



Economic losses due to enterotoxaemia in sheep

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Abstract: A study was conducted to estimate the economic losses due to enterotoxaemia and to analyse the factors influencing those losses. The data were collected from the sample of 42 enterotoxaemia-affected sample sheep farms randomly selected from 6 blocks in Dharmapuri district of Tamil Nadu. The average annual economic loss due to enterotoxaemia was estimated to be Rs.2161.00, Rs.4039.58 and Rs.4792.74 in small, medium and large farms respectively, in which the loss due to mortality formed the greater proportion with around 94 per cent in all size categories. The overall per animal loss due to enterotoxaemia in ram, ewe and lamb was Rs.1142.50, Rs.856.70 and Rs.364.00 respectively. As all the affected animals died, the economic loss involved was just more than the value of animals lost, considering the treatment cost. The regression functional analysis carried out indicated that the variables such as the number of adults affected, number of young ones affected, season during which the disease occurred and whether regular deworming was done or not were all found to be significantly influencing the losses due to enterotoxaemia.

Keywords: Enterotoxaemia, livestock, sheep, India.

Introduction

Animal diseases cause enormous economic loss through mortality, inefficient production and increase in the stock replacement rates, which all require additional resources. Control and treatment of the diseases also contribute to the losses (Mathur & Dubey, 1994). Generally, disease in livestock reduces the quantity and/or quality of livestock products than that could be obtained in its absence. Controlling the costs of production is an important concern in modern livestock farming and improving the quality of animal health can play a major role in this context. Sheep are threatened by a number of infectious diseases, among which enterotoxaemia is believed to be the most important disease resulting in heavy economic losses. The incidence of this disease varies widely but seldom exceeds 10 per cent. However, the case fatality rate approximates almost to 100 per cent (Harbola and Uppal, 1981), indicating that all those that suffer from the disease finally die.

Measurement of economic losses caused by this disease would provide information useful in

determining research priorities and in drawing attention to the adverse effects of enterotoxaemia on sheep farming. Quantification of losses would be helpful in ascertaining as to how to limit the disease loss through veterinary intervention and as to know what efforts are required to avoid the losses and at what cost. An attempt was made to estimate the losses caused by this disease and to study the factors influencing the economic losses caused by the disease.

Materials and methods

The Dharmapuri district of Tamil Nadu was purposively selected for the present study, as this district was topping the state in terms of sheep population and encountered frequent outbreaks of enterotoxaemia. For the study, 42 sheep farms affected by enterotoxaemia were selected through multistage random sampling technique. Out of 18 blocks available in this district, 6 blocks viz., Hosur, Thally, Shoolagiri, Kaveripattinam, Morappur and Pennagaram were selected randomly. Five villages were selected from each selected block and five sheep farmers were selected from each selected village. From the sheep farmers so selected, relevant data were collected for the period of two years (2000-01 and 2001-02) to achieve the objectives of the study. The data were collected through personal interview method, using pretested interview schedule. The data collected include information on age, breed and sex of diseased animals, flock size, system of rearing, prevalence of the chosen disease and season of disease outbreak. In addition, data on deworming, treatment costs and production losses were also collected. The data so collected were analysed using tabular methods to estimate the economic losses due to the disease.

A multiple linear regression function of the following form was fitted to study the factors influencing economic loss due to enterotoxaemia in sheep farms.

$$Y_j = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + U_j$$

where Y_j = Annual economic loss due to enterotoxaemia per affected farm in Rs.

X_1 = Number of adults affected due to enterotoxaemia

X_2 = Number of young ones affected due to enterotoxaemia

X_3 = Flock size in terms of number of animals



X_4 = System of rearing (0 if semi-intensive, 1 if extensive)

X_5 = Season indicator (4 if SW, 3 if NE, 2 if Winter, 1 if Summer)

X_6 = Deworming indicator (1 if not dewormed, 0 if dewormed)

X_7 = Veterinary care dummy (1 if not attended, 0 if attended)

a, b_i = Coefficients to be estimated

U_j = Error term

X_4, X_6 and X_7 are dummy variables.

Zero order correlation matrix indicated absence of multicollinearity between independent variables.

Results and discussion

Economic loss due to enterotoxaemia in different flock size categories

Table 1 portrays the average annual economic loss due to enterotoxaemia in different sheep farm size categories. The average annual economic loss due to enterotoxaemia was estimated to be Rs.2161.00, Rs.4039.58 and Rs.4792.74 in small, medium and large farms respectively, in which the loss due to mortality formed the greater proportion with around 94 per cent in all size categories. This was because almost all the affected animals died. With this being the fact, the efforts and cost spent by the farmers to save the affected animals in terms of extra labour charges and treatment cost get added to the disease cost as well.

