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Biosecurity practices in commercial poultry farms located in ElFashir Locality- Sudan

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Abstract

This study was conducted to assess the biosecurity practices in commercial poultry farms in the locality of ElFashir, North Darfur State Sudan. Thirty two farms biosecurity tests were used, biosecurity practices were evaluated in poultry farms using the checklist and organized questionnaires administered to commercial poultry farmers. Simple descriptive statistics were used (frequencies and percentages) to summarize and display the results. The results showed that 62.5% of the farms used the floor brooding system of the birds; 59.4% open barns; The domestic stock in access to the farm site 68.8%; Pets or wildlife birds have access to inside of barns or feed storage 71.9%; yearly water quality is not checked by a reputable laboratory 96.9%; employees have routine contact with other poultry species 84.4%; regular cleaning and disinfection of feeders and drinkers washing is done mainly by soap in addition to water. 43.8%; employees and their families with other people on poultry housing site 100%; poultry production, feed consumption, and mortality records are kept, but not reviewed daily 18.8%; there is untrimmed vegetation and debris within barn(s) 81.2%; vehicle flow designated way traffic onto premises and off premises 100% and perimeter fencing and gate present but not always locked or guarded or fence not completed 56.25%. The study concluded that there is a severe weakness in the application of biosecurity practices in its three branches isolation, cleaning disinfecting and traffic control. The adopted hygiene and traffic control measurement were all within the high and medium biosecurity risk limits whereas mismanagement resembled 60.4% the highest risk of biosecurity practices among the studies in commercial poultry farms of ElFashir Locality. Therefore, it is strongly recommended for local authorities to intervene with qualified teams of poultry professional and experts to train poultry farmers, managers and attendees on importance of implementing sound biosecurity practices.

Keywords: Biosecurity Practices; Poultry Health; Poultry Performance; Quality Control

1. Introduction

Biosecurity has multiple meanings and is defined differently according to various disciplines, started out as a set of preventive measures designed to reduce the risk of transmission of infectious diseases in crops and livestock, quarantined pests, invasive alien species, and living modified organisms (30). Biosecurity and farm management will help decrease the chance of disease on the farm. The first step to disease prevention is protection from exposure to disease agents. Strictly following the biosecurity guidelines will assist to decrease the chance of outbreak. The application of biosecurity practices in its three branches Isolation–involves keeping of poultry protected from sources of infection including unauthorized access and carriers of disease and separating groups of animals to minimize the spread of infection across the population. Traffic control –involves limiting incoming traffic and traffic within the farm and controlling the movement of equipment, vehicles, people, feeds, birds and eggs to prevent exposure to disease.

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Sanitation –involves regular cleaning and disinfecting housing, equipment, vehicles, and people to destroy disease agents (47). Livestock and poultry birds are major causes of zoonotic diseases transmission chain. The food from livestock sources need to be free from disease causing agents to safe guard public health.(16)estimated that the global population of domestic chickens and ducks at over 18 billion and 1 billion, respectively. Based on the number of animals, poultry represents the largest domestic animal stock in the world (18). The industry is dominated by commercial farms while in developing countries; production consists of village or “backyard” (traditional) poultry, which is often extensive (44, 45). Backyard poultry is characterized by small flocks with low biosecurity measures. Commercial poultry farms represent around 80% of poultry stocks in many developing countries (45; 37), it's often consisting of free indigenous unselected breeds of various ages, with various species mixed in the same flock (23, 37). Poultry closely interact with humans in the same household as well as with wild birds and other livestock where they are also exposed to vermin and predators. Poor or absent disease control strategies and inadequate management practices result in high levels of baseline mortality due to predators (e.g. rodents, snakes, small carnivores) or infectious diseases (e.g. Newcastle Disease (ND), salmonellosis, Gumboro disease or fowl typhoid) (44;1; 27). Farm to fork chain must be clean and hygienic. There is a tremendous growth of poultry farming in the last six decades and it creates income generation in urban and per urban area (2). Commercial poultry farms encompassed (I) similar terms such as “indigenous poultry”, “native poultry”, “scavenging poultry”, “village poultry”, “local poultry”, “traditional poultry” or “free-range poultry” (33; 2) and (II) small scale semi-intensive systems (e.g. ducks free grazing in rice fields) (45). Backyard poultry is commonly associated with poor biosecurity conditions, small size (under 100 heads per flock) (44) and poultry rose by a family or in a household in rural or per urban areas. Poultry farms can be categorized into four sectors according to a classification system developed by the (14). Sector 1 and 2 farms, by definition, have lower levels of biosecurity than farms belonging to sector 3 and 4. Our search would include sector 3. However, we purposely excluded from the review the small-scale intensive poultry system, because of its different management system; a system characterized by higher levels of biosecurity and overall husbandry conditions (23; 41). Biosecurity does not start or stop at the household or farm gate. Considering biosecurity along the whole value chain is important, including in live bird markets, and between markets and the producer’s home (17). Economically sustainable and feasible biosecurity measures need to match the production system involved and the disease risks inherent in that system. Although ways of classifying these measures may vary, they all refer to the same basic principles of bio-exclusion and bio-containment (8) and were implemented via: segregation to raise barriers to infectious diseases, cleaning and disinfection (14, 19). The objective of the study is to analyses the evidence on the recommendations and use of biosecurity measures adapted to commercial poultry with a particular focus on farms around the ElFashir Locality.

