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Economic losses due to morbidity (Fleece losses) in different age group of Marwari sheep

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Abstract
"Evaluation of economic losses due to morbidity in Marwari sheep in arid zone" have been studied using data (for Marwari, 3164) collected from CSWRI, ARC, Bikaner spread over eight years (2005-06 to 2013-14). The traits investigated were morbidity due to different diseases. The different age groups were birth to three (suckling), three to six (weaning), six to twelve (hogget) and above twelve months (adult). The diseases recorded from the farm are classified here on the basis of body systems. Significance of different classes was tested with chi-square.

Keywords: Morbidity, economic, weaning, production

Introduction
In this paper, Study of Morbidity in sheep are due to multifarious causes such as infectious diseases, parasitic infestations, nutritional disorders, adverse climatic conditions and management fluctuations were made. Systematic studies of non-genetic factors influencing morbidity rate. The reviews regarding economic/financial losses from commonly occurring diseases have not been sufficiently available in literature for Indian breeds of sheep.
Sheep pox, foot and mouth disease and renderpest are the important viral diseases of sheep for which vaccines are available in India to protect the animals. Blue tongue and PPR are two other viral diseases, which cause considerable economic losses in sheep production. Enterotoxaemia, Johne's disease, parasitic infestation besides nutritional deficiency diseases are other common problems responsible for production losses. Production losses due to parasitic infestation and nutritional deficiencies arise from morbidity as well as reduced productivity of survivors. Animal productivity is reduced by insidious effect on feed intake and the utilization, which in term affects live weight gain and reproductive efficiency.
There is no doubt that the presence of uncontrolled infections with virulent foot rot reduces the wool production of sheep. It is likely that the estimate of 8% loss of annual wool weight by Marshall *et al.* (1991) [4] was the best available estimate of the effect of virulent foot rot on average annual wool production in an infected flock.

Materials and Methods
Source of Data
The data for the present investigation were obtained from health records of Sheep Research Project entitled "Improvement of Marwari `sheep for carpet wool production through selection" located at the Arid Region campus of the Central Sheep and Wool research institute, Bikaner.

Shearing
The shearing of animals was carried out twice a year in April/May and October/November with hand scissors. The first shearing was done at the age of approximately six months. The sheep were dipped and washed with clean water before shearing.

Description of Data
The present investigation includes the data of Marwari sheep from 2005 to 2014 (year of birth) on the morbidity percentage and economic losses at different age group of lambs. The different age groups were birth to three (suckling), three to six (weaning), six to twelve (hogget) and above twelve months (adult) of age and greasy fleece weight of first and second clips be also

included in the present study.

Morbidity Rate
The numbers of sick animals for the particular disease in different age groups i.e. 0-3, 3-6, 6-12 and above 12 months of age were recorded.

Greasy Fleece Weight
The shearing of sheep was carried out twice a year after washing with clean water. The lambs were first shorn at the age of approximately six months and subsequently at six monthly intervals. The wool weight was recorded on a 5 kg dial type balance to the accuracy of 10g as for body weight; data for greasy wool weights were also coded as value 1 for diseased lamb and value 0 for healthy lamb.

Classification of Data
The data on morbidity rate was classified according to sex, year of disease and season of birth. The data on weather condition, feeding, housing, differential management for male and female were not included in the analysis because these data were not recorded at the farm.

Sex of Lamb
Morbidity rates for males and female lambs were calculated separately in 0-3, 3-6, 6-12 and above twelve months of age groups for all the diseases under investigation.

Season of Birth
In order to study the effect of climatic changes i.e. temperature, humidity, rainfall etc. on the incidences of morbidity, the year was divided into two seasons depending upon the month of lambing.

The Specific seasons

S/N	Season	Months of year
1.	First	January to June
2.	Second	July to December

Year of Morbidity
This study included the data of lambs that born during year from 2005 to 2014. The morbidity was divided into nine years from 2005-06 to 2013-14. Each year show the total number of sheep, which were available in particular year and of particular age group. Morbidity rates were calculated separately in 0-3, 3-6, 6-12 and above twelve months of age.

