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Evaluation of biosecurity compliance levels and identification of risk factors responsible for sub-optimal performance in some poultry farms in Oluyole Local Government Area, Ibadan

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Abstract

This study seeks to evaluate the biosecurity compliance levels and also to identify likely risk factors responsible for sub-optimal performance in poultry farms around Ibadan. A cross sectional survey was carried out using 51-item pre-tested and well-structured checklist in 60 poultry farms that were purposively sampled. The checklist was scored thus; 0-49% = Non-existent to poor and 50-100% = good to very good. For any poultry farm to be scored as having complied with any item, such a farm must have scored ≥ 50%. All scores were analyzed using descriptive statistical program in percentage; and Student's t-test was used to check for significant differences. The parameters measured except for lack of incinerators (20%), poor state of toilet (48%), insufficient disinfection facilities(30%) and workers (44%) and poor disinfection of hands after work (48%), also all-in all-out policy is poor (28% compliance). Compensation mechanism is non-existent (0%) showed fair compliance. The risk factors include lack of incinerators, lack of farm dips, lack of disinfectants, no facilities to disinfect hands and shoes, dead birds are not well disposed and rodents are not well controlled. The commercial farms are the major threat to the practical biosecurity when compared with the breeder farms at P< 0.05. It is hereby recommended that training on biosecurity compliance should be encouraged.

Introduction

The significance of poultry farming to the economic, social and biological needs of people in any nation cannot be over emphasized (AGRIS-FAO, 2021). Sub-Saharan Africa, Nigeria inclusive has a growing demand for poultry, but productivity in the sector has not increased to meet this demand, the major constraint in the sector is diseases (FAO, 2016). The diseases can be reduced by proper sanitation on the farm biosecurity measures and vaccination of the chickens (Hamra, 2010). Biosecurity refers to the principles engaged in reducing the chance of introduction and spread of pathogens within and between farms (Eze, et.al, 2017), by preventing infectious agents from entering (bioexclusion) or exiting (biocontainment) the farm and the principal elements are segregation, traffic control, cleaning, and disinfection (Charisis, 2008; Fasina et al., 2012). An effective biosecurity has conceptual, structural, and operational frameworks which involve housing design and construction with management procedures that keep the flock free from infectious diseases (Siekkinen et al., 2012). The operational cost of biosecurity is usually low and there is a high benefit cost ratio (Fasina et al., 2012; Akintunde et al., 2014), but inadequate implementation of biosecurity measures may be due to insufficient motivation and lack of understanding of its economic benefits (Akintunde et al., 2014).

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Biosecurity according to the Food and Agriculture Organization (FAO, 2016) has been identified as the only sustainable solution to reducing the negative effects of infectious pathogens on poultry. In Nigeria however, just as it is in other African countries, few studies conducted have revealed that biosecurity measures are not properly implemented (Dawit et al., 2009 and Mtui, 2012). Hence there is paucity of reliable repositories on the biosecurity status of commercial poultry and breeder farms in Nigeria. In view of this, this study seeks to assess the biosecurity compliance levels and also to identify likely risk factors responsible for sub-optimal performance in poultry farms around Ibadan.

Materials and Methods

Study locations, preparation of checklist and locating slaughterhouses

The study was conducted using breeder and commercial farms located within Oluyole local government area (LGA), Oluyole LGA is one of the urban local government areas located in Ibadan, Oyo state.

This study was borne out of the need to prevent or possibly reduce the incidence of sub-optimal performance in poultry production as a result of low or non-compliance to biosecurity practices. The drafting and preparation of this poultry biosecurity checklist was drawn from previous poultry and live-bird market related studies in Africa (Pagani et al., 2008), experience from poultry farms hygiene and operations in Nigeria, and recommendations for improvement on the existing hygiene and structures. A comprehensive checklist was developed based on three criteria: (i) Practical hygiene and sanitation at poultry houses, (ii) facilities, tools and equipment in use at poultry houses, and (iii) Operational Policies and regulations. A total of 51 items were identified and included in the checklist. The pretested checklists were administered in poultry farms around Oluyole LGA. The poultry farms include commercial layers and broiler farms and the breeder farms. Permissions were sought from all the poultry farms before the administration of the checklists.

Study design, sampling procedure and scoring of the checklist

A cross sectional survey was carried out by trained personnel using 51-item pre-tested and well-structured checklist in 60 poultry farms located around Oluyole LGA. Sixty (60) poultry houses were purposively sampled from this LGA. All selected farms were visited between October and November, 2023. The checklist was scored as follows; observed practical hygiene and level of sanitation compliance: Non-existent to poor (0-49%) and good to very good (50-100%). For any poultry farm to be scored as having complied with any item, such a farm must have scored ≥ 50%. All scores were entered into Microsoft Excel® (Microsoft Redmond, USA) and analyzed using descriptive statistical program for proportions (in percentage); and Student's t-test was used to check for significant differences for practical hygiene and level of sanitation between breeder and commercial poultry farms in Ibadan.

