

ECONOMIC LOSSES DUE TO SHEEP POX IN SHEEP FARMS IN TAMIL NADU

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ABSTRACT

The study was conducted to estimate the economic losses arising due to sheep pox and to analyse the factors influencing such losses at farm level. The data relating to the two-year period 2000-01 and 2001-02 were collected from the sample of 108 sheep farms randomly selected from 6 blocks in Dharmapuri district of Tamil Nadu. Average annual loss due to sheep pox was found to be Rs. 2908.17, Rs. 4662.18 and Rs. 5599.06 in small, medium and large farms, respectively. The loss due to mortality of affected animals ranged from 40 to 60 per cent of total loss in different farm size categories with the highest per cent seen in small farms. The per cent loss in market value is next only to the mortality loss with 26 to 37 per cent share in total loss. The overall per animal economic loss due to sheep pox in ram, ewe and lamb was Rs.1048.81, Rs. 744.26 and Rs. 200.22 respectively. The loss due to the reduction in market value formed the greater proportion in survived rams with 64.71 per cent. A regression model was fitted using the possible predisposing factors to explain the variations in the sheep pox disease losses. The coefficient of multiple determination (R^2) in the model fitted was high (0.908), implying that the model was a good fit. The estimated regression coefficients of the variables, viz., number of days of illness, number of adults affected and flock size were found to be significant. The severe economic losses estimated to be arising out of sheep pox indicate that this disease remains a serious economic problem telling upon the profitability of sheep farming. Realizing the enormous losses caused by the disease, the sheep farmers should be made to focus more attention towards this disease through creation of adequate awareness among them through suitable extension programs for prevention and control of sheep pox

Key words: *Sheep, sheep pox, economic losses*

INTRODUCTION

In animal production systems, diseases cause huge economic loss as a result of mortality, less efficient resource use and necessitating faster stock replacement rates, all requiring additional resources.

Control and treatment of diseases also add to the losses (Mathur and Dubey, 1994). Generally, disease causes production to be of lower quantity and/or quality than that could be obtained in its absence. Hence, ensuring proper animal health would play a vital role in assuring profitability of livestock

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farms. Animal health economics is relatively a new discipline evolved to provide a quantitative insight into the economic impact of diseases in livestock (Dijkhuizen, 1992). Although sheep are threatened by a number of infectious diseases, sheep pox remains to be the highly contagious and the most important viral disease resulting in heavy economic losses, through causing higher morbidity and mortality in sheep (Mullick, 1988 and Carn, 1993). Garner *et al.* (2000) studied the extent and the impact of sheep pox in Maharashtra state of India and found an average morbidity of and mortality rates of 63.50 per cent and 49.50 per cent, respectively. Existence of this disease also results in heavy trade restrictions in mutton trading countries and thus loss of revenue (Singh *et al.*, 1979 and Kitching, 1986). Thus quantification of animal disease losses in specific regions assumes greater international significance with a view to devise cost effective disease control programmes to contain economic barriers between countries with respect to livestock diseases.

Measurement of economic losses caused by this important disease would provide information useful in determining research priorities and in drawing attention to the effects of sheep pox on sheep systems. Quantification of disease losses would help to know the economic impact of disease and to know what efforts are required to avoid the losses and at what cost. Thus, an attempt was made to assess the economic losses arising due to sheep pox at farm level and to study the factors influencing such economic losses in Dharmapuri district of Tamil Nadu.

MATERIALS AND METHODS

Dharmapuri district of Tamil Nadu state, the southern most state of Indian sub-continent, was purposively selected for the present study, as this district was topping the state in terms of sheep population and encountered frequent outbreaks of sheep pox. For the study, 108 sheep farms affected by

sheep pox 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 block and five 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 18 sheep), medium (18 to 36 sheep) and large (more than 36 sheep) flocks by using flock size mean and SD (flocks lying below 'mean - SD' were to be small flocks, above 'mean + SD' were to be large flocks and those lie between mean + SD and mean - SD were to be medium flocks). In all, there were 22 small, 100 medium and 28 large sheep flocks. Although vaccination against sheep pox is practiced generally, farmers do not usually vaccinate their flock periodically for the fear of productivity loss, unless there are outbreaks of sheep pox in the adjoining areas.