2. Material and methods

Biosecurity has multiple meanings and is defined differently according to various disciplines, started out as a set of preventive measures designed to reduce the risk of transmission of infectious diseases in crops and livestock, quarantined pests, invasive alien species, and living modified organisms (30). Biosecurity and farm management will help decrease the chance of disease on the farm. The first step to disease prevention is protection from exposure to disease agents. Strictly following the biosecurity guidelines will assist to decrease the chance of outbreak. The application of biosecurity practices in its three branches Isolation–involves keeping of poultry protected from sources of infection including unauthorized access and carriers of disease and separating groups of animals to minimize the spread of infection across the population. Traffic control –involves limiting incoming traffic and traffic within the farm and controlling the movement of equipment, vehicles, people, feeds, birds and eggs to prevent exposure to disease. Sanitation –involves regular cleaning and disinfecting housing, equipment, vehicles, and people to destroy disease agents (47). Livestock and poultry birds are major causes of zoonotic diseases transmission chain. The food from livestock sources need to be free from disease causing agents to safe guard public health.(16)estimated that the global population of domestic chickens and ducks at over 18 billion and 1 billion, respectively. Based on the number of animals, poultry represents the largest domestic animal stock in the world (18). The industry is dominated by commercial farms while in developing countries; production consists of village or “backyard” (traditional) poultry, which is often extensive (44, 45). Backyard poultry is characterized by small flocks with low biosecurity measures. Commercial poultry farms represent around 80% of poultry stocks in many developing countries (46; 38), it's often consisting of free indigenous unselected breeds of various ages, with various species mixed in the same flock (23; 37). Poultry closely interact with humans in the same household as well as with wild birds and other livestock where they are also exposed to vermin and predators. Poor or absent disease control strategies and inadequate management practices result in high levels of baseline mortality due to predators (e.g. rodents, snakes, small carnivores) or infectious diseases (e.g. Newcastle Disease (ND), salmonellosis, Gumboro disease or fowl typhoid) (44;1; 27). Farm to fork chain must be clean and hygienic. There is a tremendous growth of poultry farming in the last six decades and it creates income generation in urban and per urban area (2). Commercial poultry farms encompassed (i) similar terms such as “indigenous poultry”, “native poultry”, “scavenging poultry”, “village poultry”, “local poultry”, “traditional poultry” or “free-range poultry” (34;

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The objective of the study is to analyse the evidence on the recommendations and use of biosecurity measures adapted to commercial poultry with a particular focus on farms around the ElFashir Locality.

2.1. Study Area/Study Population

ElFashir is the capital of North Darfur State, Sudan. Post, located at an elevation of about 730 meter (2395 feet), at 13°37'N, 25°19'E, subtropical desert / low-latitude arid hot climate, life zones system of bioclimatic classification is situated in or near the tropical thorn woodland biome. The mean annual temperature is 26.7°C (80.1°F) (13).

2.2. Questionnaire Construction

Questionnaire was used to gather information from 32 poultry farms covering all farms on the following: poultry farm (Layers and Broiler chickens), biosecurity events outside the premises, at the farm boundary, between the farm boundary and poultry house, and within the poultry house. The questionnaire was structured to obtain "yes" or "no" answers and only open for specific additional responses for clarity of answers.

2.3. Filling the Questionnaire

The questionnaire was filled by the farmer or farm personnel during farm visits conducted in July-October 2017 and validated by information obtained after observation of the farm environment, interview of the farmer, and checking of farm records on the farm and in the veterinary clinic where the farm was registered. The validation was necessary in order to eliminate response bias which could weaken the strength of questionnaire survey (35).

