

# Economics of Milk Production in Mandya District of Karnataka

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## Abstract

The study was conducted in Mandya district of Karnataka by collecting data from 90 milk producing households which were post-stratified into small, medium and large herd size categories. As far as productivity of the animal is concerned, the average productivity for milch animal was lowest for local followed by buffalo and crossbred, respectively. Similarly the average feed and fodder taken by the animals were found to be lowest for local cows followed by buffalo and crossbred, respectively. Per day maintenance cost was found to be highest for crossbred cows followed by buffalo and local cows. Among total maintenance costs feed and fodder costs accounts highest followed by labour cost, total fixed costs and miscellaneous costs, respectively. The return per litre of milk was highest for crossbred cows followed by buffalo and local cows. The net return from crossbred cow was more than that from buffalo and local cows indicating higher profitability in rearing crossbred cow in the area.

**Keywords:** Milk production, Mandya, karnataka, standard animal units, capital recovery cost

Milk is an important primary source of income for 70 million rural households engaged in dairying in India. India ranks first in milk production, accounting for 18.5% of world production, achieving an annual output of 146.3 million tons during 2014-15 as compared to 137.69 million tons during 2013-14 recording a growth of 6.26 %. The per capita availability of milk in India has increased from 176 grams per day in 1990-91 to 322 grams per day in 2014-15. Although there is considerable increase in milk production over years the productivity has not been improved. One of the main reasons for such low productivity is, dairying not practiced with economic outlook.

Hence the study on economics of milk production has gained more importance. The cost of milk production is an important tool for the evaluation of economics of dairy enterprise at producers' level as well as for fixing the procurement price at Dairy Co-operative Society level and to ensure that producers get remunerative price for milk and consumers get milk and milk products at reasonable price.

The objective of the study is to analyze the cost and returns of the milk production and compare between different herd sized categories.

## Materials and Methods

### *Selection of the study area*

Karnataka state has been purposively selected to conduct the present study. The state is well known for its agriculture and dairy achievements. According to 2012 livestock census, Karnataka has 30.52 million of livestock, comprising of 10.50 million of cattle, 4.32 million of buffalo, 9.55 million of sheep and 6.15 million of goat. Karnataka ranks ninth in total milch animal population with 64.25 lakhs next to Uttar Pradesh, Rajasthan, Madhya Pradesh, Bihar, Gujarat, Andhra Pradesh, Maharashtra, and west Bengal. State ranks eleventh in milk production with 6121 thousand tones of milk during 2013-14. Per capita availability in the state is 272 grams/day against national average of 307 grams. The State is the second largest producer

of milk in the cooperative sector after Gujarat, and the daily procurement by the Karnataka Milk Federation is about 46 lakh litres. Mandya district possess 1047 number of Dairy Cooperative Societies (DCSs) which is second highest in the state after Hasan district which possess 1097 number of DCSs. The number of Dairy Cooperative Society members in the district are 2,31,213 which is also second highest in state after Kolar district in which number of Dairy cooperative Member dairy farmers are highest in the state with 2, 38,925 farmers. The district produced 269.00 thousand liters of milk during the production year 2013-14 which is third highest in the state.

### **Data collection**

There are 7 taluks in Mandya district out of which 3 different taluks i.e., Mandya, Malavalli, Maddur, were randomly selected. Out of each taluks two different villages were randomly selected. A predetermined sample of 90 sample households was drawn randomly from all 6 villages. The sample was post stratified into three categories i.e. small, medium and large using Cumulative Square Root Frequency Method on the basis of milch animals.

### **Analytical Framework**

To achieve the objectives of the study, the data collected from 90 dairy households were scrutinized, tabulated and analyzed by employing various analytical tools. The analytical tools used for analysis of data are discussed in the present sections.

### **Tabular Analysis**

The data were subjected to tabular analysis for working out the socio-economic profile and cost and returns of milking and milch animals across various categories of sampled households. Supply of feed and fodder in the study area during the year was also worked out by using tabular method.