Relevant data were collected from the sheep pox affected flock (the cases of sheep pox - diagnosed commonly from the typical symptoms expressed, which do not require laboratory confirmations, were enumerated with the records available at the local government veterinary centres) for the period of two years (2000-01 and 2001-02) by personal interview method, using pretested interview schedule. As most of the farmers did not maintain any records of their sheep farms, the data collection process depended generally on the memory recall of the farmers. Hence, repeated attempts were made to eliminate the possible memory recall bias while collecting the data. 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. In addition, data on vaccination, treatment costs and production losses were also collected to calculate the total economic losses accrued due to sheep pox in sheep farms,

using the standardized methodology suggested by Bennet (2003). The data so collected were analyzed to estimate the economic losses due to the disease.

The total economic losses arising out of sheep pox were estimated by taking into account the value of animals which have succumbed to the disease, loss in market value of animals which had survived the disease, veterinary expenses to treat the ailing animals, extra labor charges incurred to look after the ailing animals and the losses accrued due to abortion in pregnant animals. As the analysis of scatter diagrams drawn revealed an almost linear relationship between the independent variables chosen and the dependent variable - the annual economic loss due to sheep pox in an affected farm - a multiple linear regression function of the following form was fitted to study the factors influencing economic loss due to sheep pox 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 sheep pox per affected farm in Rs.

X_1 = Number of days of illness due to sheep pox

X_2 = Number of adults affected due to sheep pox

X_3 = Number of young ones affected due to sheep pox

X_4 = Flock size in terms of number of animals

X_5 = Score for system of rearing (1 if semi-intensive, 0 if extensive)

X_6 = Season indicator (1 if summer - Mar. to May; 2 if SW - Jun. to Sep.; 3 if NE - Oct. to Dec.; and 4 if winter - Jan. to Feb.)

X_7 = Vaccination indicator (1 if unvaccinated, 0 if vaccinated)

X_8 = Veterinary care (1 if not attended, 0 if attended)

a, b_i = Coefficients to be estimated

U_j = Error term

X_5 to X_9 are dummy variables.

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

RESULTS AND DISCUSSION

Economic loss due to sheep pox in different farm size categories

Table 1 displays the average annual economic loss due to sheep pox in different farm size categories. Average annual loss due to sheep pox was found to be Rs.2908, Rs.4662 and Rs.5599 in small, medium and large farms respectively. The loss due to mortality of affected animals was worked out to be more with Rs.1835, Rs.2110 and Rs.2350 in small, medium, and large farms, respectively. This loss due to mortality ranged from 40 to 60 per cent of total loss in different farm size categories with the highest per cent seen in small farms, possibly due to the less health care provided by this category. The loss in market value of affected stock was Rs.758, Rs.1721 and Rs.1871, respectively. This per cent loss in market value is next only to the mortality loss with 26 to 37 per cent. Veterinary expenses worked out to be Rs.170, Rs.425 and Rs.783 and additional labour charges were Rs.35, Rs.86 and Rs.123, respectively. The loss due to abortion was Rs.110, Rs.320 and Rs.472. 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 the extra time spent by farmers for dressing of wounds and supportive feeding work.

Table 1
Average annual economic loss due to sheep pox

(Rs.)

Components of economic loss	Small	Medium	Large	Overall
Mortality	1835 (63.09)	2110 (45.26)	2350 (41.98)	2161 (45.10)
Loss in market value	758 (26.08)	1721 (36.92)	1871 (33.41)	1688 (35.23)
Veterinary expenses	170 (5.85)	425 (9.12)	783 (13.98)	501 (10.45)
Extra labour charges	35 (1.20)	86 (1.84)	123 (2.20)	93 (1.94)
Abortion	110 (3.78)	320 (6.86)	472 (8.43)	349 (7.28)
Total	2908 (100.00)	4662 (100.00)	5599 (100.00)	4792 (100.00)

(Figures in parentheses indicate percentages to the respective totals)

Economic losses due to sheep pox per affected animal

Table 2 displays the economic loss due to sheep pox worked out for each affected animal. As the loss was different between the dead and living animal, it was computed separately for the dead and alive. The overall per animal economic losses due to sheep pox in ram, ewe and lamb were Rs.1049, Rs.744 and Rs.200, respectively. In dead animals, the loss due to mortality was found to be 93.04, 96.09 and 95.02 per cent. The loss due to the reduction in market value formed the greater proportion in survived rams with 64.71 per cent. Similarly, in survived ewes, loss due to abortion worked out to be larger with 50.51 per cent, followed by loss in market value. It needs emphasis that all

lambs that picked up infection succumbed to the same. In all, when every succumbing ram, ewe and lamb results in a loss Rs.754, Rs.473 and Rs.200, respectively, every surviving ram and ewe led to a loss of Rs.295 and Rs.272 respectively.

