RESEARCH ARTICLE

Farm Biosecurity Measures among the Commercial Livestock and Poultry Farmers

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Abstract

Animal diseases have a major impact on the livestock sector production worldwide. Infectious diseases spread in farms from environment as well as through visitors, vectors, stray animals etc. Proper biosecurity measures are known to protect the animals from various infectious or non-infectious diseases as biosecurity and animal welfare are intrinsically linked. This study was designed to investigate the existing knowledge level of commercial dairy, pig and poultry farmers regarding various biosecurity measures. Uttar Pradesh was selected purposively keeping in view its highest meat and milk production in the country. A total of 120 farmers (40 from each group, *viz.,* dairy, pig and poultry) were selected randomly. An interview schedule was developed to collect the data. Standardised knowledge test was administered which was having 29 items under seven dimensions, *viz.,* location and design of farm, restricted access, isolation and quarantine, cleaning and disinfection, management of feed and water, disposal of carcass, manure and waste and health management. The major findings of the study revealed that 47.50% of the respondents had medium level of knowledge regarding overall biosecurity. Dairy farmers showed comparatively lower knowledge than pig and poultry farmers. An overall knowledge gap of 24 % was estimated. Highest knowledge gap of 32% was seen in case of disposal of carcass, manure and waste. The gap can be narrowed down by imparting proper education along with creating awareness regarding biosecurity.

Keywords: Biosecurity, Dairy, Knowledge gap, Pig, Poultry.

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Introduction

Due to decelerating land holding, farming methods have become more intensive, which is leading to adverse health effects. The type of production system plays a greater role in disease occurrence and spread. Animal which are reared in intensive system are more prone to infectious diseases as they have to deal with detrimental welfare issues during their production cycle (Diana *et al.,* 2020). Biosecurity consists of the procedures and measures envisioned to prevent pathogens entering and spreading within a farm (Dewulf and Van Immerseel; 2018). Various risk factors related to external and internal biosecurity, *viz.,* improper ventilation, overstocking quarantine procedures when combined with other stressful conditions, make the animal more susceptible to the health hazards It has been widely acknowledged that animal health and welfare are intrinsically linked (Pandolf *et al.,* 2018) and that good welfare measures may have positive impact on health and productivity of animals (Pandolf *et al.,* 2018; Henningsen *et al.,* 2018). Stokstad *et al.* (2020) extensively discussed regarding the role of biosecurity measures in preventing respiratory maladies in cattle. Biosecurity and welfare together are acknowledged as basic principles of proficient livestock management. There are many kinds of infectious diseases which can spread in a farm through contaminated environment, water and feed as well as through infected visitors, vectors, stray animals and birds. As per reports of

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Chauhan *et al.* (2019) on bovine TB in smallholder dairy farms in India, it is evident that due to lack of awareness about the possibility of bovine TB, knowledge among the farmers regarding the prevention and control was completely absent. Keeping these facts into consideration, the current study was aimed to assess the existing knowledge level of commercial livestock and poultry farmers of Uttar Pradesh pertaining to biosecurity.

Materials and Methods

The investigation was carried out in Uttar Pradesh, the study included commercial dairy, pig and poultry (broiler) farmers of selected area. An *ex-post-facto* research design was used to study the existing biosecurity levels. For the present study, commercial farmer was operationalised, who runs dairy, pig and poultry farm as business venture with minimum herd/flock size of 10 Livestock Unit (LSU) and earns a significant part of his income through these ventures. A total of 40 farmers from each group, *i.e.,* dairy, piggery and poultry (broiler) were selected randomly from the sampling frame which made the total sample size of 120. A test was developed and standardized for assessing the knowledge of farmers. Out of 56 items, a total of 29 items were screened for final knowledge test and administered to the respondents. The respondents were asked about their knowledge level on various biosecurity measures under seven dimensions, *viz.,* i) location and design of farm, ii) restricted access, iii) isolation and quarantine, iv) cleaning and disinfection, v) management of feed and water, vi) disposal of carcass, manure and waste and vii) health management. The knowledge test was in the form of multiple-choice questions (MCQs) and a score of 1 was added for each correct answer given by the respondents. Accordingly, the results were calculated as frequency and percentage of correct answers provided by the farmers. The levels of knowledge were calculated and clustered under three classes, *i.e.,* low, medium and high levels. Mean Rank Score (MRS) was calculated by adding the knowledge test scores obtained by individual farmers and dividing them by number of farmers. Knowledge gap (%) was calculated by using the following formula.

$$\textit{Knowledge Gap(\%)} = \frac{\text{MOS} - \text{AOS}}{\text{MOS}} \times 100$$

Where, MOS: Maximum Obtainable Score,

AOS: Actual Obtained Score

Statistical Package for Social Sciences (SPSS) software was used to analyse the data. Kruskal-Wallis H test was used to compare the knowledge on biosecurity by the different groups of farmers, *viz.*, dairy, pig and poultry farmers.

