

Evaluation of Biosecurity Status in Commercial Broiler Farms in Sri Lanka

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Abstract- Biosecurity is the practice designed to prevent the spread of diseases onto farm, with in farm and out from the farm. It has three major components, isolation, traffic control and sanitation. Good biosecurity should be practiced at all the time and it is the cheapest and the most effective means of disease control. Therefore, objectives of this study were to evaluate and grade the commercial broiler farms according to the present biosecurity status and to correlate the performances with biosecurity status of those farms. A questionnaire covering all basic conceptual, structural and operational aspects of biosecurity was used to collect data from 80 commercial broiler farms in Central Province of Sri Lanka. Minitab software was used to analyze the data. There is a significant negative correlation ($p < 0.05$) between average catching age with overall biosecurity status. The average body weight has shown positive correlation while average mortality% and FCR having negative correlation though not statistically significant ($p < 0.05$). The biosecurity status of most farms falls to category of “Average” representing about 56%, while “Good” and “Poor” had about 15% and 27% of farms, respectively. There were very few broiler farms found in categories of “Excellent” and “Very poor” in terms of overall biosecurity status.

Index Terms- Biosecurity, commercial broiler farms

I. INTRODUCTION

With the development of modern poultry rearing methods, backyard poultry farming is less prominent in the modern world. Most of the technologies and developments direct the industry toward the intensive management system where huge numbers of birds are confined to limited space with improved environmental facilities. Main disadvantage of this system observed in recent past is that when an outbreak crop up infection spreading rate is more rapid causing significant economic losses. Recent outbreaks of highly pathogenic Avian Influenza (HPAI) is a good example for such a huge loss (Rushton et al., 2005; FAO, 2014). Once birds get infected, control measures and treatments to prevent further spreading the infection and mortality is more often failed. Therefore, prevention of infectious diseases has become a priority. Thus, strict sanitation, quarantine and biosecurity within the farms, country and between the borders become an important issue today.

Biosecurity is the practice designed to prevent the spread of diseases onto farm, with in farm and out from the farm (Jeffrey, 1997). It is achieved via maintaining minimum entry of organisms such as bacteria, viruses, rodents etc. cross the farms. It has three major components, isolation, traffic control and sanitation (Jeffrey, 1997). In order to have an effective disease prevention programme, good biosecurity should be a priority and should be practiced at all times. Taking the right measures will help to protect not only birds, but also poultry industry, business as well as community.

In Sri Lanka, poultry industry is the fastest growing and the most developed livestock sub sector (Central bank 2014). There are three grandparent farms and nearly 33 registered breeder farms operating in Sri Lanka. Moreover, there are more than 15 chicken meat processors in the country. Most of these large scale companies maintain environmental controlled broiler houses for the purpose of efficient broiler meat production and thereby to meet high chicken meat demand. Management practices in these controlled houses are highly advanced and high importance has been given on effective health management through strong biosecurity programme.

However, the majority of the commercial broiler farms in Sri Lanka are side walls open houses and small scale in nature. Often farmers have poor knowledge on diseases and their spreading, biosecurity and overall farm management. It has been estimated that disease cost for commercial broiler industry is about 10% of the total cost of production (Waller, 2007). These losses can be attributing to direct mortality and indirectly from downgrading, poor performances, cost for medicine and condemnation. Moreover, there is an overuse of antibiotic and other supplements since most of the poultry medicines available in the country can be purchase over the counter. As a consequence, development of antimicrobial resistance and deterioration of the quality of the end product has been observed. For example, antibiotic residue is becoming a critical factor in meat quality certification system.

It is a question very often asked, whether commercial broiler farms in our country having basic and practicable biosecurity measures to overcome important health problems. Therefore, the objectives of this study were to evaluate the basic biosecurity status of commercial broiler farms in the country and to rank them according to the available biosecurity measures. Therefore, a survey was conducted to evaluate the biosecurity status in commercial broiler farms in Sri Lanka.