Economic Losses Due to Morbidity
Wool weight losses in first and second clip due to morbidity from various causes were calculated using the following formula:

ELWD= EVW [(WH-WD)*ND]

Here,
ELWD= economic losses in rupees due to reduced wool weight
EVW= economic value of 1 kg wool weight expressed as market price of one kg Marwari wool weight.
WH= average wool weight of healthy lambs.
WD= average wool weight of diseased lambs
ND= number of diseased lambs

Results
The present investigation was carried out to evaluate production losses caused by morbidity in Marwari sheep due to various types of diseases. The results of different analyses are presented and discussed under the following headings.

Loss due to wool weight
The morbidity due to different diseases reduced wool production in the sick lambs; thus sheep breeder suffers from the economic losses due to lower wool production. In the present study economic losses in wool production at 1st and 2nd clip due to morbidity was estimated.

First clip
The least squares mean of wool weight of diseased lambs was 537.08±4.04 g, which is 33.27 g lower in comparison to average wool weight of healthy lambs 570.35±.582. The economic loss was ₹.. 497.72 due to the wool weight loss of 6221.49 g in the 187 sick lambs.
The total wool weight losses due to sickness of 119 male and 68 female lambs were 4061.47 g and 2122.96 g, respectively, due to which the economic losses were ₹. 324.92 and 169.84, respectively.
The losses in the terms of total wool weight were 4293.30g for 165 lambs in Major season, 1940.18 g for 22 lambs in minor season. In monetary terms, the losses due to morbidity were ₹. 343.46 and 155.21, respectively. The average wool weight loss was more in the major season than minor season. (Table: 1).
Average loss in wool weight was highest during the 2006-07 (1645.95 g) followed by 2010-11 (1330.08 g) and 2007-08 (1199.52g).
The economic losses recorded due these wool weight losses were ₹. 8.83, 131.68, 95.96, 6.27, 48.97, 106.41, 1.62, 36.04 and 59.91 during 2005-06 to 2013-14, respectively.

Second clip
The least-squares mean of wool weight for diseased lambs was 686.04±4.44 g, which is 10.21 g lower than the average wool weight of healthy lamb (696.25±6.273 g). The economic loss due to 7330.78 g wool weight loss of 718 sick animals was ₹. 586.46 (Table: 2).
The total wool weight losses due to sickness of 192 male and 526 female lambs were 3870.72 g and 3471.60 g, respectively which, resulted the economic losses of Rs.309.66 and 277.73, respectively.
The losses in the terms of total wool weight were 6191.60 g for 673 lambs in Major season, 1134.00 g for 45 lambs in minor season. In monetary terms, the losses due to morbidity were ₹. 495.33 and 90.72, respectively.
The losses in the terms of total wool weight were 2071.63 g for 37 lambs, 1982.40 g for 48 lambs, 1118.25 g for 355 lambs, 197.40 g for 21 lambs, 7.48 g for 34 lambs, 848.40 g for 84 lambs, 101.25 g for 45 lambs, 785.50 g for 25 lambs and 22.08 g for 69 lambs during 2005-06 to 2013-14, respectively.
The economic losses recorded due these wool weight losses were ₹. 165.73, 158.59, 89.46, 15.79, 0.60, 67.87, 8.10, 62.84 and 18.33 during 2005-06 to 2013-14, respectively.

Economic Losses due to Morbidity
In the present investigation, economic losses due to wool weight in 0-3, 3-6, 6-12 and above 12 months age groups were calculated on the current CSWRI price (**₹** 80/- Kg of wool).

Table 1: Economic losses due to morbidity in Ist clip.