### **Estimation of Cost of milk production**

It is important to study the cost of milk production as it is an indicator of economic efficiency of milk production and indicates the profitability of the enterprise. The various cost components were identified as fixed cost and variable cost. These costs are discussed briefly in this section.

### **Fixed costs**

Fixed costs do not vary with the level of output and remain unchanged over a short period of time. The various components of fixed cost are depreciation and interest on fixed capital. Capital Recovery Cost method was used to calculate depreciation. The cost item interest on fixed capital does not need to be accounted for separately when CRC approach is followed.

### **Depreciation costs**

It is the loss in the value of an asset due to normal wear and tear, time and technological obsolescence. It can be accounted for by using the Capital Recovery Cost (CRC) Method. The CRC method is defined as the annual payment that will repay the cost of fixed input over the useful life of input and provide an economic rate of return on investment.

The formula for estimation of CRC is:

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

Where, R is capital recovery cost, Z is initial value of capital cost, r is interest rate and n is useful life of asset (in case of animals it is remaining productive life).

When the asset was purchased from borrowed capital the actual interest rate charged by the bank was taken as 'r', while in case of owned funds, the interest on term deposit of 1-5 years was taken. The useful life of assets was assumed to be 50 years for pucca cattle shed, 10 years for katcha shed, 6 years for manual chaff cutter, 10 years for power operated chaff cutter. The useful life of milch animals also varied with the type of animal and was taken as 10, 8 and 10 years for local cow, crossbred cow and buffalo, respectively. The total CRC was then apportioned to the individual animal in accordance with the Standard Animal Units (SAUs).

### **Variable cost**

Variable costs are those costs, which are incurred on the variable factors of production and can be altered in the short run. Variable cost includes three items i.e. feed and fodder cost, labour cost and veterinary and miscellaneous expenditure.

### Feed and fodder cost

This included the cost of feeding dry fodder, green fodder and concentrates to animals. In case of purchased feed and fodder, the cost was worked out as product of quantity fed to animal and purchase price of respective feed. In case of home-grown feed and fodder, the relevant prices were the farm-harvest prices. For certain types of fodder, especially cultivated green fodder, where farm-harvest prices were not available, the imputed value of crop is worked was taken as the prevailing price of standing crop in the village. In case the animal was fed with collected grass and tree leaves from the common property resources, its imputed value was their expected sale price and was accounted for while estimating the cost. When the concentrate feed was prepared at home, its cost was computed by taking the weighted prices of ingredients used in the concentrate, the weights being the share of each ingredient in the concentrate composition.

### Labour cost:

1 day of women labour = 0.67 man day (3 women = 2 men) by assuming 8 working hours a day.

### Veterinary and miscellaneous costs

The expenditure on breeding and health care of the animals was covered under the veterinary expense. It included, cost of artificial insemination (AI), natural service, vaccination, medicines, fee of veterinary doctor and other related expenses. The miscellaneous expenditure included expenses on repair of fixed assets, water and electricity charges, insurance premium and any other incidental charges. These being joint costs, apportionment of the same based on SAU were done.

### Apportionment of joint costs

Among the various cost items discussed, certain expenses are incurred on the entire herd as a whole. For instance, the fixed assets like cattle shed, stores, mangers, water tub, buckets *etc.*, are jointly used by the entire herd. Also, the information on cost on labour and miscellaneous items were not available animal wise but for the entire herd as a whole. Therefore, for the apportionment of these joint costs the total number of animal were converted into standard animal units.