II. METHODOLOGY

A questionnaire was designed to cover aspects of conceptual, structural and operational biosecurity. Conceptual biosecurity consists of information on awareness on biosecurity, hygiene, record keeping and overall farm management whereas structural biosecurity consists of questions on location of the farm, housing system and arrangement within the houses. Under operational biosecurity, information on bird rearing, feeding and watering, storage, transportation, disposal, cleaning, disinfection and treatments, were gathered. Data were collected from randomly selected 80 medium scale broiler farms in Central Province of the Sri Lanka. Total of 120 marks were allocated to the questions in questionnaire according to the strength and important of biosecurity and then the farms were graded as follow. Marks greater than 80% was ranked as 'Excellent', 70-80% as 'Good', 60-70% as 'Average', 45-60% as 'Poor' and below 45% as 'Very poor'. 'MINITAB' statistical software was used to analyze the data.

III. RESULTS AND DISCUSSION

The total of 80 farms were categorized according to the strength and important of biosecurity and then the farms were graded as 'Excellent', 'Good', 'Average', 'Poor' and 'Very poor'. The percentage of farms in each category is given in figure 1. According to the results 56% of farms belong to the category of 'Average' and 15% and 27% came under 'Good' and 'Poor' groups, respectively. One farm is in 'Excellent' category and none of the farms were in 'Very poor' category. This indicates that most of the farms having average basic biosecurity status and few farms available with perfect conditions in terms of biosecurity.

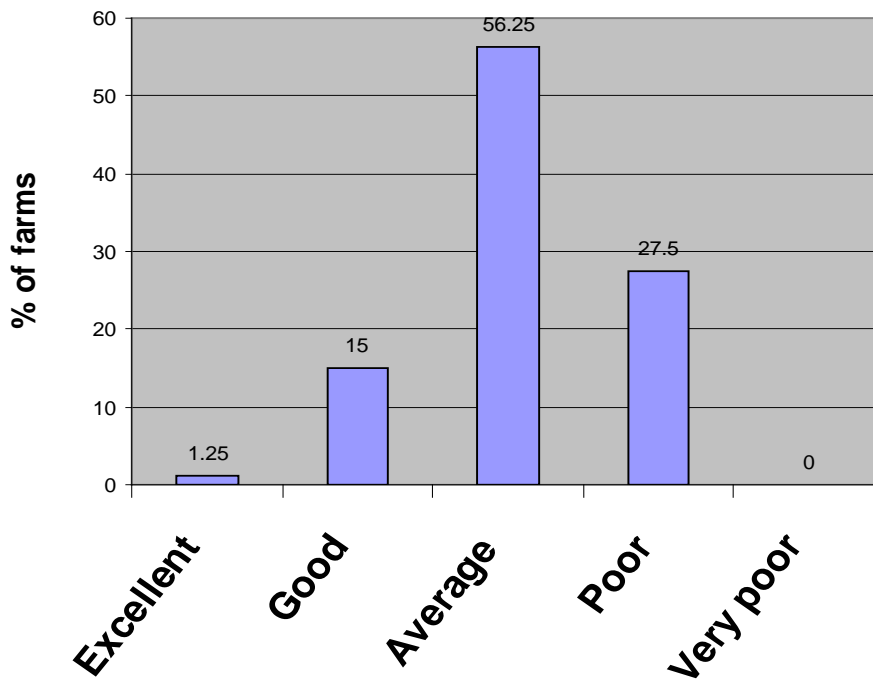


Figure 1: Percentage of farms categorized according to overall biosecurity status

Biosecurity status of broiler farms directly affects the performances of birds. The performances of broiler birds in different farm categories based on overall biosecurity status are given in table 1. When the biosecurity status is improved in the farm, disease challenge will be reduced and the environment become more favorable for birds' performance.