The questionnaire design was based on a protocol that consisted with the Asean biosecurity management manual (4).

2.4. Questionnaire analysis

Data generated were exported to Statistical Package for Social Sciences (SPSS®) version 17 (46) and were analysed, using descriptive statistics to calculate frequencies and percentages.

2.5. Scoring biosecurity risk levels

Criteria used for scoring biosecurity risk levels. Scoring of risk levels was done using a numerical system of 0-3 adopted from (47) shown in table 1

Table 1 Criteria used for scoring biosecurity risk levels

3= High risk	Recommended to determine biosecurity protocols in these areas should be or can be changed to better protect flock and the rest of the industry.
2=Medium risk	Improvement and may consider consultation with poultry veterinarian to review these practices and assess the value of making changes to further safeguard your flocks.
1=Minimal risk	Efforts should be directed toward improving the biosecurity practices that score in the previous categories to meet these levels.

3. Results and discussion

Biosecurity is the implementation of measures that reduce the risk of the introduction and spread of disease agents. Biosecurity requires the adoption of a set of attitudes, behaviors (including production systems), and motivation of people to reduce risk in all activities involving domestic, captive exotic, and wild birds and their products (15). The response rate to the questionnaires was 100% and comprised of poultry farmers from ElFashir locality North Darfur State.

Table 2 showed that the characteristics of respondent's, sex, educational status and occupation, about 81.2% of the respondents were male and 18.8% were female. The collect data indicated that 62.5% of the respondents were graduates, 6.3% had under graduate education, where 31.3% of them were at limit of secondary education. The fact that two thirds of respondents were agricultural graduates (animal production and veterinarian), despite the fact that there are specialists in the field of poultry raising in ElFashir locality by more than 65%, but the procedures of biosecurity practices is very weak.

Table 2 Characteristics of Respondent's, social information and Occupation from ElFashir locality areas of North Darfur State

Factor	Frequency N= 32	%
Sex		
Male	26	81.25
Female	6	18.80
Educational status		
Graduate	20	62.50
Under Graduate	2	06.25
Secondary	10	31.25
Occupation		
Animal Production	16	50.00
Veterinarian	5	15.63
Supervisors technician	10	31.25
Business man	1	03.13

The Traffic control (location, premises entry, manure haulers,) were shown in Table 3. shown significant differences ($P < 0.05$) in all data answered, 84.4% farms are very close to the public road, this Generates noise and discomfort to poultry 53% farms are assembled up with a particular scattered poultry is increasingly seen as a production that is not environmentally friendly and treated either as a pressure or as a driving force intensification. Concentration, and an increase in operation size, has been coupled with some detrimental environmental consequences (38).

The barns in each farmstead are kept less than 30 yards. One-quarter of the farms have ponds and dams to store water for agriculture activity on farms, as the presence of dams attracts wild birds, particularly waterfowl, on to a farm, their presence is a potential biosecurity risk due to the potential for introduction of pathogens to chickens on the farm. Potential pathways include contact of free range chickens with waterfowl on the range, or the consumption of contaminated drinking water from the dams. For the latter, it is especially prudent that farmers treat water sourced from dams to reduce this potential. 62.5% of the farms have no cautioning signs. 93.9% there are no vehicle washing or tires disinfecting of entering the farm. There are no dedicated parking spaces in all farms, there are several indicators that have a broader range of responses, one of these is parking and vehicle washing, low biosecurity with regard to this indicator means there is no designated parking area, no car wash area and no high pressure pump available to clean vehicles as they enter. 87.5% of the farms are not clean and if they are partial, 93.8% are not treated. 90.6% Insects and rodent beetles around barns. 81.2% there are remains of debris, grass and grass around the barns. Bushy surroundings around poultry farms would allow breeding of insects and rodents which will attract wild birds and reptiles likely to introduce NDV into the farm (48). These rodents and wild birds may have access to poultry feed and might contaminate

