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Estimation of economic losses due to Bluetongue disease in Sheepfarms

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Abstract

The study was conducted to estimate economic losses arising due to Bluetongue at farm level. Tirunelveli district of Tamil Nadu state, the southernmost state of Indian sub-continent, was purposively selected for the present study. For the study, 300 sheep farms affected by Bluetongue disease were selected through multistage random sampling technique. Out of 19 blocks of the study area, 6 blocks Viz., Manur, Alangulam, Ambasamuthram, Melaneelithanallur, Nanguneri, Tenkasi were selected randomly. Five villages were selected from each block and ten sheep farmers from each village. The study is based on the data pertaining to production loss and costs incurred collected through personal interview method. The results of economic losses due to disease showed that average annual loss due to Bluetongue disease was Rs.29117, Rs.57258, and Rs.105141 in small, medium and large farms respectively. The overall loss per animal was Rs.397.63. The loss due to mortality, loss in market value, veterinary expenses and vaccination cost was Rs.224.38, Rs.169.75, Rs.152 and Rs.1.98 respectively. The results of the multiple linear regression analysis revealed that the variables, flock size, number of days of illness, system of rearing, vaccination status and the additional veterinary care were found to be significantly associated with the economic loss due to the disease.

Keywords: Bluetongue disease, economic loss, sheep farms

Introduction

Sheep farming ensure income generation and provide livelihood security to farmers in drought prone district of Tamil Nadu i.e. Tirunelveli which has 3,03,105 sheep population [1]. But, sheep population andthe livelihood security of the farmers arethreatened by a number of viral diseases of which Bluetongue is one ofthe most important and has been considered as themajor constraints in the small ruminant development and production. Bluetongue (BT) was first reported in India in 1964. The disease mainly affects sheep. The occurrence of Bluetongue in sheep is more severe in Tamil Nadu, Karnataka, Andhra Pradesh and Telengana states of south India, followed by the onset of rains during North-East monsoon and to some extent due to South-West monsoon.

A late onset of disease has been reported in 2005 in the Erode district of Tamil Nadu starting early November and ending early January, due to the frost and generic chillness. Between June and July of the same year, mild to moderate forms of the disease were observed in areas such as Salem, Dharmapuri, and Erode due to South-West monsoon. The mortality due to Bluetongue was nil during this period. Bluetongue was not reported in the Nilgiris district due to high altitude of 900 to 2636 meters above sea level till 2005[2]. However mild disease incidence involving BTV-23 was reported by Venkataramanan [3]. Since, 2006, Bluetongue has occurred regularly in different districts of Tamil Nadu [4].

Bluetongue causes economic losses in terms of high morbidity, mortality, abortion, foetal death and deformities as well as milk, meat and fleece losses. Bluetongue affects particularly native sheep population and causes high mortality, overall loss of productivity, weight loss and wool break. Thus it causes significant economic losses to less-affluent farming community, because native sheep is mainly reared by these farmers. Once, Bluetongue Virus established in a particular area, it is very difficult to completely eradicate [5].

The constraint analysis was carried out in Tirunelveli district during the year of 2017 - 2018 under two NABARD sponsored projects on "Development of Mobile App. in Sheep and Goat Farming" and "Popularisation of Target Selective Anthelmintic Techniques among the sheep farmers in Tirunelveli District" and found that Bluetongue disease affecting the sheep is one of the major constraints perceived by the sheep farmers. Hence, Tamil Nadu Veterinary and

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Animal Sciences sponsored sub-project on "Economic Implications of Bluetongue Disease in Sheep" was implemented during 2019-2020 through Veterinary College and Research Institute, Tirunelveli to study the economic losses due to Bluetongue disease in sheep.

Materials and Methods

Tirunelveli district of Tamil Nadu state was purposively selected for the present study, as the district has high sheep population and which provide livelihood security to resource poor. For the study, 300 sheep farms affected by Bluetongue disease were selected through multistage random sampling technique. Out of 19 blocks of this study area, 6 blocks Viz., Manur, Alangulam, Ambasamuthram, Melaneelithanallur, Nanguneri, Tenkasi were selected randomly. Five villages were selected from each block and ten sheep farmers from each village.

The chosen farms, raised mainly for meat purpose, were post-stratified into three flock size categories, namely small (less than 60 sheep), medium (60 to 120 sheep) and large (more than 120 sheep) flocks by Strugger's rule. In all, there were 47 Small, 208 medium and 45 large sheep flocks.

