

Infectious Diseases of Poultry and its Distribution in Ogun State, Nigeria

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Target: Poultry farmers, Government agents and agencies/policy makers, Animal Scientists

Abstract

This study was carried out to determine the characteristics, types and spread of infectious poultry diseases in commercial poultry farms in Ogun State using semi-structured questionnaires. One hundred questionnaires were randomly administered in the four geographical zones (Remo, Ijebu, Yewa and Egba) of the State. However, eighty six were retrieved. Data were collected on flock size, species of poultry kept, types of poultry diseases experienced and analysed using descriptive statistic and percentage. The coordinates of the respondent farms were also taken with the aid of a Global Positioning System (GPS) and imported into General Information System (GIS) to derive spatial map. Result revealed that 44.19% of the poultry farms were established less than 10 years ago and were mostly small scale farms (59.3%). Only 2.33% of the farms possessed more than 120,000 birds while 82.56% the respondents reared chicken out of which 22.10% reared layers. Sixty seven percent of the farms experienced disease occurrence while majority (97.67%) were affected by infectious, metabolic/nutritional, parasitic, and behavioural diseases. Newcastle (16.28%) and Escherichia coli (19.77%) were the major viral and bacterial diseases experienced. The study concluded that majority of the farms were small scale enterprise and layers constituted the highest proportion of chickens. Risk map of the diseases showed that Ogun State has medium affinity for infectious diseases. However, Ogun State has high risk of Newcastle and Gumboro diseases but very low risk of Infectious Bronchitis and fowl pox diseases. Poultry Farmers were enjoined to maintain high level of structural and operational bio-security in order to maintain healthy flock and optimise production efficiency.

Keywords: Poultry, infectious diseases, distribution, Ogun State

Description of Problem

Poultry rearing has varying economic significance worldwide and it is growing into organised, specialised and

integrated industry. Poultry birds have the efficiency of conversion of grains, other agricultural and industrial products and by-products into quality

protein (meat and eggs) for nutritional benefit of man. They have wide use across different cultural background. Their adaptability to intensive management and large scale production accounts for the growth of the industry worldwide. The poultry sub-sector of Nigeria economy plays important socio-economic roles (1) and contributes about 9-10% to the Agricultural GDP with a net worth of \$230 million (2). This suggests that a significant number of people in Nigeria are employed in the poultry sector (3) while it is estimated that poultry supplies about 19% of the total meat requirement (4).

Poultry disease can literally be explained as any deviation from normal body function, caused by virus, bacterial, and other micro organisms leading to destruction or malfunctioning of body cells and undesirable consequences on production of meat and egg. Disease outbreak has successfully occasioned the liquidation of some poultry establishments while millions of naira are continuously being lost to poultry disease on cost of treatment, prevention, control and mortality of birds.

To ensure a viable poultry industry that would be responsive to the nation's animal protein demands and nutrition security, prompt recognition and treatment/prevention of disease can not be over emphasised. A farmer stands the risk of loosing all his susceptible birds to diseases such as Newcastle disease, Infectious Bursa disease (IBD), etc in the event of an outbreak.

Disease spread has no geographical bound and sometimes, it spreads across a

wide location from local to inter border. The incidence of Highly Pathogenic Avian Influenza of 2006/2007 infection in Nigeria readily comes to mind when issues arise on disease spread. The spatial distribution of disease risk and its visual presentation through risk maps can assist in the design of targeted animal disease surveillance and control strategies. This approach is particularly useful in situations in which empirical data are not readily available (6, 7). In such circumstances data on known risk factors can be used to determine those areas in which a specific disease is most likely to occur using knowledge driven models, such as Multi Criteria Decision Modelling (MCDM) as opined by (8). The Multi Criteria Decision Modelling (MCDM) is an example of a static knowledge-driven modelling approach that can be used to produce qualitative or quantitative estimates of risk based on existing or hypothesized understanding of the causal relationships to disease occurrence (8).

Since, poultry is one of the most diverse and integrated aspect of the livestock industry and production subsector in agriculture with potential for quick and efficient production and supply of animal protein, the need to redirect efforts towards disease surveillance and control is therefore of utmost concern.

