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Assessment of economic losses due to clinical mastitis amongst dairy farmers of western Maharashtra

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Abstract

Clinical mastitis is sever noticeable problem in India, where high-producing breeds are more susceptible to mammary infections. Current study conducted in three district of western Maharashtra region. Total 240 dairy farmers selected those having at least five dairy animal for the study. Data revealed that large herd size dairy farmers produce highest milk. Small herd dairy farmers had higher duration of clinical mastitis (6.1 days), discard more milk and paid highest average treatment cost (₹ 493.8/-) compared to medium and large dairy farmers. Medium herd size dairy farmers culled the maximum (71.59%) number of animals because of mastitis. The average economic loss for medium herd size dairy farmers was ₹ 13,981.30/-lactation, whereas the largest overall economic loss was ₹ 17,61,643.80/- for one lactation.

Keywords: Clinical mastitis, dairy farmers, economic losses, herd size

Introduction

Among dairy animals' diseases which affect the profitability of rearing animal, mastitis is considered to be one of the expensive diseases in terms of production losses (Bardhan, 2013) [1]. Clinical mastitis is sever noticeable problem in India, where high-producing breeds are more susceptible to mammary infections. Measuring these multidimensional losses is critical for developing data-driven health management strategies and optimizing decision-making for long-term dairy productivity. In light of these economic losses, the present study was undertaken to assessment of economic losses due to clinical mastitis among dairy farmers of Western Maharashtra

Methodology

This *ex-post facto* study was conducted in the Pune, Satara, and Kolhapur districts of the Western Maharashtra region. Four talukas were selected from each district, and two villages were chosen from each taluka. Ten dairy farmers were purposively selected from each village those having

least five dairy animals and had at least one case of clinical mastitis within the past two years in their farm or having experience of mastitis in their farm. These information was verified using the Out Patient Register (OPD) of the Veterinary Dispensary. In total, 240 dairy farmers were included for the study, resulting in the screening of 2,020 dairy animals for mastitis. Both quantitative and qualitative data were collected through structured interviews, observation, interaction, and detailed discussions with the dairy farmers.

The economic losses due to mastitis are operationally defined as the extent of information possessed by the respondents about economic losses due to mastitis of dairy farmers at the time of investigations. The economic loss due to clinical mastitis could be categorised into milk production loss, treatment loss and animal value depreciation. (Sinha & Thombare, 2023, pp. 1-5) [9]

A. Total Economic Loss due to mastitis = Production loss + Treatment loss + Culling loss

a. Milk production loss: The production loss refers to a

reduction in milk production per animal and is estimated as follows

$$YL = (0.5 \times YA) \times Yp \times Py \times Da$$

Where,

YL= Reduction in milk production per day per disease animal

YA= Average milk production loss as the animal suffers due to mastitis

Yp = Average milk productivity of a healthy animal

Py = Average price of milk

Da = Average duration of mastitis case

b. Cost of discarded milk in mastitis animals:

$$YV = (0.5 \times Yp) \times Pd \times Dd$$

Where,

YV = Monetary value of milk discarded due to mastitis per animal

Yp = Average milk productivity of a healthy animal

Pd = Difference in the Average price of good and mastitis milk

Dd = Number of days milk is likely to be discarded (3 days)

C. Treatment loss or Cost of veterinary medicines:

The medicine used for the treatment of mastitis cases was intra-mammary infusion, such as Mammitel, Pendistrin-SH, Mastilep, Inj. Enrostrong –PZ, and Mastiout, etc. The intra-mammary infusion and parental drugs were administered at 12 or 24 hour intervals for three days.

Vet. Medicine (C) = Quantity of Medicine x Number of affected quarters/Animal

Veterinary Doctor Fee or Consultation Charges

The money received by the Veterinary Doctor or Livestock Supervisor from the livestock owner is the honorarium for the treatment of a mastitis animal. The consultation charge depends on the number of visits by the Doctor or Livestock Supervisor to attend the animal at their farm. If a farmer brings his mastitis animal to the veterinary hospital or dispensary, he has to pay only the registration fee.

