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## Evaluation of commercial consequences associated with mortality of adult sheep

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### Abstract

Data on morbidity from the disorders mentioned were examined. Ages 6 to 12 (hogget) and over 12 months (adult) were the age groups under study. The Central Sheep and Wool Research Institute, Bikaner's recorded ailments are categorised here based on systemic ailments. Data (for Marwari, 3164) obtained from CSWRI, ARC, Bikaner during an eight-year period (2005–06 to 2013–14) have been used to evaluate economic losses resulting from morbidity in Marwari sheep in arid zones. Enhancing management procedures, giving diseased lambs the care and attention they need, vaccinating and deworming on time, and removing sick sires from the flock can all help to minimise these financial losses.

**Keywords:** Morbidity, economic, weaning

### Introduction

Research on sheep mortality revealed that a wide range of problems, including bacterial infections, worm infestations, malnourishment, unfavourable weather, and poor management practices, have been responsible. Systematic investigations of non-genetic variables affecting sheep mortality rates. There are vaccinations for three viral infections that affect ovine, which can protect small ruminants: rinderpest, FMD, and sheep pox. Two more viral diseases that hurt sheep productivity financially are blue tongue and PPR.

In addition to malnourishment, other prevalent problems that result in production losses include enterotoxemia, worm infestation, and Johne's disease. Nutritional deficiencies and parasite infection induce mortality and lower productivity, which translate into financial losses. Overall output is decreased by the subtle impacts on feed intake and utilisation, which affect live weight gain and reproductive efficiency. If severe foot rot infections are not treated, fewer wools are produced. The most realistic evaluation of foot rot's impact on an affected flock's average yearly wool production is probably the 8% reduction in wool weight recorded by Marshall *et al.* (1991) [2].

Regions of the country that are prone to drought are most suited for sheep husbandry. By supplying food and bolstering the income of landless farmers and the impoverished in rural areas, sheep make a substantial economic contribution to India. One of the main obstacles to this enterprise's growth is the high prevalence of illnesses and parasitic infestation in sheep, which has been shown to negatively impact the Indian economy and impoverish the impoverished sheep owners. Its strong resilience to illness, ability to withstand drought, quicker rate of growth, and ability to cover greater distances in quest of food are well known traits.

Small ruminant systems in India are complex, varied, and vulnerable to numerous hazards. Even on organised farms, the majority of the data used to record the occurrence of various diseases is based on post-mortem lesions, and clinical symptoms remain the primary basis for diagnosis when diagnostic studies are deemed unsuitable. Sheep as, compared to other livestock, they appear to respond less well to medical care when diseased. Since sheep are a common animal and may not exhibit obvious symptoms of a major disease, a veterinarian's skill is essential in preventing disease in this species. Adult offspring accounted for a greater percentage of economic loss because reproductive disorders were more common in them.

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Lower survival rates (71.69%) in Beetal and its crosses (females older than 12 months) were observed by Kanaujia *et al.* (1985) [1], indicating a high mortality rate (28.31%) in adult females.

## Materials and Methods

### Source of data

The present study's computation depends on a study of the Central Sheep and Wool Research Institute's (CSWRI) Arid Region campus, located in Bikaner, and named "Improvement of Marwari sheep for carpet wool production through selection."

### Illustration of data

The statistics overview of Marwari sheep from 2005 to 2014 (the year of birth) is included in this investigation, along with information on the economic damage and mortality % for various age groups of lambs. The age groupings were as follows: 06 to 12 months (hogget) and over 12 months (adult).

### Mortality rate

The lambs, both alive and deceased, were sorted into age groups: 6-12 months and older than 12 months. Based on post-mortem results, the probable cause of death of the lambs was noted and verified.

### Body weight

Two weeks after lambing, the birth weights of both healthy and sick lambs were noted. The lambs were weighed on a dial platform balance with a 50 kg capacity and an accuracy of 0.05 kg up until weaning, and then again on a 100 kg capacity and an accuracy of 0.10 kg after weaning. This was done in the morning before the lambs had access to feed or water at three months of age (weaning), and then again at six, nine, and twelve months.

### Classification of data

Season of birth, year of illness sire, and sex were used to categorise the death rate data. Also computed were the rates of morbidity and death by sire. Since these information were not kept on file at the farm, it was not possible to incorporate data on weather, feeding, housing, and gender-specific management in the analysis.

### Sex of lamb

In age groups ranging from six to twelve months, mortality rates for male and female lambs were computed independently for every disease under examination.