Results and Discussion

Knowledge Level of Respondents

Location and Design of Farm: Results given in Table 1 revealed that majority of the respondents (87.50%) had knowledge on recommended flooring of shed and around 85.83 % had the knowledge regarding recommended height of wall around the farm. However only 65.00 % respondents were aware with respect to the knowledge of location of sick animal shed.

Restricted Access: From Table 1 it is evident that, 34.16 % of the farmers were aware about the scientific precautionary measures to be taken before entering the farm.

Isolation and Quarantine: 76.66 % of the farmers had the knowledge of identifying and selecting healthy animals for the farm and also, 71.66 % had the knowledge of proper quarantine measures to be followed in introducing the new animals into the herd.

Cleaning and Disinfection: all the farmers were aware of the importance of maintaining hygienic conditions like the regular removal of dung and keeping premises clean. However, only 68.33% had knowledge on controlling infection by maintaining a disinfectant foot bath at the entrance.

Management of Feed and Water: 89.16% of farmers had the knowledge on importance of hygienic water supply to farms. But, only 79.16 % had proper knowledge on how to maintain a hygienic feeding area, water trough and clean tanks. To achieve amplified productivity, use of hygienic feed and water is essential (Bekele *et al.,* 2017).

Disposal of Carcass, Manure and Waste: Though 75.83% and 74.16% of the farmers had proper knowledge on handling of dead animals and carcass disposal procedure respectively, only 55.83% of farmers had knowledge on depth of carcass burial pit. 65% famers had knowledge on proper manure disposal methods.

Health Management: 91.66% had the knowledge on importance of vaccination as a disease control measure. 70.83% had knowledge on heat stress management and maintaining hydration level of animals.

Knowledge Gap among the Respondents regarding Biosecurity Measures

Based on the knowledge level at the time of investigation, the respondents were classified into three groups, *i.e.,* low, medium and high knowledge group. From Table 2, it is evident that there was a large gap in knowledge level of **'**disposal measures of carcass, manure and waste' (Gap: 32 & MRS:3.40). Improper waste management techniques in livestock farms can lead to disease outbreaks and hence must be managed sustainably (Singh and Rashid, 2017; Singh *et al.,* 2019). Also, there was a large gap in knowledge level of 'practicing restricted access to the farm' (Gap: 23.8 & MRS: 3.81). Due to lack of awareness about the

Table 1: Distribution of respondents according to their knowledge regarding various biosecurity and biosafety measures on livestock farms

Biosecurity measures	Dairy farmers (n=40)	Pig farmers (n=40)	Poultry farmers (n=40)	Pooled (N=120)
Location and design				
Optimum distance of farm from normal habitation	31 (77.50)	34 (85.00)	33 (82.50)	98 (81.66)
Recommended flooring of shed	34 (85.00)	40 (100.0)	31 (77.50)	105 (87.50)
Recommended height of wall around the farm	28 (70.00)	40 (100.0)	35 (87.50)	103 (85.83)
Location of sick animal shed	22 (55.00)	29 (72.50)	27 (67.50)	78 (65.00)
Age-wise grouping and housing of animals/birds	28 (70.00)	30 (75.00)	32 (80.00)	90 (75.00)
Restricted access				
Recommended clothing for visitors	37 (92.50)	38 (95.00)	37 (92.50)	112 (93.33)
Essentiality while entering the farm	12 (30.00)	15 (37.50)	14 (35.00)	41 (34.16)
Recommended parking place for vehicles	40 (100.0)	40 (100.0)	39 (97.50)	119 (99.16)
Fly control method	31 (77.50)	32 (80.00)	30 (75.00)	93 (77.50)
Method of controlling wild birds	30 (75.00)	29 (72.50)	31 (77.50)	90 (75.00)
Isolation and quarantine				
Source of purchasing animal/birds	29 (72.50)	31 (77.50)	32 (80.00)	92 (76.66)
Mandatory period of quarantine	28 (70.00)	29 (72.50)	29 (72.50)	86 (71.66)
Restriction inside quarantine shed	34 (85.00)	35 (87.50)	35 (87.50)	104 (86.66)
Cleaning and disinfection				
Frequency of removal of dung and dirt/litter materials from shed	40 (100.0)	40 (100.0)	40 (100.0)	120 (100.0)
Knowledge regarding the recommended condition of surface for disinfection	28 (70.00)	31 (77.50)	31 (77.50)	90 (75.00)
Interval of changing disinfectant of foot bath	25 (62.50)	28 (70.00)	29 (72.50)	82 (68.33)
Frequency of vehicle cleaning and disinfection	32 (80.00)	31 (77.50)	30 (75.00)	93 (77.50)
Management of feed and water				
Restricted access of feed storage area	32 (80.00)	36 (90.00)	35 (87.50)	103 (85.83)
Method of protecting water contamination	35 (87.50)	36 (90.00)	36 (90.00)	107 (89.16)
Maintenance of feeding area, water troughs and tanks	31 (77.50)	32 (80.00)	32 (80.00)	95 (79.16)
Disposal of carcass, manure and waste				
Handling of dead animals	29 (72.50)	30 (75.00)	32 (80.00)	91 (75.83)
Example of disinfectant	28 (70.00)	30 (75.00)	29 (72.50)	87 (72.50)
Method of carcass disposal	28 (70.0)	30 (75.00)	31 (77.50)	89 (74.16)
Depth of carcass burial pit	22 (55.00)	18 (45.00)	27 (67.50)	67 (55.83)
Method of manure disposal	23 (57.50)	27 (67.50)	28 (70.00)	78 (65.00)
Health management				
Knowledge regarding routine monitoring of temperature and hydration level of animals/birds	26 (65.00)	29 (72.50)	30 (75.00)	85 (70.83)
Essentiality of vaccination to prevent disease occurrence	36 (90.00)	38 (95.0)	36 (90.0)	110 (91.66)
Knowledge regarding person to be informed during outbreak	32 (80.00)	35 (82.50)	31 (77.50)	98 (81.66)
Knowledge regarding record keeping	28 (70.00)	26 (65.00)	32 (80.00)	86 (71.66)