HEALTHY			SICK				
Effect	Avg. wool wt. of first clip(gm)	THA	Ave. wool weight (gm)	Ave. wool weight loss	TSA	Total wool wt loss (gm)	Economic loss(₹)
Overall	570.35±4.582	2543	537.08±4.04	33.27	**187**	6221.49	497.72
Sex							
Male	592.01±6.798	1225	557.88±6.6	34.13	119	4061.47	324.92
Female	549.23±6.068	1318	518.01±4.56	31.22	68	2122.96	169.84
Season							
Major	587.29±5.505	1749	561.27±4.05	26.02	165	4293.30	343.46
Minor	545.56±7.803	794	457.37±19.21	88.19	22	1940.18	155.21
Year							
2005-06	618.98±9.428	291	591.38±17.25	27.60	4	110.40	8.83
2006-07	686.06±20.184	269	576.33±12.04	109.73	15	1645.95	131.68
2007-08	663.44±11.187	211	646.78±5.5	16.66	72	1199.52	95.96
2008-09	401.78±8.534	319	382.2±17.63	19.58	4	78.32	6.27
2009-10	555.97±9.155	292	479.45±9.42	76.52	8	612.16	48.97
2010-11	612.73±7.235	315	557.31±13.24	55.42	24	1330.08	106.41
2011-12	488.12±16.992	311	478.02±21.54	10.10	2	20.20	1.62
2012-13	573.45±18.162	298	545.29±25.04	28.16	16	450.56	36.04
2013-14	580.17±8.574	237	562.34±15.12	17.83	42	748.86	59.91
Note: Figures in parenthesis indicate number of animals economic loss was calculated on the basis of CSWRI rates ₹. 80/- per kg wool weight during the study period							

Table 2: Economic losses due to Morbidity in IInd clip.

Healthy			Sick				
Effect	Avg. wool wt. (gm)	THA	Ave.wool weight (gm)	Wool wt. loss	TSA	Total wool wt loss (gm)	Economic loss (₹.)
Overall	696.25±6.273	882	686.04±4.44	10.21	**718**	7330.78	586.46
Sex							
Male	744.04±11.405	489	723.88±9.06	20.16	192	3870.72	309.66
Female	667.92±7.032	393	661.32±4.933	6.60	526	3471.60	277.73
Season							
Major	688.82±7.741	372	679.62±4.41	9.20	673	6191.60	495.33
Minor	705.3±10.224	510	680.1±20.38	25.20	45	1134.00	90.72
Year							
2005-06	797.62±24.994	408	741.63±23.49	55.99	37	2071.63	165.73
2006-07	729.17±35.6	319	687.87±12.9	41.30	48	1982.40	158.59
2007-08	711.39±13.264	122	708.24±6	3.15	355	1118.25	89.46
2008-09	651.92±16.586	444	642.52±12.22	9.40	21	197.40	15.79
2009-10	675.64±30.554	509	675.42±17.4	0.22	34	7.48	0.60
2010-11	709.25±18.718	524	699.15±18.27	10.10	84	848.40	67.87
2011-12	593.97±10.834	471	591.72±21.25	2.25	45	101.25	8.10
2012-13	764.45±14.169	439	733.03±24.58	31.42	25	785.50	62.84
2013-14	699.35±13.186	406	696.03±15.93	3.32	69	229.08	18.33
Note: Figures in parenthesis indicate number of animals economic loss was calculated on the basis of CSWRI rates ₹. 80/- per kg wool weight during the study period							

Conclusions

1. The sex of lamb highly significantly affect the morbidity rate in the adult group, indicates that male are sturdy and resistant of diseases than females.
2. The average wool weight loss was higher in male so the economic loss was also higher in male as compare to females; however the total numbers of female progenies were more in the flock.
3. The average wool weight loss and consequent economic loss was higher in female as compare to the males indicating that female lambs were more sensitive for the diseases.
4. The effect of season of birth on morbidity and mortality rates was highly significant and shows higher morbidity in lambs born in major season. It may be due to cold stress and abrupt change in the temperature during months of January -February.
5. The average wool weight loss was more in the major season than minor season due to more number of animals in major season.
6. The effect of year of diseases on morbidity rates was significant. It may be due to environmental condition, availability of feed and fodder in pasture and outbreak of diseases in different years. Therefore to reduce the morbidity, animals should be protected from extremes of weather. Further, supplementary feeding of concentrates and dry fodder during lean period and prophylactic treatments may reduce the morbidity.

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