



Study on Economics of Milk Production under Dairy Cooperative Societies in Aizawl District of Mizoram, India

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ABSTRACT

Background: Mizoram is the fifth smallest state in the Indian Union characterized predominantly by hilly landscape and a little plane region with the whole area covering 21,081 square kilometres in the North-Eastern Region of India situated between 23.1645°N and 92.9376°E. More than 90% of the people of the State referred to as 'Mizo' belong to Schedule Tribe. Agriculture and its allied activities are the main occupation of the people, while animal husbandry plays significant role in bringing economic stability to most of the vulnerable population during crop failure.

Methods: Twelve cooperative societies affiliated to Mizoram Milk Producers' Cooperative Union Ltd. (MULCO) were selected purposively from Aizawl district of Mizoram. And from each cooperative society, ten numbers of farmers were randomly selected among the farmers who have been raising dairy cattle for a minimum of 5 years and have at least one lactating cow at the time of visit. Thus, acquiring a total of 120 (n=120) respondents. The farmers thus selected were divided into three categories as per their herd size, for these statistical tools like standard deviation and average were used. The fixed cost for different farm categories of each farmer were recorded by using Capital recovery cost method and the other parameters recorded were variable cost, total cost, cost per liter of milk, return from sale of milk, return from sale of animal, value of dung, net cost, net return and net return per liter of milk.

Result: Overall net return per liter of milk production was found to be Rs 20.34; the highest was for the medium herd farmers (Rs 20.64) and lowest for the small herd farmers (Rs 18.84). So, the overall managerial practices followed by medium herd farmers were better compared to small and large herd farmers.

Key words: Dairy farmers, Management, Milk, Returns.

INTRODUCTION

More than 90% of the people of the State referred to as 'Mizo' belong to Schedule Tribe. Agriculture and its allied activities are the main occupation of the people, while animal husbandry plays significant role in bringing economic stability to most of the vulnerable population during crop failure.

As per 20th Livestock Census (2019) the total population of cattle in the state was 45,701 of which 21,455 are exotic/crossbred and 24,246 are indigenous cattle, Aizawl district alone have 9,024 nos. of exotic/ crossbred cattle which is more than 42% of the whole State' population. Total milk production (2021-2022) in the state is 24,588.1 Metric tons (Statistical Handbook Mizoram, 2022).

The Mizoram Multi-Commodity Producers Cooperative Union (MULCO) was established on the 5th January, 1983 with the initiation of Department of A.H. and Veterinary, Mizoram and is registered under Mizoram Cooperative Act on 5th June 1984, to function as an Autonomous body. At present MULCO have 36 affiliated Dairy Cooperative Societies under it with a total number of 711 members. The main role of the Union is to procure milk from its affiliated societies, processed and sell milk and its product, as well as look into the welfare of the societies by making dairying a sustainable source of income and by providing their requirements including trainings (MULCO Annual Report, 2022-23). Literature/documents/reports related to systematic study on economics of dairy cattle farming are

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still very less in Mizoram. Thus, the primary objectives of the current research is to determine the economics of rearing dairy cattle in Aizawl district of Mizoram.

MATERIALS AND METHODS

Selection of cooperative societies

Twelve cooperative societies affiliated to Mizoram Milk Producers' Cooperative Union Ltd. (MULCO) were selected purposively from Aizawl district of Mizoram. The data were collected, compiled and analyzed for a period of 2 years (2022 to 2024).

Selection of respondents

From each cooperative society, ten numbers of farmers were randomly selected among the farmers who have been raising dairy cattle for a minimum of 5 years and have at least one lactating cow at the time of visit. Thus, acquiring a total of 120 (n=120) respondents.

Categorization of farmers

The herd sizes of each individual were converted into Standard Animal Units (SAUs) as per Sirohi *et al.* (2019). Based on the total number of SAU possessed, the farmers were categorized into three herd groups, *viz.*, small herd farmers, medium herd farmers and large herd farmers by using mean and standard deviation (Table 1). The topography of the land of the study area is in such a way that the mountainous terrain does not favoured grazing as well as housing and maintaining in large number. This might be the reason why a large majority of the farmers have medium (3 to 7) herd size.