### Season of birth

The year was split into two seasons based on the month of lambing in order to examine the impact of meteorological variations, such as temperature, humidity, rainfall, etc., on the incidences of death.

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

### Year of mortality

Data on lambs born between the years of 2005 and 2014 were included in this study. The nine-year period from 2005–06 to 2013–14 was used to divide the mortality. The quantity of sheep available in each year, broken down by age group, is displayed annually. Separate mortality rates were computed for ages 6-12, and older than twelve months.

## Economic losses due to mortality

Economic losses due to mortality were calculated on the basis of live healthy animals as follows:

$$ELBM = EVB [BH * ND]$$

$$ELWN = EVW [WH * ND]$$

Here,

ELBM/ELWM= the economic losses (in rupees) in body weight /wool weight due to mortality.

BH/WH= the body weight /wool weight of diseased lambs.

ND= number of lambs died.

EVB/EVW= the economic value per kg body /wool weight expressed as market price of 1 kg of live/wool weight.

## Results

### Economic Losses due to body weight (Mortality)

For every age group, birth season, and disease year, the economic losses in body weight resulting from mortality were computed. Throughout the course of the study, the average cost per kilogramme of live weight at CSWRI was Rs. 130.

The mean weight of the eighteen lambs who perished was  $20.95 \pm 0.70$  kg, meaning that a total of 377.10 kg of body weight was lost. According to Table 4.1, the economic loss as a result of this body weight drop was Rs. 49023.00.

For the 11 male and 7 female lambs, the overall body weight losses were 240.79 kg and 145.11 kg, respectively. As a result, the economic losses incurred were Rs. 31302.70 and 18864.30, respectively.

The overall body weight losses for the 12 lambs born in the main season were 252.96 kg, whereas the losses for the 6 lambs born in the minor season were 110.76 kg. The monetary losses incurred as a result of mortality were Rs. 32884.80 and Rs. 14398.80, respectively. The economic loss resulting from animal mortality was greater in the major season of birth compared to the minor season because there were more animals in the major season.

The cumulative body weight losses from 2005–06 to 2013–14 resulting from the deaths of 1, 2, 1, 0, 2, 2, 0, 6 and 4 lambs were, in order, 14.04, 50.06, 23.39, 0.00, 24.22, 46.82, 0.00, 97.26 and 95.04 kg.

1825.20, 6507.80, 3040.70, 0.00, 3148.60, 6086.60, 0.00, 12643.80 and 12355.20 and other amounts were the economic losses documented throughout these years. The overall total economic loss due to mortality was Rs.98591.09.

### Adult group (above twelve months of age)

The total body weight loss resulting from the death of 63 lambs was 1800.10 kg, with an average loss of  $28.57 \pm 0.180$  kg/lamb. Thus, Rs. 234012.87 was the economic loss as a result of this body weight drop (Table: 4.2).

For the 10 male and 53 female lambs, the total body weight losses were 315.93 kg and 1383.30 kg, respectively. As a result, the economic losses incurred were Rs. 41070.90 and Rs. 179829.20, respectively. Due to the higher number of deceased female animals, the economic losses in the female group were greater than in the male group.

For 59 lambs born in the major season, the losses in terms of total body weight were 1755.84 kg, and for 4 lambs born in the minor season, it was 108.20 kg. The monetary losses resulting from mortality were Rs. 14066.00 and Rs. 228259.20, respectively. Because there are more animals in

the major season than in the minor, the economic loss from mortality is higher in the major season of birth.

From 2005–06 to 2013–14, the total body weight losses resulting from the deaths of 0, 3, 8, 3, 5, 11, 7, 15, and 11 lambs were 0.00, 90.17, 240.96, 83.39, 140.60, 309.10, 186.20, 447.75, and 338.66 kg, in that order.

During these years, there were the following reported economic losses: 0.00, 11721.84, 31324.80, 10836.15, 18278.00, 40183.00, 24206.00, 58207.50, and 44025.41, in that order. The entire economic loss as a result of mortality was 354328.13 rupees. The period from 2012 to 2013 had the largest drop in body weight.

The entire amount of money lost as a result of body weight loss was Rs. 629150.05.

## Discussion

Acute respiratory disease outbreak in a flock of adult sheep and lambs in Uttar Pradesh, India, was reported by Kumar *et*

*al.* (2005) [3]. The disease was caused by *Pasteurella* sp. There were 127 sheep in all that were at risk of infection; the rates of morbidity, mortality, and case fatalities were 47.24%, 18.11%, and 38.33%, respectively.

Due to helminthic load, Biffaa *et al.* (2006) [4] reported 20% mortality in adults and 30% mortality in lambs.