D. Culling loss or Economic loss due to culling of mastitis animal

The economic loss due to culling or discarding, and the replacement cost, was calculated as follows

$$AL = (Pl_a - Pca)$$

Where,

AL = Farmer's loss due to culling a mastitis/ lactating animal

Pl_a = Average market price of the milch animal in lactation

Pca = Average market price received by the farmer for the culled animal

$$\text{Economic loss due to animal culling} = Pa \times Pc \times La$$

Where,

Pa = Proportion of animal population affected by mastitis

Pc = Per cent of culled animal

La = Economic loss in terms of value per animal due to culling

Results and Discussion

Table 1 revealed that large herd size dairy farmers produced the highest milk on average, 61.8 litres/day, followed by medium herd size, 53.6 litres/day and small herd size, 46.0 litres/day. Kolhapur had the highest milk production among small herd size, 52.9 litres/day, Pune, 85.2 litres/day, had a noticeably higher milk production in medium herd size dairy farmers. In the category of large herd dairy farmers, Satara had the maximum milk production of 85.6 litres/day. Small herd size dairy farmers produced the least amount of milk, 16,336 litres, while medium herd size produced the highest on average, 22,430 litres, followed by large herd, 16,906 litres. This suggests that medium herd sized dairy farmers had relatively higher milk production, perhaps as a result of appropriate herd strength and balanced management techniques.

Small herd size dairy farmers discard milk on average, 3.1 litres/day, followed by medium herd size (2.9 litres/day), and large herd size dairy farmers (1.4 litres/day). The largest milk loss due to the discard of milk among small herd size dairy farmers (4.0 litres/day) was reported by Satara. The greatest loss in Medium Herd size was recorded in Pune (3.8 litres/day). All regions had relatively low milk loss due to discard of milk in large herd size with Pune having somewhat higher milk loss (1.5 litres/day), than Satara and Kolhapur.

Medium herd size of dairy farmers had the most cases of clinical mastitis (69.23%), followed by large herds (16.48%) and small herds (14.28%). In the Pune districts, medium herd size dairy farm accounted for the majority of cases of clinical mastitis (16.48%), followed by large herd size dairy farmers (11.53%) and small herds (4.39%). This implies that one of the main factors impacting the frequency of mastitis in Pune may be medium herd management techniques.

Small herds reported the largest average amount of milk discarded due to mastitis, 41.3 litres (₹ 1,935/-), followed by medium herds, 48.66 litres (₹ 1,620/-), and large herds, 27.9 litres (₹ 1,141/-). In terms of herd-wise distribution, Satara had the largest average milk discard among small herd size dairy farm, 76 litres (₹ 2660/-), Pune recorded the largest discard, 66.3 litres (₹ 2,320/-), among medium-sized dairy and large herd size, 36.4 litres (₹ 1,274/-).

The results after medication, small herd size dairy farm had the largest average milk loss, 2.8 litres (₹ 98/-), followed by large herds, 1.3 litres (₹ 45.5/-), and medium herds, 1.0 litres (₹ 35/-). This implies that milk waste after treatment was comparatively lower in medium-sized cows and greater in small-sized herds.

Small herd size had the greatest average duration of mastitis, 6.6 days, followed by medium herd size, 5.9 days, while large herd size had the smallest length, 3.7 days. This suggests that large herd size typically have quicker recovery times, perhaps as a result of improved management techniques and prompt treatment. Small herd size obtained relatively lower prices (₹ 34.60/-/litre), while medium herds recorded the highest average market price (₹ 39.50/-/litre), closely followed by large herds (₹ 40.30/-/litre).

Table 2 shows that large herd size dairy farmers had the

lowest average treatment cost (₹ 339.6/-), while small herd size dairy farmers had the highest average treatment cost (₹ 493.8/-), followed by medium herd size dairy farmers (₹ 453.4/-). In terms of herd size wise dairy farmers distribution, Satara reported the highest treatment cost (₹ 716.6/-), Pune had the highest cost (₹ 603/-) for medium herd size dairy farmers and Kolhapur had the lowest treatment cost (₹ 187.5/-) in large herd size dairy farm. While large herd size dairy farmers paid the lowest average veterinarian fee (₹ 154/-), small herd size dairy farmers paid the highest average (₹ 314.2/-), followed by medium herd size dairy farmers (₹ 254.1/-). In terms of herd-wise distribution, Satara had the highest veterinarian fee (₹ 508.3/-) for small herd size dairy farmers, Pune recorded the highest charge (₹ 295.3/-) for medium herd size dairy farmers.