Factors influencing economic loss due to sheep pox in sheep farms

A linear regression model was fitted to assess the contribution of different factors to the economic loss arising due to sheep pox in sheep farms and the results are presented in Table 3. The coefficient of multiple determination (adjusted R^2) for the model fitted for sheep pox was 0.908, which implied that the model was a good fit and that about 90.80 per cent of the variation in the dependent variable, i.e., economic losses due to sheep pox

could be explained by the chosen independent variables. The 'F' statistic also showed that the estimated regression model fitted the data well. The estimated regression coefficients of three variables, viz., number of days of illness, number of adults affected and flock size, included to explain the variation in sheep pox disease losses were found to be significant ($P \leq 0.01$). The other factors such as number of affected young ones, system of rearing,

season, vaccination and veterinary care had not significantly influenced the losses due to sheep pox. The possible reasons for this insignificant influence of these factors on economic losses could be less value of young ones, indifferent prevalence of sheep in different systems of rearing and seasons, less effective vaccines and non-availability of effective medicines to cure sheep pox, respectively.

Table 2
Economic loss due to sheep pox per affected animal

Components of economic loss	Ram		Ewe		Lamb	
	Dead	Alive	Dead	Alive	Dead	Alive
Mortality	701 (93.04)	-	454 (96.09)	-	190 (95.02)	-
Loss in market value	-	191 (64.71)	-	85 (31.21)	-	-
Veterinary expenses	50 (6.63)	101 (34.10)	18 (3.81)	49 (17.91)	10 (4.98)	-
Extra labour charges	2 (0.33)	4 (1.19)	1 (0.10)	1 (0.37)	-	-
Abortion	-	-	-	137 (50.51)	-	-
Total	753	296	473	273	200	-
Overall per animal average	1049		746		200	

(Figures in parentheses indicate percentages to the respective totals)

The coefficient of number of days of illness indicated that the economic loss due to sheep pox would increase by Rs.44.43 when days of illness extended by one day from its mean level. This may be due to increased treatment cost, loss of value and increased labour charges. The coefficient of number of adult affected indicated that, if number of adult affected increased by one unit, the economic loss would increase by Rs.685.30 from its mean level. Flock size also had a significant influence ($P \leq 0.01$) on the sheep pox losses with the coefficient of 137.573 which indicated that the loss would increase

by Rs.137.57 as the flock size increased by one unit.

Table 3
Regression coefficients of linear models fitted to analyse economic loss due to sheep pox
(Dependent variable: Economic loss due to sheep pox in Rupees)

Variables	Coefficients
Constant	-2547.312 (3262.618)
Number of days of illness (X_1)	44.426** (7.677)
Number of adults affected (X_2)	685.299** (93.641)
Number of young ones affected (X_3)	101.769 (217.697)
Flock size in terms of number of animals (X_4)	137.573** (40.247)
System of rearing (X_5) - (1-Semi intensive, 0-Extensive)	-19.257 (618.614)
Season (X_6) - (4-Winter, 3-NE monsoon, 2-SW monsoon, 1-Summer)	-48.146 (382.573)
Vaccination (X_7) - (1-Unvaccinated, 0-Vaccinated)	-915.327 (2028.970)
Veterinary care (X_8) - (1-Not given, 0-given)	1275.879 (746.285)
Co-efficient of multiple determination (adjusted R^2)	0.908
F statistic	129.489
N	108

(Figures in parentheses indicate standard errors)

** Significant ($P=0.01$)

CONCLUSIONS

The severe economic losses estimated to be arising out of sheep pox indicate that this disease remains as a serious economic problem telling upon the profitability of sheep farming. The variables viz., number of days of illness, number of adult animals affected and flock size were all found to significantly and positively influencing the economic losses arising out of sheep pox. It was also found from the

study that system of rearing, vaccines and veterinary care did not have any significant influence on the economic losses the disease cause to the farmers, which could be attributed to the possible reasons of indifferent prevalence of sheep in different systems of rearing, less effective vaccines to prevent the disease and non-availability of effective medicines to cure sheep pox, respectively. Realising the enormous losses caused by the disease, the sheep farmers should be made to focus more attention

towards this disease through creation of adequate awareness among them through suitable extension programmes for prevention and control of sheep pox. The available information on the epidemiology need to be exploited to make available more potent vaccines against sheep pox for launching a systematic control programme against the disease.

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