In the suckling, weaner, hogget, and adult age groups, Sharma (2006) [5] observed that the total morbidity rates in Marwari sheep were 8.53, 6.21, 15.38, and 34.79 percent, respectively. Barbosa (2014) investigated that enterotoxaemia (25.5%), septicemia (19.1%), colibacillosis (14.9%), coccidiosis (8.1%), and other diverse causes (31.9%) were found to be the main risk factors for poor lamb survival. Most lambs (55%) died without exhibiting any clinical symptoms, with mortality rates greater in those between 0–14 and 31–45 days old (36%). A total of 116.706€ was lost annually by the 57 sheep farms due to an average mortality rate of 13.05%, which included abortions and lamb deaths.

**Table 1:** Economic losses due to mortality in hog got group

Effect	Healthy		Died Animal				Total Economics (Rs)
	Avg. body wt. (kg.)	THA	Body wt. loss (kg.)	ND	Total Bwt. Loss (kg.)	Economic Loss Rs	
Overall	22.99±0.101	2543	20.95±0.17	18	377.10	49023.00	98591.09
<b>Sex</b>							
Male	24.74±0.155	1225	21.89±0.239	11	240.79	31302.70	75330.32
Female	21.27±0.097	1318	20.73±0.202	7	145.11	18864.30	23602.54
<b>Season</b>							
Major	22.74±0.123	1749	21.08±0.175	12	252.96	32884.80	68556.15
Minor	23.32±0.169	794	18.46±0.621	6	110.76	14398.80	28295.54
<b>Year</b>							
2005-06	21.89±0.295	291	14.04±1.077	1	14.04	1825.20	5909.77
2006-07	26.03±0.573	269	25.03±0.434	2	50.06	6507.80	8455.85
2007-08	24.45±0.271	211	23.39±0.179	1	23.39	3040.70	12943.58
2008-09	20.91±0.241	319	13.05±0.723	0	0.00	0.00	4084.57
2009-10	19.96±0.162	292	12.11±0.508	2	24.22	3148.60	11317.74
2010-11	24.31±0.21	315	23.41±0.458	2	46.82	6086.60	8891.48
2011-12	21.46±0.248	311	20.78±0.729	0	0.00	0.00	177.32
2012-13	24.07±0.291	298	16.21±0.731	6	97.26	12643.80	28982.07
2013-14	24.13±0.298	237	23.76±0.832	4	95.04	12355.20	14413.62

**Note:** Figures in parenthesis indicate number of animals economic loss was calculated on the basis of CSWRI rates Rs. 130/- per kg live body weight during the study period

**Table 2:** Economic losses due to mortality in adult group

Effect	Healthy		Died animal				Total Economics (Rs)
	Avg. body wt. of lambs (kg.)	THA	Body wt. loss (kg.)	ND	Total Body wt. Loss (kg.)	Economic Loss Rs	
Overall	29.86±0.154	882	28.57	63	1800.10	234012.87	354328.13
<b>Sex</b>							
Male	33.25±0.217	489	31.59	10	315.93	41070.90	82479.54
Female	27.25±0.125	393	26.10	53	1383.30	179829.00	258466.00
<b>Season</b>							
Major	31.02±0.22	372	29.76	59	1755.84	228259.20	338671.58
Minor	28.73±0.203	510	27.05	4	108.20	14066.00	23899.85
<b>Year</b>							
2005-06	32.79±0.529	408	31.35	0	0.00	0.00	6916.78
2006-07	31.15±1.105	319	30.06	3	90.17	11721.84	18548.40
2007-08	31.6±0.511	122	30.12	8	240.96	31324.80	99626.80
2008-09	28.86±0.446	444	27.79	3	83.36	10836.15	13768.17
2009-10	28.88±0.463	509	28.12	5	140.60	18278.00	21623.94
2010-11	29.28±0.279	524	28.10	11	309.10	40183.00	53068.60
2011-12	27.63±0.359	471	26.60	7	186.20	24206.00	30202.25
2012-13	30.81±0.391	439	29.85	15	447.75	58207.50	61278.75
2013-14	31.9±0.427	406	30.79	11	338.66	44025.41	54009.02

**Note:** Figures in parenthesis indicate number of animals economic loss was calculated on the basis of CSWRI rates Rs. 130/- per kg live body weight during the study period

**Conclusion**

The adult group's morbidity rate is greatly influenced by the sex of the lamb, suggesting that males are more robust and disease-resistant than females.

**Declarations of Competing Interest**

The authors declare that they have no conflicts of interest associated with this publication.

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