Relevant data were collected from the Bluetongue affected flock by personal interview method, using pretested well fabricated interview schedule. As most of the farmers did not maintain any records of the sheep farms, the data collection process depended generally on the memory recall of the farmers. The data collected include age, breed and sex of diseased animals, flock size, system of rearing, prevalence of the chosen disease and season of disease outbreak. The economic losses incurred due to disease in sheep farming was estimated by taking into account the loss in value of animals, mortality pattern, veterinary expenses, additional labour charge and vaccination cost using conventional analysis in the form of averages and percentages. The average loss per affected animal was also estimated using percentage and averages. The economic loss due to disease was estimated by using the method adopted by Bera et al. [6],

$$\text{Economic loss due to disease} = \frac{\text{loss due to mortality} + \text{Loss in market value} + \text{Veterinary}}{\text{expenses} + \text{Additional labor charges} + \text{Vaccination cost}}$$

$$\text{Loss due to mortality} = \frac{\text{No. of animal died} \times \text{Value of animals}}{\text{Total numbers of animals in the flock}}$$

Factors associated with the Economic loss due to Blue tongue virus disease
Multiple Linear Regression Analysis

To analyze the farm related variables associated with the economic losses due to bluetongue virus disease, the following multiple linear regression model was fitted in the study.

$$Y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \beta_8 x_8 + \mu$$

Where,

Y = Economic losses due to bluetongue virus disease in INR
α = Constant term
β_i's = Regression coefficients
x_i = Farm related variables
μ = Random disturbance term; ($\mu_i \sim 0, \sigma_i^2$)

The explanatory variables (X_i) used in this analysis include

$X_{i\,s}$	Variables
α	(Constant)
X_1	Supplementary feed
X_2	Days of illness
X_3	No. of adult
X_4	No. of youngones
X_5	Flock size
X_6	Rearing system (1 = Semi intensive, 0 = Extensive)
X_7	Vaccination status (1 = Vaccinated, 0 = Unvaccinated)
X_8	Veterinary care status (1 = Vet care provided, 0 = No Vet care)

Results and Discussion
Economic loss due to Bluetongue in different farm size categories

Table1 displays the average annual economic loss due to Bluetongue in different farm size categories. Average annual loss due to Bluetongue was found to be Rs. 29117, Rs.57258 and Rs.105141 in small, medium and large farms respectively. The loss in market value of affected stock was Rs.22307, Rs.40357 and Rs.79327 in small, medium and large farms respectively. This per cent loss in market value is with 70 to 77 per cent.The loss due to mortality of affected animals was worked out to be more with Rs.5166, Rs.14472 and Rs.22352 in small, medium and large farms, respectively. This loss due to mortality ranged from 17 to 25 percent of total loss in different farm size categorieswith the highest per cent seen in medium farms, possibly due to less health care provided by this category. Veterinary expenses worked out to be Rs.676, Rs.965 and Rs.1257 and additional labour charge were Rs.250 in all categories. The loss due to vaccination cost was Rs 625, Rs.1116 and Rs.1855.

Table 1: Average annual economic loss due to Bluetongue (Rs.)

Components of economic loss	Small	medium	Large	Overall
Mortality	5166 (17.74)	14472 (25.27)	22352 (21.26)	14245 (23.69)
Loss in market value	22307 (76.61)	40357 (70.48)	79327 (75.45)	43424 (72.21)
Veterinary Expenses	676 (2.32)	965 (1.69)	1257 (1.20)	965 (1.60)
Additional labour charges	250 (0.86)	250 (0.44)	250 (0.24)	250 (0.42)

Vaccination cost	625 (2.15)	1116 (1.95)	1855 (1.76)	1153 (1.92)
Total	29117 (100.00)	57258 (100.00)	105141 (100.00)	60135 (100.00)

(Figures in parentheses indicate percentages)

Loss in market value of animals was due to reduced weight gain and reduction in skin value of affected animals, while veterinary expenses included medicine cost and veterinarian's fee. Extra labour charges arose from extra time spent by farmers from dressing of wounds and supportive feeding work. The overall loss due to mortality of animals and loss in market value were found to be high around 95 per cent and this is probably due to death of the most affected animals and lost their value of animal.

Several studies reported that, on an average 2- 30 per cent of animals infected by Bluetongue die. However, the number may reach up to 100 per cent in high susceptible sheep. Bluetongue caused death of 300000 sheep and goats in Tamil Nadu during the monsoon season of 1997-1998 [7]. It is the major contributing factor for annul economic losses in Indian sheep industry during 1991-2005. Bluetongue caused maximum economic losses (60.8 per cent) among all infectious diseases in sheep. The higher morbidity and mortality in rural areas was attributed to stress factors, such as poor nutrition, parasitic burden, fatigue due to long walks and absence of veterinary facility. Ramesh et al. [8] and Tabachnick [9] reported that estimated annual economic loss due to Bluetongue outbreak was Rs.52 lakhs in Tamil Nadu and $3 billion worldwide.