Currently, there is dearth of robust and adequate information on prevailing disease types and spread in Ogun State in particular and Nigeria in general. Studies on disease dynamics are not spatially explicit and explored to describe and understand disease spread for policy intervention and engender

food security in Ogun State. Thus the need for this study.

Materials and Methods

Location of Study

The study was carried out in selected

commercial poultry farms in four regions (Remo, Ijebu, Egba and Yewa) of Ogun State based on the geographical distribution of the people. Twenty five commercial poultry farms were selected from each region.



Figure 1: Map of Ogun State

Data Collection/procedure

Semi-structured questionnaires were used to gather information from the commercial poultry farms. Global Positioning System (GPS) was used to determine the geographical location of each farm and coordinates were obtained with aid of hand-held GPS receiver.

Statistical Analysis

Data collected were analysed using descriptive statistics such as frequency and percentage. The Global Positioning System data were imported into Geographical Information System (GIS) as point locations which were interpolated using Inverse Distance Weighted (IDW) in (**ArcGIS 9.3**) software (9). The interpolations were used to derive infectious disease risk maps in the study area.

Results and Discussion

Table 1 shows year of establishment of commercial poultry farms in Ogun state. A little less than half (44.19%) of the farms were established between 5-10 years ago. Poultry farms that were established less than 5 years ago

represented 19.77% of the respondents while farms that were established between 11-15years constituted 17.44% of the sampled farms. The result also revealed that poultry farms that were established more than 20years ago represented 12.79% while those established between 16-20years ago represented 5.81% of the respondents.

Due to the effects of the deadly Highly Pathogenic Avian Influenza (HPAI) between 2006 and 2007 during which many farmers were sent out of business, the pultry industry in Ogun State could be assumed to begin to pick up in this study. (10) reported that the Nigerian pultry idustry was developing rapidly when HPAI struck in 2006. The results also inferred that many new poultry farmers are coming into poultry business. This could be as a result of the fast growing nature of the industry as broiler chickens nowadays attain market weight in 42 days and layers produce about 290 eggs per annum. Poultry industry in the developing world (including Nigeria) and the world at large has been described as growing enterprise(5).

Table 1: Year of establishment of poultry farms in Ogun State

Measurement	Frequency	Percentage (%)
<5years	17	19.77
5-10 years	38	44.19
11-15 years	15	17.44
16-20 years	5	5.81
>20 years	11	12.79
Total	86	100

Table 2 shows the flock size of poultry farms in Ogun state. Over half (59.30%) of the poultry farms had flock size of less than 500 birds. Poultry farms with flock size ranging from 501-5,000 birds

constituted 27.90% of the respondents while those with 5,001-120,000 flock size represented 10.47%. The result also revealed that poultry farms with more than 120,000 flock size constituted only

(2.33%) of sampled commercial poultry farms in Ogun state.

The results also showed that most of the farms were operating at small scale with less than 500 birds. This was in line with finding of (11) who reported that small scale farmers have increased over time

in Nigeria from 100 backyard bird population. The report of (12) that poultry serves as means of fighting poverty and hunger among resource poor farmers also gave credence to these findings and probably suggested why farmers hold small scale poultry production.

Table 2: Flock size kept in commercial poultry farms in Ogun State

Measurement	Frequency	Percentage (%)
Poultry population: ≤ 500	51	59.30
Poultry population: 501-5,000	24	27.90
Poultry population: 5,001-120,000	9	10.47
Poultry population: $>120,000$	2	2.33
Total	86	100

The result of chicken types kept in poultry farms in Ogun State is shown in Table 3. About one-fifth (22.10%) of the respondents kept layers alone while 3.49% kept broilers. The result also revealed that most of the poultry farms kept more than one type of chicken. About one-third (33.72%) of the respondents kept broilers and layers while 15.12% kept layers and cockerel. Broiler, layer and cockerel were kept by 18.60% of the sampled poultry farms. Commercial poultry farms in Ogun State that kept broiler, layers, cockerel and pullet constituted 1.16% of the sampled population.

From this results, majority of the poultry farms in the study area kept layers. This finding was in line with an earlier report by (13) that large number of poultry farms reared layers because of their eggs. High rate of layer production was also an indicator of marketability of poultry eggs compared to chicken meat. (14) reported N15 as cost of unit egg in Nigeria thus described chicken egg as a

cheaper and affordable quality animal protein.