the feed and litter with their manure containing infectious diseases agents (6, 32) a poultry site must be prepared methodically for the entry of each new batch. In general, the Traffic control is very poor in the investigated farms, where there is a very high risk of obstruction. Many of the factors that contribute to the transmission of diseases to birds such as beetles and rodents, the entry of vehicles to farm space with no bathtubs for vehicles to cleanse them. Diseases caused by bacterial and viral, and protozoan infections all these diseases impact seriously in poultry production are those of greatest concern to poultry producers, rodents also carry ecto-parasite such as lice, fleas, and mites. It is probable that several disease-causing pathogens will be present during routine animal production, although specific disease problems may not be evident. Secondary infections with enzootic flock pathogens can be important, where secondary infections are important determinants of morbidity and mortality (31). The efforts to minimize vectors can significantly reduce disease transmission and corresponding economic losses. (42) Vectors include rodents, wild birds, insects and internal and external parasites, which can bring pathogens to poultry facilities. Pathogens may be transferred via such as fecal material (including wild birds' feces, feathers or dust) and by wind, water or in feed. (26) The major vertebrate pests on poultry ranches are mice, ground squirrels, wild birds, and rats. Rodents, feral animals and birds can be sources of pathogens for poultry. Wild birds can transmit mycoplasma gallisepticum and Fowl Mites, and rodents can be carriers of fowl cholera and salmonella sp. Recent demonstration of salmonella associated with mice has raised visibility and concern about mice in and around poultry ranches. More farms 96.9% do not have dedicated parking spaces and tire decomposition factors that help in the transmission of many pathogens through them. Manure and litter not treated before leaving the farm 93.8% poultry production adversely affects the environment in numerous ways –through poor management of manure and litter, waste streams from birds' death birds, dust, insects, odour, etc.

Table 3 Traffic control (location, premises entry, manure haulers,)

premises entry/security	Response to biosecurity risk %	Risk level
Proximity of poultry to public road Greater than 100 yards	100	1
Gated always kept locked and doors	84.4	1
Poultry farms near population accommodation	84.4	3
Farm located in poultry dense area	53.8	2
Distance between poultry houses 15-30 yards	100	3
Presence of dam or pond within farm	25	1
Perimeter fencing and gates present but not always locked or guarded	56.25	2
Biosecurity signage No biosecurity signage or signage only in English	62.5	2
Vehicle entry and disinfection inadequate vehicle disinfection station	93.8	2
Vehicle parking there is not a designated parking area	96.9	1
Vehicle flow designated way traffic onto premises and off premises	100	3
Clean and dirty areas at entry to premises inadequate/intermittent use	87.5	1
Manure handling Not treated before leaving the farm	93.8	1
there an active fly beetle and rodents control program seasonal	90.6	1
There was untrimmed vegetation and debris within barn(s)	81.2	3
Overall	80.6	1.71

Furthermore, intensive poultry production is held responsible for the emission of greenhouse gasses, acidification, and eutrophication. These workers mention that (36; 29; 39) the magnitude of environmental impacts is highly dependent on production practices and especially on manure management practices. One of the major problems is the accumulation of large amount of wastes, especially manure and litter, generated by intensive production. Most of the manure and litter produced by the poultry industry is currently applied to agricultural land. When managed correctly, land application is a viable way to recycle the nutrients such as nitrogen, phosphorous and potassium in manure. In agriculture, the contamination of litter and soil is an important health issue that can lead to outbreaks of food poisoning in humans (12).

Workers observed that pollution and nuisance problems can occur when manure is applied under environmental conditions that do not favor agronomic utilization of the manure-borne nutrients (7; 28). Methods of disposal include landfill, burial in trenches, burning, and composting, check the effectiveness of cleaning and disinfection, the main problems are the accumulation of large amounts of waste, especially compost and garbage, resulting from intensive

production(32).One of the things used in commercial poultry farms in ElFashir is to follow the system of entering 'all-in/all-out' (32) the important requirements to facilitate hygiene and sanitation is adoption of the 'all-in/all-out' method, together with the restriction of each enterprise to a single type or species of bird. In general traffic control mean to prevent exposure to disease, but the limiting incoming traffic and traffic within the farm and controlling the movement of equipment, vehicles, people, feeds, birds and eggs very low.