### Regional Standard Animal Units (SAUs)

Considering the differences in regional endowments of animal wealth and species, the SAUs have been formulated by Sirohi *et al.* (2015) at regional level for five regions viz; Eastern (including north-east), Western, Southern, Northern plains and Hills. Most of the earlier studies have considered only labour utilization as the basis of apportionment. In this case, apart from labour utilization, the body weight of the animal was also taken into consideration for the estimation of the SAUs. Based on expert opinion 60% weight was given to labour utilization and 40% to body weights of animals for the final estimation. As the study area falls in the Southern region so standard animal Units for this region shown in Table 1 was used as given below:

**Table 1:** Standard animal units for Southern regions of India

Animals	Local cow	Crossbred cow	Buffalo
Adult male ( $\geq 3$ years)	0.97	1.12	1.04
Adult female ( $\geq 3$ years)	1.00	1.62	1.24
Young stock male ( $< 1$ year)	0.22	0.24	0.24
Young stock female ( $< 1$ year)	0.27	0.3	0.28
Young stock male ( $> 1$ year)	0.54	0.63	0.6
Young stock female ( $> 1$ year)	0.47	0.52	0.51
Heifer	0.82	0.86	0.77

Source: Sirohi *et al.* 2015

### Other cost concepts used

**Gross cost:** It was obtained by adding all the cost components including fixed and variable costs.

Gross cost = Total variable cost + Total fixed cost

**Net cost:** The net cost was worked out by deducting the imputed income earned through dung, from the gross cost.

Net cost = Gross cost – Value of dung

**Gross returns:** Gross returns were obtained by multiplying milk yield of an individual milch animal with respective prevailing prices in the study area

Gross returns = Quantity of milk  $\times$  Market price of milk

**Net returns:** Net return was calculated by subtracting net cost from gross returns

Net returns = Gross returns - Net cost

## Results and Discussion

The cost of milk production presented in this section has been summed up under maintenance costs, which include variable and fixed costs as delineated in the methodology chapter. Among variable cost the feed and fodder cost is important. The returns from milk production were computed taking weighted average of milk for different species of bovines into consideration. The gross returns were worked out taking the milk price and quantity of milk as well as deducting the imputed value of dung from cost together. Hence, analysis of cost of milk production across the milch species forms an important aspect in bovine husbandry.

Table 2 shows that the overall gross maintenance cost for milch local cow was worked out to be ₹

80.75 per day which varied from ₹ 78.39 for small category ₹ 81.48 for medium category to ₹ 85.12 for large category. The overall total fixed cost was found to be ₹ 10.47 and total variable cost to be ₹ 70.29. Feed cost accounted for the major share of gross cost varying from ₹ 50.92 (59.82%) for large category to ₹ 46.01 (58.69 %) for small category which is in agreement with similar findings of earlier studies by Singh (2015) in Ranchi district of Jharkhand. Overall per litre cost of milk production was worked out to be ₹ 26.76 per milch local cow. A net return per litre per milch animal was found to be negative for small and medium categories and positive for large size categories. It was highest for large category (₹ 0.1) and lowest for small category (₹ -0.77). Table 3 shows that the overall gross maintenance cost for milch buffalo was worked out to be ₹ 102.17 per

**Table 2:** Cost and Returns of Milk production from Milch Local cow (₹/animal/day)

Cost/Returns Components	Herd size Category			
	Small	Medium	Large	Overall
Total Fixed Cost (TFC)	9.00 (11.48)	11.29 (13.85)	12.01 (14.10)	10.47 (12.96)
Green Fodder (F1)	28.10 (61.07)	29.71 (60.06)	31.07 (61.01)	29.14 (60.41)
Dry Fodder (F2)	11.00 (23.90)	11.62 (23.44)	10.10 (19.83)	11.15 (23.11)
Concentrate (F3)	6.91 (15.01)	8.23 (16.60)	9.75 (19.14)	7.93 (16.44)
Feed & Fodder Cost (V1=F1+F2+F3)	46.01 (58.69)	49.56 (60.82)	50.92 (59.82)	48.23 (59.72)
Labour Cost (V2)	22.17 (28.28)	19.10 (23.44)	20.23 (23.76)	20.51 (25.39)
Veterinary cost (V3)	0.54 (0.69)	0.69 (0.85)	0.91 (1.06)	0.66 (0.81)
Miscellaneous (V4)	0.67 (0.85)	0.84 (1.03)	1.05 (1.23)	0.80 (0.99)
Total Variable Cost (TVC=V1+V2+V3+V4)	69.39 (88.51)	70.19 (86.14)	73.11 (85.89)	70.29 (87.04)
Gross Cost (A=TFC+TVC)	78.39 (100.00)	81.48 (100.00)	85.12 (100.00)	80.75 (100.00)
Value of Dung (B)	5.11	3.74	3.33	4.24
Net Cost (C=A-B)	73.28	77.74	81.79	76.52
Price of milk	26.17	26.32	26.40	26.27
Average milk production L/ animal/day (E)	2.72	2.91	3.10	2.86
Gross Return (D)	71.18	76.59	81.84	75.16
Net Return (D-C)	-2.09	-1.14	0.05	-1.36
Cost of milk production(₹/Litre) (C/E)	26.94	26.71	26.38	26.76
Return (₹/ litre)	-0.77	-0.39	0.01	-0.49