Economic losses due to Bluetongue disease per affected animal

The economic loss due to Bluetongue disease in sheep was found out for each affected animal using averages and percentages and is presented in Table. 2. The overall loss per animal was Rs.397.63. The loss due to mortality, loss in market value, veterinary expenses and vaccination cost was Rs.224.38, Rs.169.75, Rs.152 and Rs.1.98 respectively. The losses due to mortality and market values are higher than other losses because most of the animals affected with Bluetongue disease died and other losses due to loss due to veterinary expenses and vaccination cost are very minimal or negligible.

The results were found to be similar with the findings of Senthilkumar and Thirunavukkarasu [10], Serma Saravana Pandian et al. [11] where loss due to mortality was found to be high. The overall losses due to cost of vaccination was low which could be due to lack of awareness among farmers about sheep diseases and their control methods.

Table 2: Economic loss due to Bluetongue Disease per animal

Sl. No.	Components of economic loss	Average Economic loss in Rupees / animal
1	Mortality	224.38 (56.43)
2	Loss in market value	169.75 (42.69)
3	Veterinary expenses	1.52 (0.38)
4	Vaccination cost	1.98 (0.50)
	Total	397.63 (100.00)

Factors influencing economic loss due to Bluetongue in sheep farms

Themultiple linear regression analysis was used to find out the farm related variables influencing the economic losses due to Blue tongue virus disease.

Table 3: Results of Multiple linear regression analysis

	Variables	Unstandardized Coefficients		Standardized Coefficients	t-value	p-value
		B	Std. Error	Beta		
	(Constant)	8552.293	4277.743		1.999	.047
X_1	Supplementary feed	-14.232	39.496	-.005[NS]	-.360	.719
X_2	Daysofillness	395.038	224.995	.025*	2.756	.011
X_3	No. of adult	3184.511	55.914	.005[NS]	.413	.680
X_4	No. of youngones	1779.807	106.170	.042[NS]	1.064	.150
X_5	Flocksize	499.360	24.759	.413 **	20.168	.000
X_6	Rearingsystem	514.664	1244.774	1.162 **	56.954	.000
X_7	Vaccination status	-3840.375	2111.031	-.025*	-2.319	.030
X_8	Veterinary care status	-1343.263	1109.128	-.016*	-2.121	.043
Dependant Variable		Economic Loss due to Blue tongue in INR				
N		300				
F-Value		709.508**				
R^2		0.952				
Adjusted R^2		0.951				
NS - *P<0.05* - P<0.05 ** - P<0.01						

From the table 3, it could be observed that the adjusted coefficient of multiple determination (Adjusted R^2) was found to be 0.951, which indicated that 95.1 per cent variations in the dependent variable were explained by the independent variables. The F value (709.508) of the function was found to be significant at 1 per cent level. Among the 8 independent variables used in this study, 5 variables were found to be significantly influencing the economic losses due to blue tongue virus. Among the significant variables, the variables, viz., Flock Size and Rearing system were found to be highly significant ($P<0.01$). The variables, days of illness, Vaccination status and Veterinary care status were significant at 5 per cent level ($p<0.01$). It could be inferred from this result that the farms with higher flock size and more days of illness were associated with higher economic loss. Farms with semi intensive rearing system had more economic loss. The vaccinated farms and the farms with veterinary care had lower economic loss due to the disease.

Conclusion

The results of economic losses due to disease showed that average annual loss due to Bluetongue disease was Rs.29117, Rs.57258, and Rs.105141 in small, medium and large farms respectively. The overall loss per animal was Rs.397.63. The overall loss per animal was Rs.397.63. The loss due to mortality, loss in market value, veterinary expenses and vaccination cost was Rs.224.38, Rs.169.75, Rs.152 and Rs.1.98 respectively. The results of the multiple linear regression analysis revealed that the variables, flock size, number of days of illness, system of rearing, vaccination status and the additional veterinary care were found to be significantly associated with the economic loss due to the disease. Severe economic losses estimated to be arising out of Bluetongue indicate that this disease remains as a serious economic problem telling upon the profitability of sheep farming. The available information on the epidemiology need to be exploited to make available more potent vaccines against Bluetongue for launching a systematic control programme against the disease.

Acknowledgement

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