Table 4 The sanitation practices and biosecurity risk levels in poultry house as indicated by respondents from ElFashir locality North Darfur State

The people entry, personnel biosecurity in poultry house	Response to biosecurity risk %	Risk level
Employees have routine contact with other poultry species	84.4	3
Employees and their families with other people onsite housing	100	3
Employees own poultry or pet birds	68.8	2
Foot pans for disinfection before the house adapted to suit this purpose	81.3	3
Regular cleaning and disinfection of feeders and drinkers washing is done mainly by soap used in addition to water.	43.8	2
Must visitors wash hands and wear farm provided clothing and footwear?	53.8	3
Visitors are allowed to bring vehicles inside perimeter fence	18.8	2
Usage of gloves and boots are not regular washed and disinfected	84.4	3
Personnel move between farms following a specific multi-farm management biosecurity protocol	12.5	1
Poultry production, feed consumption, and mortality records are kept, but not reviewed daily	18.8	3
Biosecurity training is provided for employees	43.8	3
Vaccination practiced by crew strictly follows their biosecurity protocol.	96.9	1
overall	70.7	3.0

From the table 4 shown that 84.4% of poultry farm workers are in contact with other types of birds. All farms workers are located alone or with their families. 68.8% of them have domesticated birds or pets. More than four fifths farms 81.1% Usage of gloves and boots are not regular washed and disinfected. Less than half of the farms 43.8% use disinfectants and soaps to clean and clean the equipment of barns and mattresses. Absence of records In many farms, only 18.8% keep records on farms, record keeping is extremely important to successful poultry production for financial decisions. Feeding decisions, breeding decisions, productivity of birds, etc. noted that one possible approach to improving limited farming is through the use of farm records. Without farm records, a farmer will not make it very far in today's business environment. This is because a farmer who maintains an adequate set of records can usually handle problems better than the one who does not (24). May due to poultry farmers have a relatively low experience in poultry farming, or to the small numbers of birds kept by poultry farmers is likely to reflect on their farm record keeping activities (40) added that small-scale farmers are likely not to show interest in keeping farm records because they know that because of the small size of their farm holdings they will not be able to effect economies of scale. Keeping and analyzing farm financial records are essential to the efficient management of a farm business (10). Developing and using a farm record-keeping system will allow the farm manager to make more informed decisions affecting the profitability of the farm. More than half the farms (43.8%) do not care about the biosecurity training, may due to non-compliance with biosecurity practices has been related to inadequate training farmers and limited or non-communication between farmers and technical service providers The World Health Organization(49) provides guidelines that enhance safety and security in containment laboratories if strictly adhered to. Order the level of risk of biosecurity is very high at ratio overall were (3.0), biosecurity is about managing risk to meet the objectives stated above. The level of biosecurity was lower in barns, mainly due to the poor confinement against the outdoor environment and the poor infrastructural hygiene. It is essential that a risk assessment be conducted to implement control measures appropriate to these levels of risk. The arrival, operation and departure of feed trucks, loading trucks, and clean out equipment contribute to noise

levels outside the barn. Unattended alarms which go off due to the poor farm management can be another source of annoyance to neighbors. Feed delivery trucks should be scheduled during the day to minimize impact of noise on neighbors.

Truck drivers should be instructed not to use engine brakes in the neighborhood and should drive directly to the nearest trucking route from the farm. Truck engines should be turned off while birds are being loaded. Work environments which require raising the voice to communicate at a distance of 1 meter, are above safe working levels (5). When such a breach of biosecurity occurs, pathogen spread, amplification, (3). Investigated that trucks containers used to transport farm animals can be contaminated with pathogens (43). It appears that poultry farms who are close to important sources of risk such as neighboring farms and roads may believe that can contribute to high the risk. Sanitation mean to destroy disease agents, nevertheless regular cleaning and disinfecting housing, equipment, vehicles, and people, this branch is not controlled in the form that contributes to the clearance operations and the accompanying procedures very pathetic.

Table 5 Isolation specific biosecurity measures by farm standards, personnel and visitors in Elfashir, as assessed in a survey of 32 broiler and layers

Isolation specific biosecurity measures	Response to biosecurity risk %	Risk level
Perimeter fence exists and driveway is gated and always kept locked	84.4	2
There is no clearly identified designated visitor parking area	71.9	2
Practice all-in-all-out management.	84.4	2
Lock for each house padlock or firmly secured entrance/door	71.9	2
Footbaths are used (changed daily or when visibly soiled)	59.4	2
Maintained the premise only during downtime (between flocks)	21.9	3
Each farm has its own set of designated outerwear is NOT available	59.4	2
Poultry houses designed and maintained to prevent the entry of wild birds and rodents	68.8	2
Full access outdoors, some loose, stray poultry seen inside the poultry houses	62.5	2
Water quality is checked by a reputable laboratory yearly	3.1	3
Small tools are brought onto the farm without cleaning and disinfection	43.8	3
Feed storage containers and delivery systems are not water-proof	62.5	2
Other domestic stock is access to the farm site.	68.8	3
Pets or wildlife birds have access to inside of barns or feed storage	71.9	2
Other avian species kept on the farm.	31.2	3
Manure and dead birds are removed, delivered away far from the premises	81.3	2
No restrictions on contact with other birds poultry	59.4	2
overall	54.9	2.33