Farmers kept broiler chickens in target of a particular festive period such as Easter, Christmas, Ei-del Fitri and New Year. However, specialised broiler producers target the fast food joints and they are not as many as the farmers and poultry farms that produce layers. This opinion is probably suited in the result obtained for the broiler farms which revealed that only 3.49% of the sampled farms produced only broiler chickens compared with layers that represented 22.10% of the respondents.

Table 4 reveals the source of day old chicks in commercial poultry farms in Ogun State. Majority (90.70%) of the respondents sourced their day old chicks from commercial poultry farms. Some of the poultry farms (5.81%) sourced their day old chicks from open market while 2.33% of the poultry farms sourced for day old chicks from Government Farms. The result also revealed that 1.16% of the poultry farms sourced for their day

old chicks from both Government and commercial farms. This finding implied that industrialised breeder farms remain the major supplier of day old chicks to

other various scales of poultry farms. They could therefore be prominent point of disease intercept and prevention in Ogun State.

Table 3: Types of chicken kept in commercial poultry farms in Ogun State

Measurement	Frequency	Percentage (%)
Broiler	3	3.49
Layers	19	22.10
Cockerel	0	0
Pullet chicks	0	0
Parent stock	1	1.16
Grandparent stock	0	0
Broiler/ Layer	29	33.72
Layer/Cockerel	13	15.12
Broiler/Layer/Cockerel	16	18.60
Broiler/ Layer/Pullet	1	1.16
Layer/Cockerel/Pullet	3	3.49
Broiler/Layer/Cockerel/Pullet	1	1.16
Total	86	100

Table 4: Source of day old chicks for poultry farms in Ogun State

Measurement	Frequency	Percentage (%)
Open market	5	5.81
Government farms	2	2.33
Friends	0	0
Commercial farms	78	90.70
Government farms/Commercial farms	1	1.16
Total	86	100

Table 5 shows infestation of poultry disease in commercial poultry farms in Ogun State, Nigeria. Majority (67.44%) of the poultry farms in the study area reported incidence of disease occurrence/infestation while 32.56% did not suffer disease infestation. This was an indication of prevalence of poultry diseases among poultry farmers. Equally it emphasised the importance of bio-security as indispensable disease preventive mechanism (15, 16). This

result was also an attestation to level of production of the farms as 39% of the respondents were medium and large scale producers. According to (10), large and industrialised commercial poultry producers practiced medium to high level bio-security and this gave credence to this finding. Commercial poultry farms are therefore encouraged to maintain good level of structural and operational bio-security measures as opined by (15).

Table 5: Occurrence of poultry disease outbreak in Ogun State

Measurement	Frequency	Percentage (%)
Occurred	58	67.44
Not occurred	28	32.56
Total	86	100

Poultry farms in Ogun State faced more than one type of disease (Table 6). Infectious and parasitic diseases affected 4.65% of the respondents while metabolic and nutritional/behavioural diseases affected 22.33%. The study also revealed that 16.27% of the poultry farms were affected by metabolic and nutritional, infectious and parasitic diseases. Metabolic and nutritional/infectious/behavioural diseases were reported by 4.65% of the poultry farms while 56.97% were affected by metabolic and nutritional/infectious/parasitic/behavioural diseases.

Poultry environment had been described as a complex phenomenon where factors in colonies and large commercial flocks may alter enriched components (17) as indicated in complex disease conditions. Multiple disease conditions observed in this result probably attested to the

opinion of (17) as the environment could have been compromised probably by multiple influence and pathogenic factors and/or organisms. However, the result showed that 2.33% of the farmers recorded no disease occurrence. These could be industrialised farms with high level of bio-security and controlled or less compromised environment. (18) and (19) in their reports suggested that for commercial viability, housing systems should provide birds with basic physical and biological needs for survival, productivity and to reduce stress for improved quality of life. Equally, (10) reported that industrialised farms practice high level of structural and operational bio-security and therefore record low level of disease infections. These opinions could be responsible for result of low disease occurrence in farms with over 120000 birds in this study.