Cost of milk production

Overall milk production cost consists of two components:

- A. Fixed cost
- B. Variable cost

Fixed cost

Fixed costs remain constant and un-effected by changes in output quantities over a short period of time. Depreciation and interest on fixed capital investments are the two components of fixed costs. The capital recovery cost (CRC) method as per Sirohi *et al.* (2015) was used for calculation of fixed costs. Interest on fixed cost does not have to be accounted separately when using the CRC method.

Depreciation (and interest on fixed capital investments)

Depreciation is the decline in value of assets resulting from constant and prolonged use. The CRC methods used to calculate depreciation costs is the annual repayment, to make up with the fixed cost throughout their useful life and make it possible for return on investment. The following formula was used to calculate CRC:

$$R = Z \left[\frac{(1+r)^n r}{(1+r)^n - 1} \right]$$

Where:

R = Capital recovery cost (CRC).

Z = Initial value of the capital asset.

r = Interest rate.

n = Useful life of the assets.

The present worth of the asset was taken into consideration in the event of any kind of practical challenges in obtaining the data on initial outlay at the field level. When using owned funds, the interest on a 1-5 year term deposit was used (6.50%), whereas when using borrowed funds, actual interest rate paid to the bank was used ("r"). The useful life was taken as 50 years for pucca shed, ten years for kutcha shed, six years for manual chaff cutter and ten years for power driven chaff cutter. The lifespan of milch animals

varies depending on the species (local and crossbred). According to subject matter experts, average number of calving during their useful or productive life is defined in terms of age (years) and order of lactation: Crossbred cow: 8-10 years, 5-6 calving, local cow: 10 years, 6 calving. Finally, the total CRC was then divided among each animal as per Standard Animal Units (SAUs) listed by Sirohi *et al.* (2019).

Variable cost

Variable cost are the costs that have the possibility to change within a short term and are very much dependent on the input such as feed costs, labor costs, veterinarian assistance or consultation fees and other miscellaneous expenses.

Feed and fodder cost

The quantity of feed consumed, the prevailing market price and the corresponding SAU was taken into account for concentrate feeds and dry fodder, however prices for green fodder which were cut and collected by the farmers cannot be ascertained and thus not considered in this study.

Veterinary and miscellaneous cost

Cost incurred for health care including vaccination and A.I charges within a year were included in veterinary expenses while miscellaneous expenditure includes cost of repairs, electricity fee, water supply, purchase of milk cans, buckets, rope *etc.* However, some expenditure were shared by the entire herd like; cattle shed, storage, water tub, buckets *etc.* including cost of labor and other expenditure for which SAU was taken into account.

Total cost

It is the aggregate of all cost required for operation of a farm and for the present study it was calculated by summing up the expenditure incurred for Total fixed cost and Total variable cost.

$$\text{Total cost} = \text{Total fixed cost} + \text{Total variable cost}$$

Cost per liter of milk

$$\text{Cost per liter} = \frac{\text{Maintenance cost per animal per year}}{\text{Total milk produced per animal}}$$

Returns

Returns from sale of Milk

It was estimated by multiplying each animal's milk production by applicable market rates in the research area, *i.e.*

$$\text{Returns from milk production} = \text{Quantity of milk} \times \text{Market price of milk}$$

Table 1: Categorization of dairy herd farmers.

Herd size (SAU)	Farmer's category	Number	Percentage
<3	Small herd	17	14.17
3 to 7	Medium herd	92	76.67
>7	Large herd	11	9.16
	Total	120	100

Returns from sale of animals

It was the income incurred from sell of animal (s).

Value of dung

The average quantity of dung produced by the farm as such or after drying was multiplied by the existing market prices in the study area. The resultant value was again converted into SAUs for easy assessment of manure production by the milch cattle.