Table 5 shown isolation specific biosecurity measures the data show no significant differences ($P > 0.05$) 71.9% of farms have no parking area. A third of the farms do not close the doors of the barns. More than one-third 40.1% do not use foot baths at the barn entrance. Similarly one-third 40.1% do not use work clothes. 31.2% of the farms are poorly designed buildings allowing rodents to enter wild birds, these results touch on the complex topic of factors that influence biosecurity compliance on farms by farmers ; such factors include the perceived threat of disease, ease and benefits of performing the practice, and personality traits (34). Rodents can transmit about 35 different diseases affecting man and other domestic animals; primarily contaminate animal feed in storage areas and feeders through urine and faeces (25) and (11). The squirrels harbor fleas capable of transmitting plague bacteria, and are thus a public health threat as well (26). Wild birds introduce various disease organisms and ectoparasite into commercial flocks. Passerine birds can serve as reservoirs of numerous avian parasites and pathogenslice and northern fowl mites are maintained on wild birds and transmitted to caged flocks when feral birds are permitted entry to the houses. 62.5% of the farms allow the exit of birds from the barns to the yard. Only one farm tests the availability of water annually. 43.8% The equipment is exchanged

between the farms without disinfection and sterilization, poor management practices or the identification of any health behavior or problem occur, thus contributing to the spread of pathogenic causes, especially using equipment contaminated, unclean or unsterile. Loose equipment should be soaked in detergent, rinsed and allowed to dry before re-use (20). 62.5% of the roofs of the warehouses allow rain water to enter; broken roofs can cause damage to the rations and contaminate it with fungus and mold. Wild birds can enter through the openings into storages and warehouses and pollute their manure, causing disease transmission. 68.8% Are found in the same farm employees own poultry or pet birds. Keeping pets' animals and poultry in the same premises is a major biosecurity concern, the national farm biosecurity manual for the Australian poultry industry states that this should not occur and that farm staff must not come into contact with other avian species (9).

71.9% of farms wild birds can be seen in barns and feed stores; there was a significant negative association between compliance of wild bird proofing sheds and farmer-observed importance of wild birds. There was negative relationship between wild bird presences in sheds this means that when farmers either performed wild bird proofing of sheds or reported wild birds in sheds, their perceived importance of wild bird control was lower. Reasons for these associations may be due to general un awareness of the significance of wild bird presence inside sheds in terms of pathogen transfer. 59.4% there are no restrictions preventing contact with birds directly in the barns. The presence of poultry abroad mixed with wild birds contributes to the elimination of diseases as a result of contact between them feeding and drinking together in the same equipment's. Disinfection is the least reliable element of biosecurity and depends on many factors, particularly on the quality of cleaning and water hardness. The risk of bacterial and protozoa increase as the number of persons visiting the flock increases. Pathogens can enter industrial farm animal production operations in a number of ways, including carryover from previous production cycles, from unrelated domestic or wild animal vectors, and through contaminated feed or water. Founded that smallholder farms do not require the shifting of animals between stages of production and eliminate the need for mass long distance live animal transport (21, 22). Isolation mean to minimize the spread of infection across the population but this branch is very weak to keeping of poultry protected from sources of infection including unauthorized access and carriers of disease and separating groups of animals

4. Conclusion

There is a severe weakness in the application of biosecurity practices in its three branches isolation, traffic control and cleaning disinfecting. The biosecurity control score consist of many biosecurity control indicators to reduce the flock to disease incursion, the control level is very low, overshadowed by neglect by producers of commercial poultry production in locality biosecurity on poultry farms is to be encouraged we need to understand the drivers of adoption and the types of poultry farms that are more likely to improve biosecurity. Understanding a poultry farmer's decision making process with regard to biosecurity adoption is the first step in the industry. Therefore, it is strongly recommended for local authorities to intervene with qualified teams of poultry professional and experts to train poultry farmers, managers and attendees on importance of implementing sound biosecurity practices. We recommend that in carrying out activities in training in the future for those engaged in poultry breeding activities and conducting seminars.

Compliance with ethical standards

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Disclosure of conflict of interest

There was no conflict of interest

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