Table 6: Types of diseases affecting commercial poultry farms in Ogun State

Measurement	Frequency	Percentage (%)
Metabolic/nutritional	0	0
Infectious	0	0
Parasitic	0	0
Behavioural	2	2.33
Infectious/Parasitic	4	4.65
Metabolic and nutritional / Behavioural	2	2.33
Metabolic and nutritional/Parasitic	2	2.33
Metabolic and nutritional /Parasitic /Behavioural	2	2.33
Metabolic and nutritional /Infectious /Parasitic	14	16.27
Infectious/Parasitic/Behavioural	5	5.81
Metabolic and nutritional /Infectious /Behavioural	4	4.65
Metabolic and nutritional / Infectious/Parasitic/Behavioural	49	56.97
No disease	2	2.33
Total	86	100

Table 7 reveals that 16.28% of the sampled commercial farms in Ogun State were affected singularly by Newcastle Disease followed by Marek disease (3.49%), Fowl Pox disease

(2.33%), Infectious Bursal Disease (2.33%) and Infectious Bronchitis disease (1.16%). About one-third (36.05%) of the respondents were affected by two types of viral diseases

while 20.92% were affected by more than two types of viral diseases. However, 17.44% of the poultry farms in the study area had no occurrence of viral diseases.

This result was supported by the findings of (20) and (21) who reported Newcastle disease (ND) as the most important viral disease of poultry in the world including

developing countries. (22, 23, 24, 25, 26) also reported that ND has a devastating effect on commercial as well as village poultry industries. More so, (27, 28) reported that exotic breeds in commercial farms are more susceptible to disease infection. These reasons could be responsible for the result obtained in this study.

Table 7: Types of viral diseases affecting commercial poultry farms in Ogun State

Measurement	Frequency	Percentage(%)
Avian Influenza	0	0
Infectious Bronchitis	1	1.16
Newcastle	14	16.28
Marek	3	3.49
Fowl Pox	2	2.33
Hemorrhagic Enteritis	0	0
Viral Arthritis	0	0
Infectious Bursal	2	2.33
Newcastle/Marek	1	1.16
Infectious Bronchitis/Fowl Pox	4	4.65
Avian Influenza/Newcastle	1	1.16
Avian Influenza/Infectious Bursal	1	1.16
Marek/Infectious Bursal	2	2.33
Marek/Fowl Pox	2	2.33
Newcastle/Fowl Pox	8	9.30
Fowl Pox/Infectious Bursal	2	2.33
Infectious Bronchitis/Marek	4	4.65
Newcastle/Infectious Bursal	4	4.65
Infectious Bronchitis/Newcastle	2	2.33
Newcastle/Marek/Fowl Pox	2	2.33
Avian Influenza/Fowl Pox/Infectious Bursal	2	2.33
Avian Influenza/Marek/Hemorrhagic Enteritis	1	1.16
Infectious Bronchitis/Fowl Pox/Infectious Bursal	1	1.16
Infectious Bronchitis/Newcastle/Fowl Pox	2	2.33
Avain Influenza/Newcastle/Fowl Pox	1	1.16
Newcastle/Fowl Pox/Infectious Bursal	3	3.49
Avain Influenza/Marek/Fowl Pox	1	1.16
Infectious Bronchitis/Newcastle/Marek/Fowl Pox	1	1.16
Newcastle/Marek/Fowl Pox/Infectious Bursal	1	1.16
Infectious Bronchitis/Newcastle	1	1.16
/Fowl Pox/Viral Arthritis		
Infectious Bronchitis/Marek	1	1.16
/Fowl Pox/Infectious Bursal		
Infectious Bronchitis/Newcastle/Marek	1	1.16
/Fowl Pox/Infectious Bursal		
No Disease	15	17.44
Total	86	100

Table 8 shows types of bacteria diseases affecting commercial poultry farm in Ogun State. *E.coli* was a singular bacteria disease that affected 19.77% of respondents who are commercial poultry producers in Ogun State. Other singular infectious bacteria diseases were Salmonella (13.95%) and Infectious Coryza disease (9.30%). Some of the poultry farms were found to have been affected by more than one type of bacteria diseases. Majority (29.08%) were affected by two types of bacteria diseases while 10.45% were affected by more than two types of bacteria diseases.