Results

Table 1 shows the compliance level of poultry farms located around Oluyole LGA to practical hygiene and level of sanitation. The results shows that most of the farms complied well to the parameters measured except for lack of incinerators (20%), poor state of the staff toilet (48%), also the facilities needed for disinfection are insufficient (30%) and poor disinfection of hands after work (48%).

Table 2 shows the compliance levels of farms around Oluyole LGA to facilities, tools and equipment, the farm and pen locations are not appropriate (36%), also they do not have enough land for future expansion (36%). All other parameters scored under this classification ranged from fair to good.

The results in Table 3 shows that the poultry farms did not employ enough workers (44%) to take care of the birds, it was also observed that they don't practice all-in all-out policy in the farm (28% compliance). Compensation mechanism is not instituted (0%) for the farms around this LGA, and the health of the workers on the farm are not monitored (36%).

There are eight parameters which can constitute risk factors in practical hygiene and level of sanitation in farms located around Oluyole LGA, there are significant differences between these parameters in breeder farms and commercial farms. These eight parameters can be found in Table 4. It was observed that more risk due to poor compliance are found more in commercial farms than in the breeder farms located around Oluyole LGA.

Table 1: Practical hygiene and level of sanitation at Poultry farms around Oluyole LGA

S/N	Variable	Score (%)		Compliance
		< 50	≥ 50	
1.	Garbage disposal services	12(24)	38(76)	Good
2.	Environmental cleanliness of the farm	8(16)	42(84)	Good
3.	Presence of an incinerator in the farm	40(80)	10(20)	Poor
4.	Washing of feeding/drinking tools and equipment	12(24)	38(76)	Good
5.	Disinfection of the farm/dips	10(20)	40(80)	Good
6.	Presence of drains on the farm	18(36)	32(64)	Fair
7.	Availability of sufficient, regular and clean water	8(16)	42(84)	Good
8.	Availability of toilets	16(32)	34(68)	Fair
9.	Present state of the toilet	26(52)	24(48)	Poor
10.	Access to facility to wash hands and shoes	24(48)	26(52)	Fair
11.	Access to facility to disinfect hands and shoes	35(70)	15(30)	Poor
12.	Access to facility to bath after farm work	23(46)	27(54)	Fair
13.	Safe disposal of dead birds	14(28)	36(72)	Good
14.	Safe disposal of waste	13(26)	37(74)	Good
15.	Good hygiene in the farm premises	21(42)	29(58)	Fair
16.	Good hygiene around different farm sections	23(46)	27(54)	Fair
17.	Disinfection of infrastructure and equipment	15(30)	35(70)	Good
18.	Disinfection/fumigation of premises	23(46)	27(54)	Fair
19.	Cleaning of farm done routinely	12(24)	38(76)	Good
20.	Protective apparels worn by workers in farm	23(46)	27(54)	Fair
21.	Hands washing after routine work	13(26)	37(74)	Good
22.	Hands disinfection routine work	26(52)	24(48)	Poor
23.	Controlled rodent environment	23(46)	27(54)	Fair

Scores: Non- existent to poor (0-49%) or < 50; fair to good (50-100%) or ≥ 50

Table 2. Facilities, tools and equipment in use at Poultry farms around Oluyole LGA.

S/N	Variable	Score (%)		Compliance
		< 50	≥ 50	
1	Foot dip usage in the farm	14(28)	36(72)	Good
2	Sufficient feeders and drinkers in pen	5(10)	45(90)	Good
3	Appropriateness of location of farm and pens	32(64)	18(36)	Poor
4	Fencing and gates around the farm	10(20)	40(80)	Good
5	Isolation of farm from residential houses	22(44)	28(58)	Fair
6	Proper farm layout	12(24)	38(76)	Good
7	Availability of feed mill in the farm	15(30)	35(70)	Good
8	Availability of pipe-borne water/bore-hole facility	5(10)	45(90)	Good
9	Water delivery system in place in the farm	5(10)	45(90)	Good
10	Clearing of pen surrounding is done routinely	6(12)	44(88)	Good
11	Disinfection of equipment used in the farm	22(44)	28(56)	Fair
12	Enough space for future expansion.	32(64)	18(36)	Poor
13	Location of water source	13(26)	37(74)	Good
14	Facility for isolation of sick birds	11(22)	39(78)	Good

Scores; Non- existent to poor (0-49%) or < 50; Fair to good (50-100%) or ≥ 50.