Table 3 revealed that medium herd size dairy farmers culled the maximum (71.59%) number of animals because of mastitis, whereas small herd size dairy farmers culled the 19.31 percentage followed by large herd size dairy farmers (09.10%). The average market price of milch animals was highest for medium herd size dairy farm (₹ 70,200/-), followed by large herd size dairy farm (₹ 68,518/-) and small herd size dairy farm (₹ 62,651/-). This suggests that compared to dairy animal kept in small herd size, those kept in medium herd and large herd sizes typically had greater

market prices. In terms of herd-wise distribution, Kolhapur dairy farmers had the highest average price for small herd size dairy animals (₹ 67,050/-), followed by Satara (₹ 58,733/-) and Pune (₹ 59,000/-). This result was consistent with the findings of Modi (2010) ^[5], Sabbapara (2014), Rahman and Gupta (2015) ^[6] and Hulmani (2022) ^[3] who asserted that most respondents had a small herd.

Table 4 shows that Mastitis cause a significant strain on the finances of dairy farmers, according to data on the distribution of overall economic losses due to mastitis based on herd size of dairy farmers. Dairy farmers faces a total economic loss of ₹ 25,38,718/- across all herd groups of dairy animals; the overall average economic loss per dairy farmers was ₹ 13,949/-.

The overall economic loss to dairy farmers was ₹ 2,79,765.20/- with the average for small herd size dairy farmers of ₹ 10,760.20/- for one lactation. The average economic loss for medium herd size dairy farmers was ₹ 13,981.30/-lactation, whereas the largest overall economic loss was ₹ 17,61,643.80/- for one lactation. The average economic loss for large herd size dairy farmers was ₹ 11,988/-, while the total reported economic loss was ₹ 3,59,640/-. Almost similar types of losses were reported by Sinha *et al.* (2014) ^[9] and Rathod *et al.* (2017) ^[7]. and Christy (2014) Highest incidence of CM was observed in crossbred cows due to more.

Table 1: Distribution of Economic losses in dairy farmers due to milk production loss on the basis of herd size

Particulars	Pune	Satara	Kolhapur	Overall
Milk yield from a healthy animal (litres/day)				
Small	33.25	49.5	52.9	46.0
Medium	85.2	44.69	42.8	53.6
Large	58.8	85.6	48	61.8
Mean± SD	50.7±34.3	36.4±21.6	35.5±22.0	40.9±27.4
Average total milk production/lactation (litres)				
Small	1,960	13,566	18,674	16,336
Medium	22,096	22,163	23,021	22,430
Large	17,474	11,250	20,666	16,906
Mean± SD	20299.7±11791.8	20006.2±13063.5	21846.6±13705.3	20717.5±12849.6
Average milk loss due to mastitis (lit/day)				
Small	1.8	04	3.6	3.1
Medium	3.8	2.5	2.7	2.9
Large	1.5	1.4	1.2	1.4
Mean± SD	2.0±0.9	1.9±0.7	2.2±0.8	2.0±0.8
Number of animals affected by mastitis				
Small	08(04.39)	06(03.29)	12(06.59)	26(14.28)
Medium	30(16.48)	49(26.92)	47(25.82)	126(69.23)
Large	21(11.53)	05(02.74)	04(02.19)	30(16.48)
Mean± SD	0.73±0.56	0.75±0.49	0.78±0.58	0.75±0.52
Average milk discarded due to mastitis (litres)				
Small	40.6	76	25.3	41.3
Medium	66.3	47.9	31.8	48.66
Large	36.4	24	23.5	27.9
Mean± SD	38.48±12.41	36.58±14.15	31.23±13.83	39.28±13.46
Discarded milk after giving medicine in litres (litres)				
Small	2.6	4.5	2.1	2.8
Medium	1.7	0.9	0.6	1.0
Large	0.3	1.6	6	1.3
Mean± SD	0.1±0.3	0.1±0.3	0.1±0.3	0.11±0.32
Duration of mastitis (days)				
Small	4.3	8.8	7.1	6.6
Medium	7.4	5.1	5.7	5.9
Large	3.9	3.4	3.2	3.7
Mean± SD	4.2±1.5	4.0±1.2	4.6±1.3	4.3±1.4