Table 1: Comparison of broiler performances with different category of farms

Farm Category	Average catching age (days)		Average final body weight (kg)		Average FCR		Average mortality %	
	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI
Excellent	39	-	2.05	-	1.80	-	2.5	-
Good	40	39.11-41.55	2.00	1.83-2.16	1.83	1.67-1.83	3.7	3.30-4.19
Average	41	39.89-41.29	1.95	1.93-2.00	1.83	1.75-1.84	3.7	2.99-4.28
Poor	42	41.07-42.86	1.90	1.81-1.98	1.85	1.80-1.88	4.2	3.40-4.70
Very Poor	-	-	-	-	-	-	-	-

95% CI- 95% Confident Intervals

There is 100 g final body weight difference between excellent and average levels of farms. However, the FCR remain more or less same. This concludes that the feed cost to produce 1 kg live weight is less in excellent farms as the environment more conducive to exploit the optimum genetic potential of broiler birds with minimal disturbances from pathogens. Moreover, average total mortality is less in excellent category (2.5%) compared with category ‘good’ (3.7%). Therefore, good biosecurity reduce the economic loss for drugs and other medications bringing down the cost of production. Furthermore, catching period is shortened by two days in excellent category compared to good category. This is important to have more batches per year which ultimately increases the production per year. This is important to increase down time and more cycles of batches with in the year. Good, Average and Poor farms performances are in-between 95% confident intervals value and they are significant with z test.

Regression analysis was performed for total biosecurity score with average final body weight, average catching age, average mortality% and FCR. Average catching age had significant negative correlation ($p < 0.05$) with final biosecurity score. Though statistically not significant, average final body weight had positive correlation while average mortality% and FCR had negative correlation. That means when total biosecurity score increases average body weight increases while total mortality %, FCR and final catching age decreases.

A. Conceptual biosecurity

When considering the conceptual biosecurity aspects among broiler farms, record keeping and technical consultation are good while other areas such as awareness of important of biosecurity, diseases and their transmission, farm management and farm hygiene are remain as average (Table 2).

Table 2: Percentages of conceptual biosecurity status among broiler farms

	Good %	Average %	Poor %
Awareness of important of biosecurity	15.00	72.50	12.50
Awareness of diseases & transmission	7.50	71.25	21.25
Hygiene of farm	7.50	76.25	16.25
Record keeping	43.75	36.25	20.00
Overall farm management	15.00	76.25	8.75
Technical consultation/ services	45.00	43.75	11.25

Participation of private sector is high and competitive in poultry industry in Sri Lanka. Therefore, they provide extension services for their customers free of charge. This service had helped to improve the conceptual biosecurity among the poultry farms. Other possible reason could be the farmers are profit oriented and therefore they are also concerned about the biosecurity.

B. Operational biosecurity

Operational biosecurity is the real day to day management or practices done in the farms. It includes many activities and concepts. Figure 2 illustrates the evaluated aspects of operational biosecurity in this study.