Table 3. Operational policies and regulations in Poultry farms around Oluyole LGA.

Variable	Score (%)		Compliance
	< 50	≥ 50	
Monitoring & supervision of stages of farm activities	5(10)	45(90)	Good
Documentation of numbers of birds in the farm	13(26)	37(74)	Good
Level of education of operators	5(10)	45(90)	Good
Ratio of workers to bird population	28(56)	22(44)	Poor
Ratio of support staff to bird population	15(30)	35(70)	Good
Access to veterinary inputs	5(10)	45(90)	Good
All in all out policy in the farm	36(72)	14(28)	Poor
Isolation of sick birds	18(36)	32(64)	Fair
Separation of birds of different age	6(12)	44(88)	Good
Separation of birds of different breed	18(36)	32(64)	Fair
Restriction of movement of operators within the houses	12(24)	38(76)	Good
Compensation mechanism in place for disease outbreaks	50(100)	0(0)	Poor
Monitoring of the state of health of operators	32(64)	18(36)	Poor
Regulation of environmental waste/effluent disposal	18(36)	32(64)	Fair

Scores; Non- existent to poor (0-49%) or < 50; Fair to good (50-100%) or ≥ 50.

Table 4. Differences in practical hygiene and level of sanitation between breeder and commercial farm operations around Oluyole LGA

Practical hygiene & level of sanitation	Breeder farm	Commercial farm	P-value
Garbage disposal services	2.430	2.250	0.650
Environmental cleanliness of the farm	2.750	1.500	0.037
Presence of an incinerator in the farm	2.750	0.000	0.001*
Washing of feeding/drinking tools and equipment	3.000	2.750	0.042
Disinfection of the farm/dips	2.650	1.200	0.011*
Presence of drains on the farm	2.250	1.650	0.074
Availability of sufficient, regular and clean water	2.5 00	2.250	0.300
Availability of toilets	3.200	2.750	0.660
Present state of toilets	2.755	1.950	0.050
Access to facility to wash hands and shoes	1.670	1.350	0.760
Access to facility to disinfect hands and shoes	2.570	1.750	0.032*
Access to facility to bath after farm work	2.250	2.100	0.750
Safe disposal of dead birds	2.760	1.355	0.001*
Safe disposal of waste	1750	1.600	0.860
Good hygiene in the farm premises	1.866	1.666	0.570
Good hygiene around different farm sections	1.788	1.700	0.677
Disinfection of infrastructure and equipment	2.450	1.650	0.021*
Disinfection/fumigation of premises	1.889	1.150	0.011*
Cleaning of farm done routinely	1.850	1.650	0.580
Protective apparels worn by workers in farm	2.350	1.466	0.001*
Hands washing after routine work	1.562	1.633	0.680
Hands disinfection routine work	1.766	1.850	0.556
Controlled rodent environment	2.220	1.360	0.020*

**Significant @ P< 0.05*

Figure 1 shows the different types of poultry farms operated around Oluyole LGA, with commercial broiler farms having the highest percentage of 48%, this is followed by breeder farms with 30% and commercial layers with 22%.

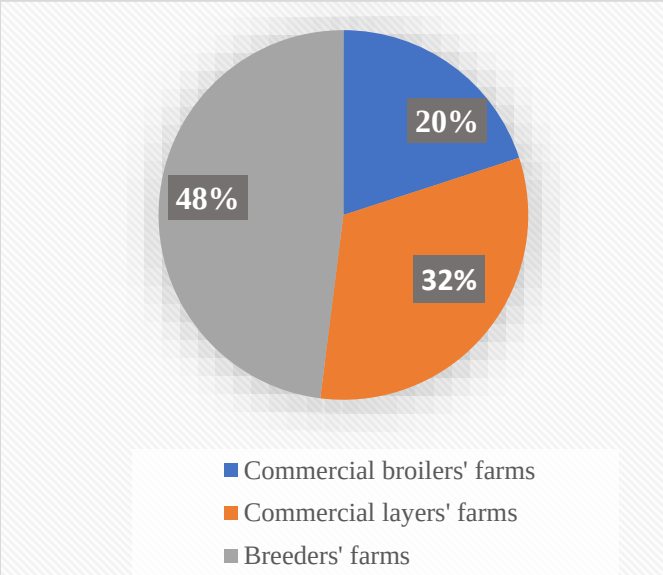

Fig. 1: Types of poultry farms operated around Oluyole Local Government Area

Discussion

This study has confirmed that compliance with biosecurity measures in the poultry farms located around Oluyole LGA remains partly poor despite huge investment in intense efforts in the training of staff to support biosecurity implementation. Whereas poultry farmers or operators claimed to be practicing biosecurity measures, but partial compliance were noticed in many of the farms, which is still corroborating the submission of Pagani et al. (2008), that some biosecurity measures were poorly implemented in majority of the poultry farms in Nigeria.