It had been reported (29) that 5-10% of mortality in poultry were due to *E. coli* infections with no pronounced signs. This suggested that the infection may be incubated by animal but not easily detected and therefore requires regular tests for proper diagnosis. The situation leading to mortality with no pronounced clinical signs will be more critical since it would result in greater losses as reduced performance and lower egg production. (30) affirmed that *E. coli* infections will not only result in reduced egg production and mortality, it could be a predisposing factor for other complications like IBD.

Salmonellosis is one of the infectious diseases considered to be the most important causes of mortality in village chicken (31). Salmonellosis has been described as poultry disease with high potential world-wide distribution but in practice is confined to non-commercial flocks in many countries. Its infection results in high mortality in young chicks

(32). Therefore, Salmonella infection control should be considered and integrated into national disease policy control plan.

Infectious Coryza disease has been reported to be potentially encountered in any poultry-raising area but frequently occurs as a chronic or seasonal problem (32). The disease results in decreased egg production in commercial laying and breeder operations (32). Therefore, Infectious Coryza control should also be considered in the disease policy control plan.

Figure 2 shows infectious diseases potential in Ogun state. Though most part of the State had medium risk potential for infectious diseases, extreme North and Central parts of the State were observed to have infectious disease risk ranging from very low to low spread. However, some parts of the Northwest, Central, Northeast and extreme South of Ogun State were observed to have infectious disease risk ranging from high to very high spread. This result could be due to human population concentration since infections had been reported to be transferred through direct and indirect contacts (32). High human population attracts good market for consumable products. Also is urbanization which play good roles as many poultry farms would be sited not too far from the market. However, these drivers (high population and urbanization) of poultry farming are not without cost. Therefore, commercial farmers could be advised to explore areas with low to very low infectious disease potentials but expand on their marketing outlets with high level of operational biosecurity.

Table 8: Types of bacteria diseases affecting commercial poultry farms in Ogun State

Measurement	Frequency	Percentage(%)
Infectious Coryza	8	9.30
Pasteurella	0	0
E.coli	17	19.77
Bordetella	0	0
Salmonella	12	13.95
Erysipelas	0	0
Staphylococcus	0	0
Necrotic Enteritis	0	0
Colibacillosis	0	0
Mycoplasmosis	0	0
<i>E.coli</i> / Necrotic Enteritis	3	3.49
Infectious Coryza/Salmonella	10	11.63
<i>E.coli</i> /Salmonella	7	8.14
Infectious Coryza/ <i>E.coli</i>	2	2.33
Pasteurella/Salmonella	2	2.33
<i>E.coli</i> /Colibacillosis	1	1.16
Pasteurella/Salmonella/Mycoplasmosis	1	1.16
Infectious Coryza/ <i>E.coli</i> /Salmonella	1	1.16
Infectious Coryza/Bordetella/Salmonella	1	1.16
Infectious Coryza/Salmonella /Colibacillosis/Mycoplasmosis	1	1.16
Infectious Coryza/ <i>E.coli</i> /Salmonella /Mycoplasmosis	1	1.16
Infectious Coryza/ <i>E.coli</i> /Salmonella /Staphylococcus/Mycoplasmosis	1	1.16
Infectious Coryza/ <i>E.coli</i> /Salmonella /Staphylococcus/Colibacillosis	3	3.49
No Disease	15	17.44
Total	86	100