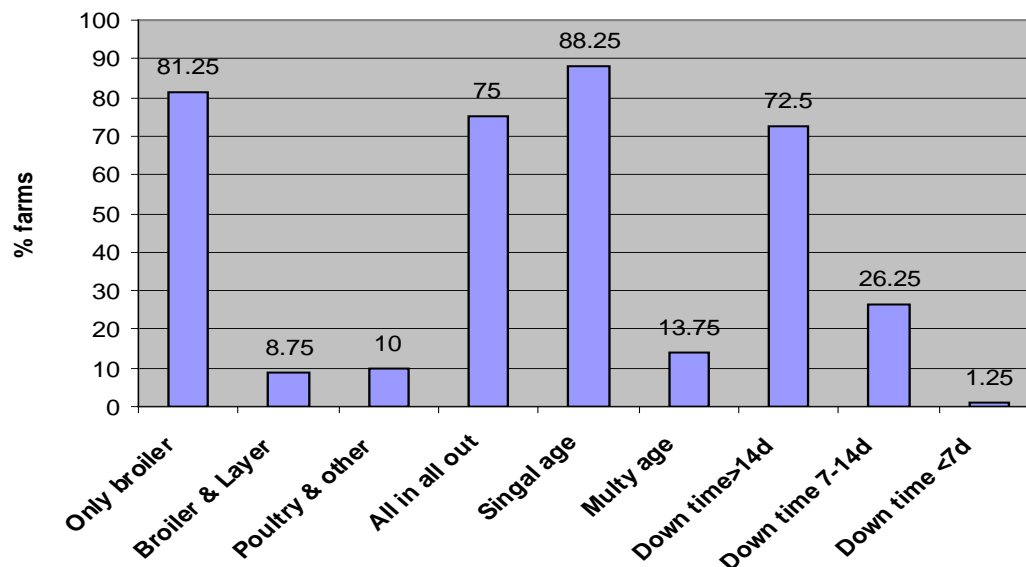


Figure 2: Different operational biosecurity measures among broiler farms.

Majority of the farms under this survey reared only broiler birds and there were few farms who reared layer birds and other livestock. All in all out system with single age flocks was the common practice. Awareness about cross contamination of germs and limitation of physical and economical recourses of the farmer may have influenced to stick to this system. Down period in most farms were more than 14 days.

Contaminated water is capable to carry infectious agents and transmit the diseases within and among the poultry flocks. Therefore, source of water and methods of water treatment quite important when concern in biosecurity. Figure 3 elaborates the different type of water sources and water treatment methods. Tap water was used in most of the farms as the water source and chlorination is the main water treatment method that practiced by farmers. About 55% practice water treatment while 44% are not using any water treatment method. Chlorination is more common due to low cost and effectiveness.

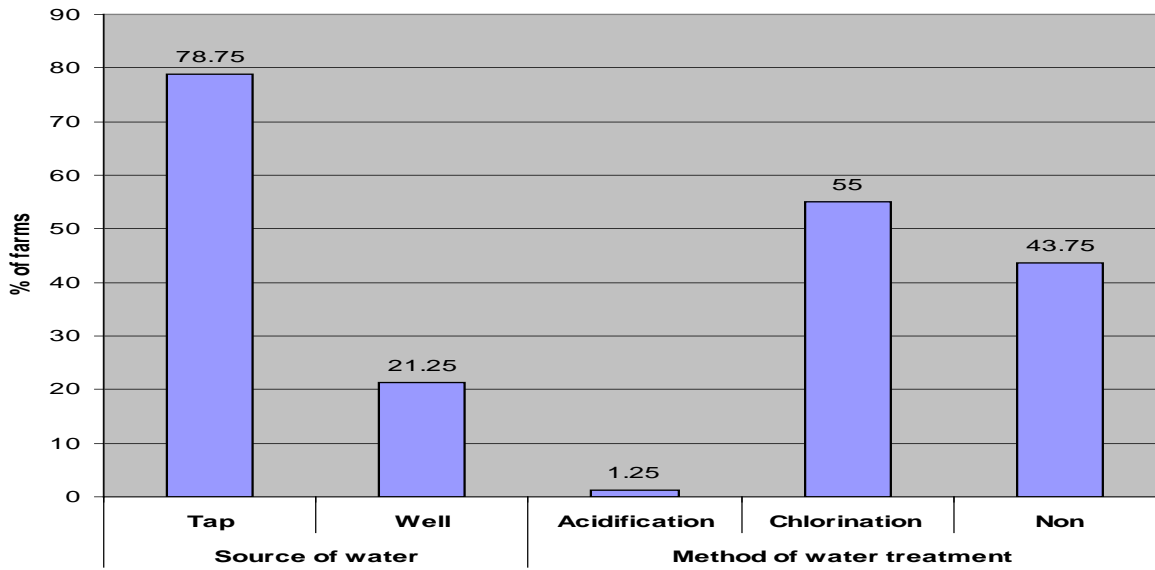


Figure 3: Percentage of farms which used different type of water sources and water treatment methods.

Carcasses and litter disposal is more important in prevention and control of diseases in poultry farms because these are the sources which are rich in infectious agents. Figure 4 shows the different methods of death bird and litter disposal methods among broiler farms.