Poultry production is one of the easiest ways to increase the availability of protein in food because eggs contain essential nutrients such as amino acids, minerals and vitamins that can augment protein deficiency in the body (Adene and Oguntade, 2006). Production of meats and eggs occupies a prime position for improving animal protein consumption of both rural and urban households in Nigeria (Alhaji and Suleiman, 2017). According to the Food and Agriculture Organization (FAO, 2021) reports, Nigeria has low animal protein intake with an average of 6g per head per day while the world average is 34g per head per day.

Although globally, as at 2011 and 2016, over 50 billion poultry birds and 66 billion poultry birds were produced across the world respectively; these numbers dropped to 23 billion birds by 2018 (Mottet and Tempio, 2017) due to the more recent outbreak of avian influenza and poor implementation of practical biosecurity which affected 13.6% of the world's poultry supply during the year 2016 in addition to the effect of ongoing poultry consumption by the human population (Chatziprodromidou, et al., 2018).

This study also shows that there was lack of incinerators, the facilities needed for disinfection are insufficient (30%) and poor disinfection of hands after work (48%). All these are integral parts of biosecurity if properly implemented, they confer protectiveness on the birds reared on the farm. Biosecurity confers protection on poultry birds from pathogens or diseases (Crovato et al., 2024). This may include the separation of the flock from living vectors or inanimate objects called fomites.While prevention of host-specific and zoonotic diseases is important, the commercial poultry industry is already preoccupied with the challenges of day-to-day operations (Farnell and Whyte, 2023). The local and global spread of certain poultry diseases, in birds and humans indicates current surveillance and control measures in terms of the biosecurity measures are insufficient (Awada et al., 2018).

Furthermore, this study shows that the number of employee to birds reared is low, which means the workers over work themselves and by so doing may not perform effectively, it was also observed that they do not practice all in all out policy in the farms (28% compliance). Compensation mechanism is not instituted (0%). In view of the fact that the poultry farms adherence to compensation mechanism for culled birds was poorly implemented from this study it is recommended that a carefully structured compensation system with regular options for review should be put in place. It has been confirmed that compensation encourages cooperation of farm operators and other role players and supports voluntary reportage of outbreaks (Alders et al., 2009). A breach

in biosafety practices in poultry production systems in many parts of Nigeria may be due to lack of awareness on the part of stakeholders and the refusal to implement biosafety practices resulting in recurrent outbreaks of infectious diseases that will lead to sub-optimal performance in poultry farms, which can significantly erode the profit or lead to capital loss in the industry (Ifeduba et al., 2020).

Some risk factors identified in the surveyed farms were compared; we observed that the dips (foot, hand and vehicular) even though are present are not put into use, so also is the habit of improper disposal of dead birds, which may have died as a result of an infectious disease, by so doing creating an endemic situation on the farm and likelihood of zoonosis. This risk factors are more conspicuous in the commercial farms than breeder farms in the study area. While risk can never be brought down to zero, it may be reduced and controlled with good managemental practices with good hygiene and sanitation as it is commonly done in the breeder farms (Jerson and Cuellar, 2021). Disinfection is far better in the breeder farms when compared to the commercial poultry farms, the reason for this is not far-fetched, that is complying with the producers instruction; while there are many viable disinfectants/sanitizers in the market, disinfecting a clean surface and following recommendations for contact time are very important to get the desired results, which is optimal performance (Gosling, 2018; Conan et al., 2012). From this study however, the compliance level of practical biosecurity to some measured parameters is fairly good at the farms operating around Oluyole LGA irrespective of the type of birds reared. About 60% of the farms complied with the laid down rules of biosecurity. Even at that, there are some integral components of biosecurity whose compliance is non-existent to poor.

The risk factors identified were eight, but the most prominent include lack of incinerators, lack of farm dips, lack of disinfectants, no facilities to disinfect hands and shoes, dead birds are not well disposed and rodents in the environment are not well controlled. The commercial farms are the major threat to the practical biosecurity when compared to the breeder farms.

It is hereby recommended that there is the need for stakeholders and workers training on biosecurity compliance, operational hygiene and sanitation, and their relevance in poultry husbandry for optimal performance emphasized.

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