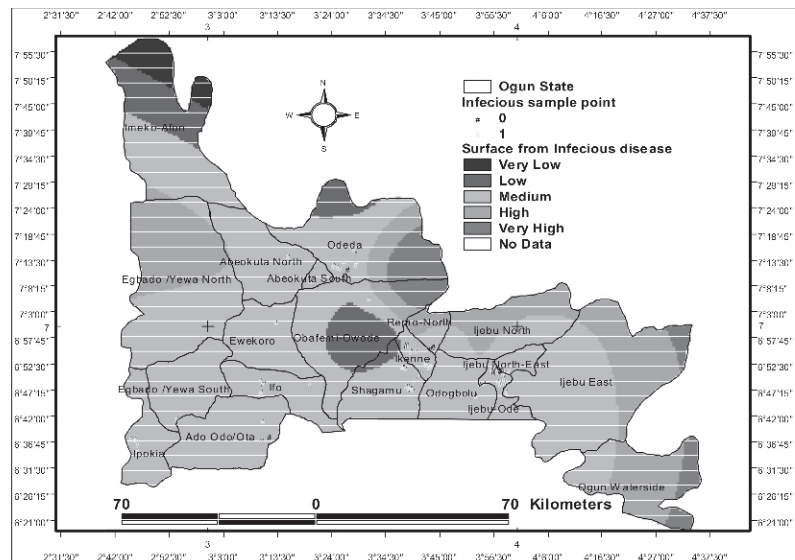


Figure 2: Risk map of infectious diseases in Ogun State

Figure 3 shows the spatial distribution of Infectious Bronchitis (IB) disease in Ogun State. The result revealed that Ogun State had very low potential for IB across the 20 Local Government Areas of the State. However, part of Northwest and Southwest zones of Ogun State had medium to very high prevalence of IB. This could be due to high concentration of poultry farms in these zones. (33) had earlier reported that IB has wide distribution and characterized by respiratory disorder, increased mortality and depressed egg production and shell

quality in commercial layers and breeder flocks. (34) reported that IB could be aggravated by bad management, climatic stress or other disease condition as the causative organism (virus) can be transmitted from clinically affected birds to susceptible flocks through direct or indirect contact.

Therefore, high concentration of poultry farms with poor management practices and low biosecurity measure as reported by (16) could be assumed to be responsible for the results obtained.

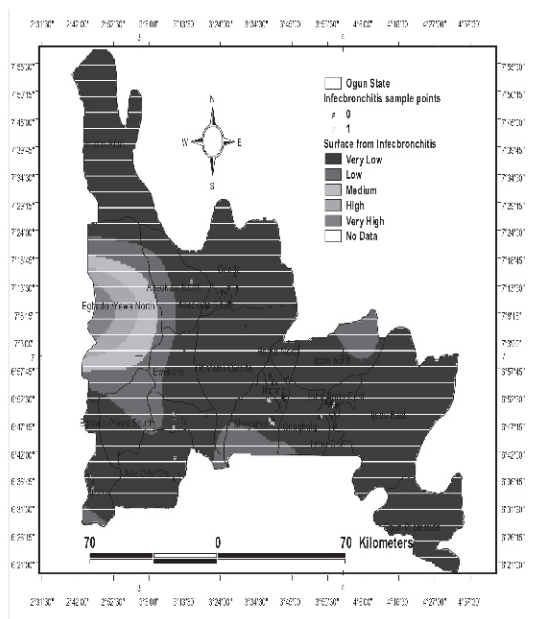


Figure 3: Risk map of Infectious Bronchitis disease in Ogun state

Figure 4 shows Newcastle disease (ND) potential spread in Ogun State. The result revealed that Ogun State had high prevalence of Newcastle disease ND and this was recorded in the Northwest, Southwest and Central parts of the State. Parts of the Northwest and extreme North of the State recorded very high prevalence of ND. Areas around the

extreme West, Central, Northeast and extreme South recorded very low to medium occurrence of ND. This result was not unexpected as ND had become widespread and of considerable economic importance in both exotic and local poultry with mortalities approaching about 80% (35, 36, 37). Similarly, (20) showed that ND,

Infectious Bursal Disease (Gumboro), Fowl Pox and Fowl Typhoid, in that order, were the most important disease in backyard (family) poultry. Another study by (10) reported ND to be more common in layers than broiler chickens and the incidence is highest during the months of October – December. Since layers represented the highest

proportion of chicken type reared in Ogun State and in view of these earlier opinions, wide ND risk spread was not unanticipated. Commercial poultry investors are enjoined to implement good vaccination programme, management practices and strict biosecurity in their desire to reduce ND risk spread in Ogun State.