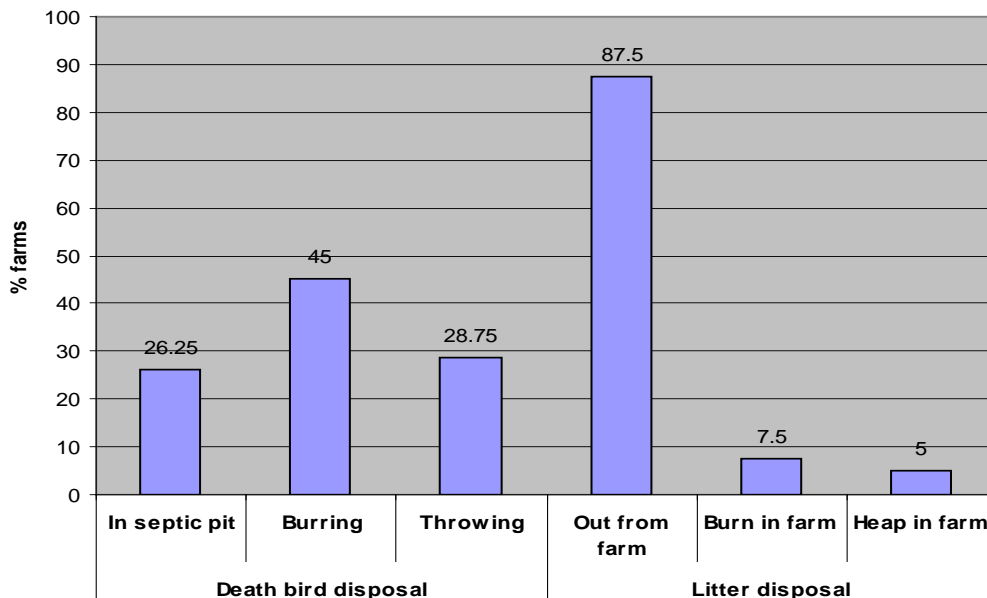


Figure 4: Comparison of different methods of death bird and litter disposal in broiler farms.

As far as the disposal of carcasses are concerned, majority of the farmers are practicing burring the carcasses (45%), and 26% used septic pit for disposal while 29% got no proper disposal system. These farmers throw the dead birds in the farm carelessly without realizing any risk. Majority of farmers dispose used litter by taking out from the farm. Farmers are aware of dead birds and litter materials as sources of carrying diseases. In addition, farmers are making extra profit by selling litter material directly or after composting.

About 90% of farmers are vaccinating their flock against most common prevailing poultry diseases such as Infectious bursal disease (Gamboro) and Newcastle disease. Figure 5 shows the status of vaccination among the broiler farms. Farmers are well aware on the consequences of economical loss of inadequate vaccination based on their own experience. Hence, vaccination against common poultry diseases is common among the farms investigated.