Net cost

It was the cost obtained by subtracting the sum of dung value and return from sale of animal from the Total cost, *i.e.*

$$\text{Net cost} = \text{Total cost} - (\text{Value of dung} + \text{Return from sale of animal})$$

Net return

Net return was the difference incurred between the return from sale of milk and net cost of milk production, *i.e.*

$$\text{Net returns} = \text{Return from sale of milk} - \text{Net cost of milk production}$$

Net return per liter of milk production

It was calculated by dividing the average net returns per animal (SAU) per year with average lactation yield (SAU) per animal.

Net return per liter =

$$\frac{\text{Net return per animal (SAU) per year}}{\text{Total milk yield per animal (SAU) per year}}$$

RESULTS AND DISCUSSION

The data on the results of economics of milk production are presented in Table 2. The total fixed cost of small, medium and large herd farms were 33.31, 33.85 and 32.91 per cent of their total cost while the overall total fixed cost is 33.94 per cent of the overall total cost, the annual average total costs of milk production per SAU for small, medium and large herds farms were found to be Rs.1,20,500.08, Rs.1,12,384.70 and Rs. 1,14,207.93, respectively, while the overall total cost was Rs. 1,13,701.51. Higher total fixed cost along with higher cost involved in concentrate feed, labor and miscellaneous cost might have resulted in higher total cost of milk production. In contrast to the present findings, Deb (2022) in Tripura claims the average overall total fixed cost to be 19.60% of the overall total cost.

Total variable cost of milk production for small, medium and large herd farmers was found to be 66.69, 66.15 and 67.09 per cent of the total cost. The annual feed and fodder cost for small, medium and large herd farmers were 51.20, 51.92 and 54.56 per cent of their total cost and the overall annual feed and fodder cost was 52.05 per cent of its total cost. Lal (2016) stated that, 60 to 75% of the maintenance cost were from feeds and fodder, which is in contrast to the present findings as green fodder were obtained through

the farmers cut in the forest which cannot be accounted to in the present study. A variety of factors in the environment, comprising the herd, year, calving season, age at calving and management practices, play an important role in determining the performance and assessment of individual animals (Talukdar *et al.*, 2016; Talukdar *et al.*, 2022). Moreover, the herd size in the study area refers to the total number of dairy animals housed and managed together by a farmer.

The labour costs for small, medium and large herds farmers were 7.86, 7.49 and 7.35 per cent, respectively of their total cost and the overall labour cost was 7.53 per cent of the total cost. The small herd farmers have higher labour cost than the medium and large herd farmers; this might be due to the fact that the cost of labour is inversely proportional to the number of cattle in the herd. The present observation was in accordant with Singh *et al.* (2019) in Manipur, who stated that, with the increase in herd size the cost of labor decreases.

The miscellaneous costs for small, medium and large herds dairy farmers were 7.63, 6.74 and 5.19 per cent, respectively and overall miscellaneous cost is 7.53 per cent of the overall total cost. From the study it was found that miscellaneous cost was a shared cost and it decreased with the increase in the number of cattle.

The average return for each liter of milk sold for small, medium and large herds farmer were Rs. 18.84, Rs. 20.64 and Rs. 20.14, respectively and overall total return was worked out to be Rs. 20.34 per liter. Base on the data of the present study, it was observed that medium herd farmers have the highest total return per liter of milk because cost of milk production per liter is lowest in medium herd farms compared to small and large herd farms. The present result is in consistent with Sumer (2023) who claims the overall total return per liter of milk as Rs. 19.91 while studying in Meghalaya. On the contrary, Deb (2022) revealed the average overall total return per liter of milk to be Rs. 9.50 per liter in Tripura. According to Dawkins (2004), farmers from large herd, medium herd and small herd categories all faced issues with space availability, which is directly related to stocking density. Animal welfare is greatly impacted by the physical state, even though it interacts with other environmental factors like ventilation, stocking density, or overcrowding. Here in the present study area, small herd farmers never have the problem in terms of space availability, whereas medium herd sometimes and large herd farmers to a greater extend use to have such issue. Applying appropriate housing systems and microclimatic protection measures can improve the reproductive and productive performance (Bertoni and Calamari, 2001; Boro *et al.*, 2022). Often, financial gain overshadowed considerations for the welfare and behavior of dairy cattle when making decisions about housing design and management (Bertoni *et al.*, 2007). Besides these factors, provision of separate milking parlour is still not in practice within the study area which might be due to the

