreak. As a result of the closure of poultry farms, destruction of bird flocks to contain the spread of avian influenza in the study area, many people have lost their jobs as managers, attendants, stockmen and cleaners of poultry farms. This had an immediate impact on the livelihood and well-being of the affected farmers, workers and their dependents. Also, due to the disruptions in the farm income of some poultry farmers, they were pressured to cut down a large number of workers/laborers on the farm to a minimum number that they can cater for. The impact of these decisions made by the poultry farmers cannot be overlooked following the fact that a significant percentage of the farmers in the study area operate their farms with employees.

Distortion of Poultry Trade, Commerce and Industry (Decreased Production)

The Poultry industry has become one of the most important aspects of agriculture. Poultry production is an important and diverse component since eggs and meat are part of the health and diet of larger populations all over the world. But beyond this fact is a situation where the industry's performance comes to a steady halt. According to the World Organization for Animal Health (2021), Avian influenza outbreaks often occupy the attention of the international community due to their negative impact on livelihoods, global and local trade as well as their threat to public health. Following the outbreak in the study area, decreased production has led to the distortion of the production performance of the poultry industry. This outcome is a reflection of the fragile nature of the Ghanaian poultry industry as cited by Otte et al. (2009).

Increased Prices of Inputs

Poultry inputs are necessary demands that fuel the farm's functioning. They are called inputs because they literally cover what goes into the farm to make it work. Feed is the major component of input cost, accounting for up to 70% of the total production cost (Szollosi et al., 2014). The poultry industry in the Bono east region has been challenged with increased prices of inputs (feed, day-old chicks, drugs and medications) as a result of the consequences of the outbreak of the avian influenza disease in the region. Considering the necessity of these inputs in the functioning of any poultry farm, it can be concluded that increased prices of inputs were a hard blow to the poultry industry in the study area.

Inputs Unavailability

Not only was there an increase in the prices of inputs, but also the availability of the inputs was not regular at the peak of the outbreak. Inputs in the study area were not readily accessible because there was a ban on importation at the time in the country due to the Covid-19 pandemic. Farmers had to struggle to acquire inputs because they were too expensive to buy and they are not timely in supply. This has led to the worsening of production related constraints.

Ranking of the Impacts

The impact of the avian influenza outbreak on the poultry industry in the Bono East region was identified to include: economic losses, the reduced income of farmers, loss of jobs, distortion of trade, commerce and industry, increased prices of inputs and unavailability of inputs. These impacts were ranked using an Excel spreadsheet with the data from the questionnaire responses. The results of the data are shown in the Table 5.

The most pressing impact of the outbreak on the industry was reduced income for farmers and other stakeholders of the poultry industry leaving most farmers in unstable and uneasy financial positions.

The second most severe impact that the industry has faced was identified to be that of economic losses resulting from the deaths of infected birds and also from measures fashioned to control the spread.

The next impact was increased prices of inputs, followed by distortion of trade, commerce and industry, then loss of jobs and finally unavailability of inputs. It is important to note that, the impact of the outbreak of the disease in the study area is varied and distinct to individual farms.

Table 5. Rank of Impacts of Avian Influenza Outbreak on the Poultry Industry

Impact of Avian Influenza Outbreak	Rank	Total Percentage
Reduced Income	1st	93
Economic Losses	2nd	64
Increased Prices of Inputs	3rd	24
Distortion of Trade, Commerce and Industry (Decreased Production)	4th	21
Loss of Jobs	5th	17
Inputs Unavailability	6th	11

CONCLUSION and RECOMMENDATION

The study can conclude that a good number of farmers are very well conversant with the avian influenza disease, although a significant number of farmers especially those who have not experienced an outbreak, may still not be very well aware of the disease. The study can also indicate that even though the recent outbreaks of the disease in the study area affected only about 11% of farms (respondents), it resulted in very negative consequences for the industry. This is a blow to the already fragile poultry industry, and a threat to the livelihoods of many who depend directly or indirectly on the sector.

By way of recommendation, we suggest a continuous education of farmers on the recognition of the disease and active surveillance by officials of the Veterinary Services Directorate. This study also provides some data which can be pursued further with follow-up studies, as well as some basis for intervention by policymakers in the poultry industry.

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Authors Contribution

The authors contributed equally to the article.

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