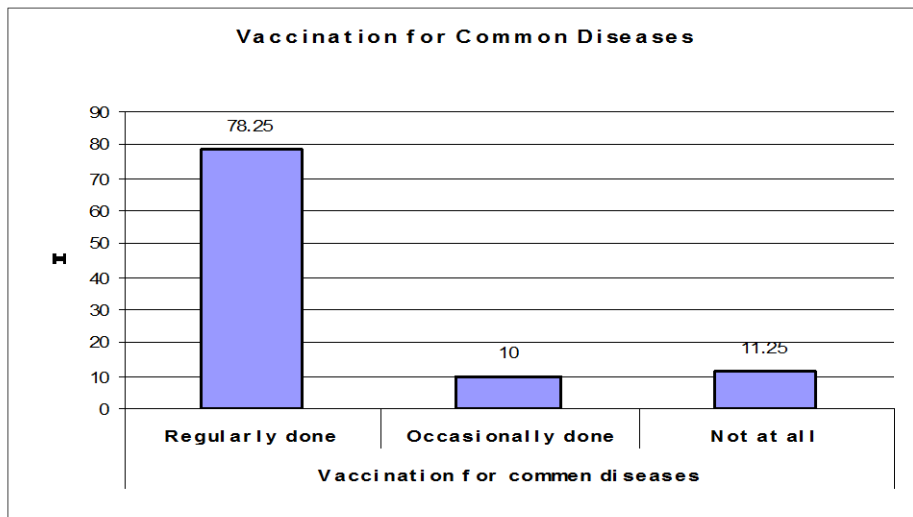


Figure 5: Use of vaccination for common diseases in broiler farms

However, irrespective of the biosecurity status in farms, diseases outbreak were recorded in all most all categories of farms. Colibacillosis, Salmonellosis, Chronic respiratory diseases (CRD), Coccidiosis and infectious bursal disease are the most common diseases in the broiler farms. Some of the chick born diseases and easy access to visitors increases the mechanical transmission and incidence. Figure 6 express the disease status recorded among the broiler farms.

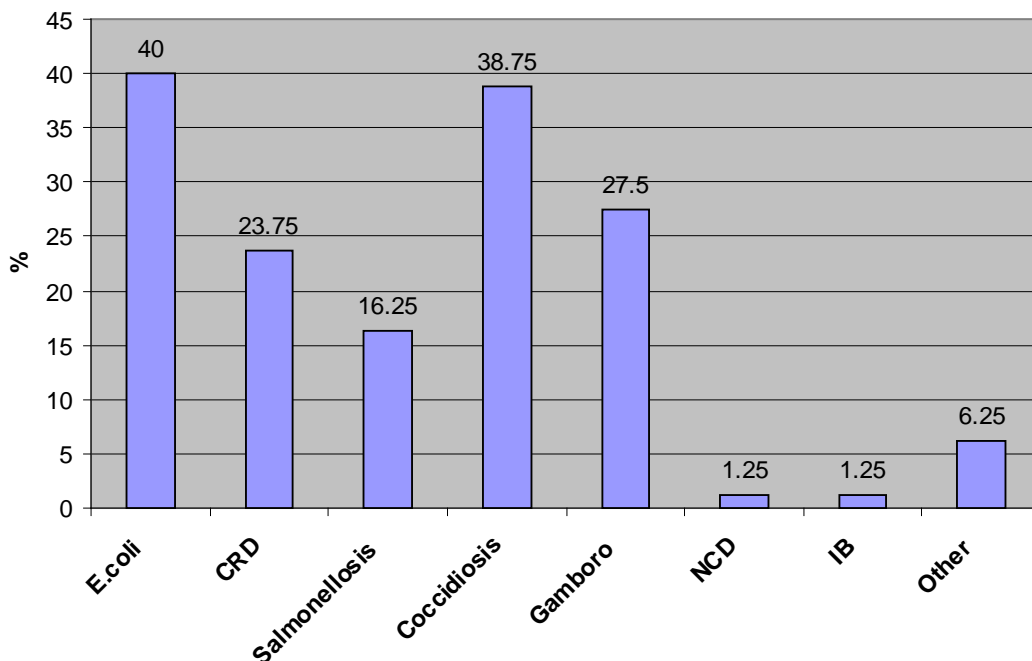


Figure 6: Common diseases recorded in broiler farms.

E.coli infections show highest distribution among selected poultry farmers while coccidiosis, Gumboro, CRD also shows moderately higher distribution. New castle disease, Infectious bronchitis and other diseases such metabolic disorders are less common in these selected farmers.

IV. CONCLUSION

In conclusion this survey shows that majority of commercial broiler farms belong to the category of 'Average' in biosecurity status. The body weight, mortality%, FCR and final catching age differs with different category of biosecurity status. Biosecurity status significantly influenced catching age of the birds. Whatever the biosecurity status, incidences of diseases are high among all the farms. Disease incidences are high irrespective of the status of biosecurity of the farm.

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