Table 2: Cost of milk production and returns in different categories of dairy farms.

(Rs/SAU/year)

Component	Small herds farmers	Medium herd farmers	Large herd farmers	Overall
Total fixed cost (TFC)	40140.69(33.31)	38047.23(33.85)	37582.02(32.91)	38589.98(33.94)
Green fodder (F1)*	0.00(0.00)	0.00(0.00)	0.00(0.00)	0.00(0.00)
Dry fodder (F2)	0.00(0.00)	728.63(0.65)	6031.31(5.28)	1111.49(0.98)
Concentrate (F3)	61691.53(51.20)	57620.18(51.27)	56277.51(49.28)	58073.87(51.08)
Feed and fodder cost (V1=F1+F2+F3)	61691.53(51.20)	58348.81(51.92)	62308.82(54.56)	59185.36(52.05)
Labour cost (V2)	9470.26(7.86)	8412.21(7.49)	8392.18 (7.35)	8560.26 (7.53)
Miscellaneous cost(V3)	9197.60(7.63)	7576.46(6.74)	5924.92 (5.19)	7654.73(6.73)
Total variable cost (TVC=V1+V2+V3)	80359.39(66.69)	74337.47(66.15)	76625.91 (67.09)	75400.35(66.31)
Total Cost (A=TFC+TVC)	120500.08 (100.00)	112384.70 (100.00)	114207.93 (100.00)	113701.51(100.00)
Value of dung (B)	3821.70	3842.80	4077.21	3842.80
Return from sale of animal (C)	1881.91	2542.86	2317.47	2428.56
Net cost (I=A-B-C)	126203.69	118770.36	120602.61	119972.87
Price of milk (D)	66.70	64.37	66.75	64.92
Average milk production (liter/animal) (E)	2426.47	2455.95	2296.28	2437.14
Return from sale of milk (F=D*E)	161309.22	157215.66	153273.18	157434.19
Total return(G=B+C+F)	166584.79	163552.90	160532.57	163705.55
Net return (H=G-A)	46084.71	51168.19	46324.64	50004.04
Cost of milk production/liter (A/E) (Rs/liter)	50.10	46.34	49.80	47.19
Gross return(G/E)	68.94	66.98	69.94	67.53
Return/liter(H/E) (Rs/liter)	18.84	20.64	20.14	20.34

Figures in brackets represent a proportion of the total cost of the column.

* The farmers cut and collect cannot be ascertained so it is included in the labor cost.

topography and scarcity of land, as well as low educational status of the farmers.

CONCLUSION

The overall total fixed cost/SAU/year was observed to be 33.94% of the total cost and feed and fodder cost was observed to be 52.05% of the total cost. The average net return/liter of milk production is observed to be Rs 20.34, the highest amount (Rs. 20.64) is for the medium herd farmers and lowest amount (Rs. 18.84) for small herd farmers category.

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Disclaimers

The views and conclusions expressed in this article are solely those of the authors and do not necessarily represent the views of their affiliated institutions. The authors are responsible for the accuracy and completeness of the information provided, but do not accept any liability for any direct or indirect losses resulting from the use of this content.

Informed consent

All animal procedures for experiments were approved by the Institution Animal Ethics Committee of College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Selesih, Aizawl, Mizoram, India.

Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this article. No funding or sponsorship influenced the design of the study, data collection, analysis, decision to publish, or preparation of the manuscript.

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