Market price of milk (₹ /litre)				
Small	41.8	29	36	34.6
Medium	39.0	39.3	40.0	39.5
Large	40.45	40	30	40.3
Mean± SD	39.71±06.81	37.41±07.35	38.98±06.94	38.07±07.07

(Figure in parenthesis express in percentage)

Table 2: Distribution of economic losses due to treatment of dairy animals on the basis on herd size

Particulars	Pune	Satara	Kolhapur	Overall
Cost of treatment (₹) on the basis on Herd Size				
Small	318.70/-	716.60/-	499.10/-	493.80/-
Medium	603/-	390.80/-	423.40/-	453.40/-
Large	354.20/-	400/-	187.50/-	339.60/-
Mean± SD	351±176.7	318.1±175.6	333±159.4	334.0±170.6
Veterinary doctor fee (₹) on the basis on Herd Size				
Small	168.70/-	508.30/-	314.10/-	314.20/-
Medium	295.30/-	258.90/-	222.70/-	254.10/-
Large	155.70/-	160/-	137.5/-	154/-
Mean± SD	168.5±76.45	206.7±91.95	184.8±72.12	186.7±81.81

Table 3: Economic Losses Due to culling of dairy animals on the basis on Herd Size

Particulars	Pune	Satara	Kolhapur	Overall
Number of animals culled due to clinical mastitis on the basis on Herd Size				
Small	03(03.41)	02(02.27)	12(13.63)	17(19.31)
Medium	09(10.23)	07(07.95)	47(53.40)	63(71.59)
Large	03(03.41)	01(01.13)	04(04.54)	08(09.10)
Mean± SD	0.18±0.45	0.12±0.33	0.08±0.28	0.13±0.36
Market price of milch animals (₹) on the basis on Herd Size				
Small	59,000/-	58,733/-	67,050/-	62,651
Medium	69,634/-	70,114/-	70,807/-	70,200/-
Large	69,350/-	66,750/-	65,333/-	68,518/-
Mean± SD	68500±13847.2	67812.2±11774.3	69662.5±11249.6	68658.3±12313.5

(Figure in parenthesis express in percentage)

Table 4: Total Economic Losses Due to Clinical Mastitis on the basis on Herd Size

Sr. No	Particulars	Small	Medium	Large	Overall
Milk Production Loss					
1.	Average milk discarded due to mastitis (Lit.)	38.48	36.58	31.23	39.28
2.	Average Discard milk after giving medicine (Lit.)	0.1	0.1	0.1	0.11
3.	Average milk loss during discarded milk (₹)	1440.20/-	1369.30/-	1665.90/-	1470.10/-
Treatment Loss					
1.	Cost of veterinary consultation (₹)	168.5/-	206.70/-	184.80/-	186.70/-
2.	Cost of medicine (₹)	351/-	318.10/-	333/-	334/-
Culling Loss					
1.	Culling loss due to mastitis. (₹)	7450/-	10232/-	8180.80/-	10123.70/-
3.	Overall loss due to the culling/animals (₹)	1351/-	1855.20/-	1483.30/-	1835.50/-
Average Economic Loss/farmers (₹)		10760.20/-	13981.30/-	11988/-	13949/-
Total Economic losses of dairy farmers (₹)		279765.20/-	1761643.80/-	359640/-	2538718/-

Conclusion

The overall economic loss of ₹ 25,38,718/- due to mastitis is a major threat to the dairy farmers' economy in western Maharashtra. While large herd size dairy farmers have optimized their management to minimize loss and maximize recovery, medium herd size dairy farmers are currently the most affected by incidence of mastitis, and small herd size dairy farmers are the most burdened by the cost of intervention. To improve this sector, policy interventions should focus on providing small and medium herd size dairy farmers with better access to affordable veterinary care services and standardized hygiene protocols to mirror the efficiencies seen in large-scale operations.

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