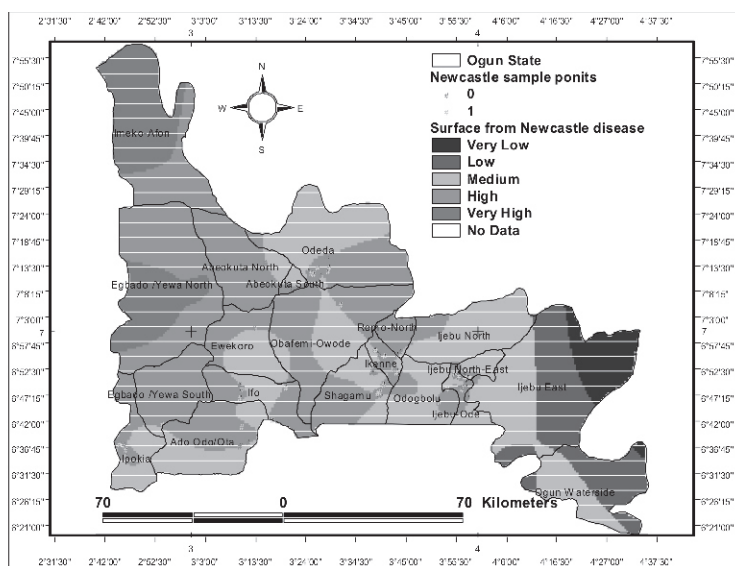


Figure 4: Risk map of Newcastle disease distribution in Ogun State

Figure 5 shows Infectious Bursal disease (Gumboro) potential spread in Ogun State. The figure revealed that the State had high to very high risk for Infectious Bursal disease in major 19 out of the 20 Local Government Areas of the State. This distribution could be as a result of high concentration of poultry farms in the study area as well. According to (38) the disease spreads occur in the poultry-rich Southern States of Nigeria. (20) showed that ND, Gumboro disease, Fowl Pox and Fowl Typhoid, in that order, were the most important disease in backyard (family) poultry while Gumboro had also been described as an

acute, highly contagious viral disease of poultry characterized by the enlargement of the bursa of fabricus and moderate-high mortality (32). Also serological studies by (39) that were carried out in Ekiti, Lagos Ogun, Osun, and Oyo States showed 34% prevalence in 2000 local chickens that were examined. These opinions therefore explained reasons for the high to very high disease risk spread in Ogun State. Good bio-security and vaccination helps prevent the disease and should be employed if efficiency and low mortality in poultry is desired. However, the extreme South and North of the State

showed medium to very low risk of Infectious Bursal Disease. This could be as a result of low concentration of poultry farms in these locations

therefore the report of (38) who opined that Gumboro disease spreads occur in the poultry-rich areas gave credence to this finding.

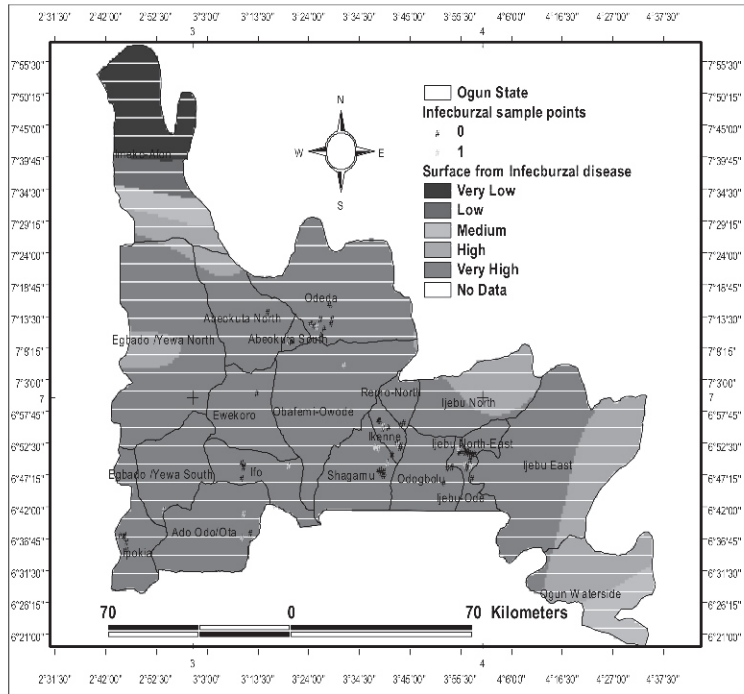


Figure 5: Risk map of Infectious Bursal disease in Ogun State

Figure 6 shows Fowl pox disease potential spread in Ogun State. The figure revealed that the State had low prevalence of fowl pox disease in 18 Local Government Areas. This finding was at variance with report of (32) which stated that Fowl pox disease occurs in most countries with warm and humid climates while the virus that transmits the disease is mosquito-borne. Ogun State is located in the tropics with high prevalence of mosquitoes yet Fowl pox risk potential was very low. The vector could not transmit the causative virus through bite. This was due to the fact that body physiology of chicken and turkey is one that is cover with feathers except the