Figures in parentheses indicate percentage

possibility of disease occurrence due to unrestricted entry, the possibility of disease outbreaks are more (Chauhan *et al.,* 2019).

Knowledge Level of Farmers Pertaining to Biosecurity

Majority of the farmers had medium level of knowledge on biosecurity measures to be followed. Dairy farmers had significantly lower knowledge on biosecurity measures ($p<0.05$) compared to pig and poultry farmers (Table 3). Sahlström *et al.* (2014) reported lower level of knowledge on biosecurity measures in dairy farmers.

Niemi *et al.* (2016) conducted a study on the adoption of biosecurity and reported that level of education and the farmer's own efforts to update professional knowledge imparted a positive impact on the actual implementation of biosecurity. Ajewole and Akinwumi (2014) stated that education, farm size, and training have significant positive influence on the farms' biosecurity control score. Community education plans may include effective biosecurity measures, animal management practices, understanding the risk associated with animal contact, and use of personal protective measures (Belay *et al.,* 2017). Hence, ensuring better understanding about these measures can be attained by creating awareness and providing education (Coelho and Diez, 2015). Also, previous studies have reported that awareness has a significant correlation with education level (Singh *et al.,* 2022). Awareness about biosecurity measures carries remarkable importance which can be accomplished through education (Zaki, 2010). Digital medias can be a game

Table 2: Distribution of respondents according to their level of knowledge regarding biosecurity measures

Dimensions	Dairy farmers (n=40)	Pig farmers (n=40)	Poultry farmers (n=40)	Pooled (N=120)
Location and design of farm				
MRS	3.57	4.32	3.95	3.94
Gap (%)	29	14	21	21.2
Restricted access				
MRS	3.75	3.85	3.85	3.81
Gap (%)	25	23	23	23.8
Isolation and Quarantine				
MRS	2.27	2.37	2.40	2.34
Gap (%)	24.2	21.9	20	22.0
Cleaning and Disinfection				
MRS	3.12	3.16	3.24	3.17
Gap (%)	22	21	19	20.8
Management of feed and water				
MRS	2.43	2.58	2.55	2.52
Gap (%)	19	14	15	16.0
Disposal of Carcass, manure and waste				
MRS	3.25	3.40	3.65	3.40
Gap (%)	35	32	27	32.0
Health management				
MRS	3.04	3.12	3.20	3.12
Gap (%)	24	22	20	22.0

MRS: Mean Rank Score

Table 3: Knowledge level of farmers pertaining to biosecurity.

Overall knowledge level of biosecurity	Dairy farmers (n=40)	Pig farmers (n=40)	Poultry farmers (n=40)	Pooled (N=120)
Low (0-9)	11 (27.50)	7 (17.50)	5 (12.50)	23 (19.16)
Medium (10-19)	21 (52.50)	18 (45.00)	18 (45.00)	57 (47.50)
High (20-29)	8 (20.00)	15 (37.50)	17 (42.50)	40 (33.33)
MRS	21.17^{a}	22.33^{b}	22.62^{b}	22.04
Overall knowledge gap (%)	27	23	22	24
Kruskal-Wallis H Test= 5.89*				

*Figures in parentheses indicate percentage; *significant at 5% level; MRS: Mean Rank Score*

changer in imparting knowledge and information to the farmers (Singh *et al.,* 2021; Jat *et al.,* 2021; Panda *et al.,* 2022).

Conclusions

Prevention is better than cure. Thus, it is very important that farmers be aware of the biosecurity measures to be practiced to maintaining health of animals, improve production and maintain the quality of production. However, there are only limited sources that farmers could access to gain the knowledge on these practices. Only an effective and credible information along with training can enhance the adoption rate of biosecurity measures. Digital information sources like IVRI-Biosecurity and Biosafety app may serve as good source of information for remote farmers. This can also act as a pocket friendly information source.

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