Table 1: Average annual economic loss due to Enterotoxaemia/ affected farm (in Rs.)

Components of economic loss	Average annual economic loss in		
	Small farm	Medium farm	Large farm
Mortality	2037.00 (94.26)	3780.43 (93.58)	4500.14 (93.89)
Veterinary expenses	102.00 (4.72)	224.15 (5.55)	250.60 (5.23)
Extra labour charges	2.00 (1.02)	35.00 (0.87)	42.00 (0.88)
Total	2161.00 (100.00)	4039.58 (100.00)	4792.74 (100.00)

(Figures in parentheses indicate percentages to the respective totals)

Economic losses due to enterotoxaemia per affected animal

The economic loss due to enterotoxaemia was worked out for each affected animal and the same is presented in Table 2. The overall per animal loss due to enterotoxaemia in ram, ewe and lamb was Rs.1142.50, Rs.856.70 and Rs.364.00 respectively. It needs emphasis that all enterotoxaemia affected animals died, that too within a short period of time after the onset of symptoms. Hence, the economic loss involved in enterotoxaemia is almost equal to the value of animal lost. The other costs of the disease viz.,

veterinary cost and extra labour charges are only negligible.

Table 2. Economic loss due to enterotoxaemia per affected animal (in Rs.)

Components of economic loss	Average economic loss per affected animal		
	Ram	Ewe	Lamb
Mortality	1125.00 (98.47)	850.00 (99.22)	364.00 (100.00)
Veterinary expenses	15.50 (1.36)	5.70 (0.66)	-
Extra labour charges	2.00 (0.17)	1.00 (0.12)	-
Total	1142.50	856.70	364.00

(Figures in parentheses indicate percentages to the respective totals)

Factors influencing economic loss due to enterotoxaemia in sheep farms

The results of the linear regression model fitted to assess the contribution of different factors to the economic loss arising due to enterotoxaemia in sheep farms are presented in Table 3. The coefficient of multiple determination (adjusted R^2) for the model fitted for enterotoxaemia was 0.958, implying that the model was a good fit and that 95.80 per cent of the variation in the dependent variable, i.e., economic losses due to enterotoxaemia was explained by the chosen independent variables. The 'F' statistic also showed that the estimated regression model fitted the data well.

The variables - number of adults affected, number of young ones affected, season and deworming were found to be significantly ($P \leq 0.01$) influencing the losses due to enterotoxaemia, while the remaining variables- flock size, system of rearing and veterinary care had no significant influence. The coefficient of number of adults affected indicated that if the number of adults affected increased by one unit, the economic loss would increase by Rs.1309.21 from its mean level. This is because of the 100.00 per cent case fatality rate observed in enterotoxaemia. The coefficient of number of young ones affected also had a significant influence on economic loss, indicating that as the young ones affected increased by one unit, the economic loss would increase by Rs.402.47 from its mean level. The coefficient of season too had a significant influence on the economic loss. The coefficient of deworming indicates that when the number of 'not dewormed' sheep increased by one it would increase the economic loss by Rs.454.54 per flock from its mean level.



Table 3. Regression coefficients of linear model fitted to analyse the economic loss due to enterotoxaemia in sheep farms (dependent variable: economic losses due to enterotoxaemia per affected farm in Rs.)

Variables	Coefficients
Constant	-756.292 (702.630)
Number of adults affected (X_1)	1309.207** (73.181)
Number of young ones affected (X_2)	402.465* (123.820)
Flock size in terms of number of animals (X_3)	5.730 (15.257)
System of rearing (X_4) (0-Semi intensive, 1-Extensive)	268.240 (200.646)
Season (X_5) (4-SW monsoon, 3-NE monsoon, 2-Winter, 1-Summer)	309.287 (132.860)
Deworming (X_6) (1-Not dewormed, 0-Dewormed)	454.538* (207.674)
Veterinary care (X_7) (1-Not given, 0-given)	-144.503 (291.230)
Co-efficient of multiple determination (adjusted R^2)	0.958
F statistic	133.443
N	42

(Figures in parentheses indicate standard errors)

*** Significant ($P \leq 0.01$) * Significant ($P \leq 0.05$)*

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