comb and wattle. Proliferative lesions on the skin of comb, wattle and other unfeathered areas could come under major attack of mosquitoes leading nodulation of the eyelid and the beak region while protracted cases could lead to respiratory disorder, reduced feed intake, reduced egg production in laying birds and mortality.

Conventional management practice is to vaccinate birds that would be reared for more than 12weeks. This vaccine is usually administered when the birds are about 6weeks; at a time before the comb and wattle become very prominent. And since layers are produced more than broiler chickens for it gives more

premium to farmers, commercial poultry farms would undoubtedly prevent fowl pox infection on their farms. This could be the reason for the very low risk potential for fowl pox occurrence in the study area.

However, parts of the Northeast and the extreme South of the State showed a

medium to very high prevalence of Fowl pox disease spread.

This result was at variance with the normal distribution of fowl pox disease as reflected in this study. Commercial poultry farms in these region are hence enjoined to vaccinate their stock regularly and practice strict operational biosecurity.

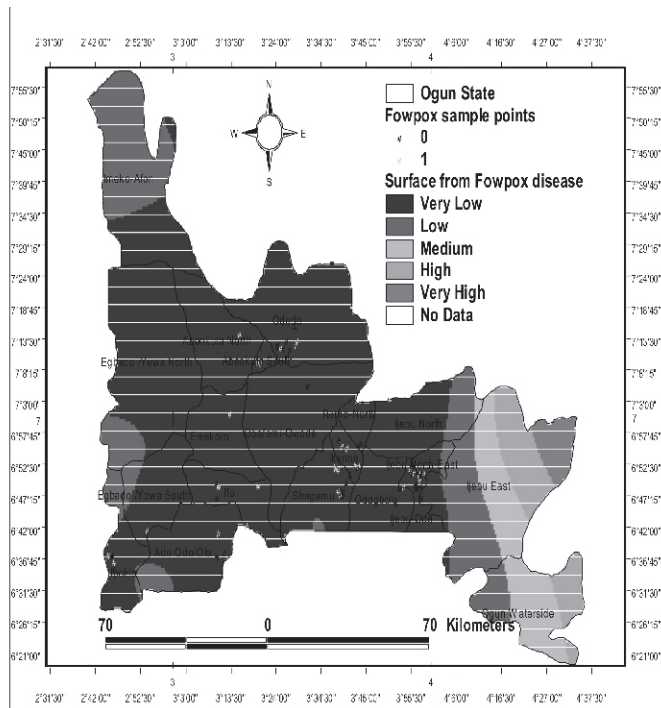


Figure 6: Risk map of Fowl Pox diseases in Ogun State

Conclusion

Majority of the poultry farms in Ogun State were established within the age range of 5-10years and most of the poultry farms had flock size of less than 500 birds. The farms kept chicken alone while layers were the major type of chicken kept. Newcastle Disease and *E.coli* were viral and bacteria diseases, respectively that affected commercial poultry farms in Ogun State. Risk map of infectious diseases showed that Ogun

State had medium affinity for infectious diseases. However, the State had very low risk of IB, high prevalence risk of ND, very high risk of Gumboro and very low risk of fowl pox diseases. Poultry farmers should uphold biosecurity in high esteem and vaccinate their birds correctly for maximum and efficient rewards on investment.

Application

Would-be and existing Poultry farmers

should apply the findings of this study in site selection for poultry investment. Results also become useful in Government disease surveillance for necessary policy formulation and advisory services.

In the practice of Animal Science in Nigeria particularly, Ogun State, this study on Infectious Diseases of Poultry and distribution channels present new opportunities in the use of GIS in disease prevention and control through effective operational biosecurity which could be explored when consideration for structural biosecurity is desired.

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