Note: Small (1-3 milch animals); Medium (4-6 milch animals); Large (7 & above milch animals)

Figures in parentheses indicate percentage to the total



day which varied from ₹ 96.70 for small category, ₹ 100.35 for medium category to ₹ 108.01 for large category. The overall total fixed cost was found to be ₹ 13.58 and total variable cost to be ₹ 88.58. Feed cost accounted for the major share of gross cost varying from ₹ 65.45 (60.59 %) for large category to ₹ 59.35 (61.37 %) for small category. Overall per litre cost of milk production was worked out to be ₹ 23.17 per milch buffalo. A net return per litre per milch animal was found to be positive for all the categories. It was highest for large category (₹ 4.88) and lowest for small category (₹ 2.98). Table 4 shows that the overall per day gross maintenance cost for milch crossbred cow was worked out to be ₹ 169.11 per day which varied from ₹ 166.72 for small category, ₹ 166.42 for medium category and ₹ 178.48 for large category. The overall total fixed cost was worked out to be ₹ 23.88 and total variable cost was ₹ 145.23. The overall per cent share of feed cost

to the total maintenance cost was 64.43% varying from 64.35% for small category to 63.22% for large category. Feed cost was found to be the other major component in variable cost whose overall cost was found to be ₹ 108.97 per day. Overall cost of milk production per litre of milk was worked out to be ₹ 18.49. The lowest cost per litre of milk was observed for large category (₹ 17.95) and highest for small category (₹ 19.03). Net returns per litre of milk were found to be positive for all the categories which found overall as ₹ 5.57 per litre. It was highest for large category (₹ 6.34) and lowest for small category (₹ 4.96) which is in agreement with similar findings of earlier studies by Singh (2015) and Kumari (2015). The net profit per day was higher for crossbred cow compared to buffalo and local cows which are in agreement with similar findings of earlier studies by Singh (2015) and Kumari (2015).

**Table 3:** Costs of Milk Production and Returns from Milch Buffalo (₹/animal/day)

Cost/Returns Components	Herd size Category			
	Small	Medium	Large	Overall
Total Fixed Cost (TFC)	12.66 (13.09)	13.19 (13.14)	14.69 (13.60)	13.58 (13.29)
Green Fodder (F1)	37.72 (63.55)	39.77 (63.45)	41.85 (63.94)	40.03 (63.63)
Dry Fodder (F2)	10.45 (17.60)	10.36 (16.53)	10.00 (15.27)	10.29 (16.35)
Concentrate (F3)	11.18 (18.83)	12.54 (20.00)	13.60 (20.77)	12.62 (20.06)
Feed & Fodder Cost (V1=F1+F2+F3)	59.35 (61.37)	62.67 (62.45)	65.45 (60.59)	62.91 (61.57)
Labour Cost (V2)	22.94 (23.72)	21.77 (21.69)	23.57 (21.82)	22.62 (22.13)
Veterinary cost (V3)	0.82 (0.84)	0.79 (0.78)	1.09 (1.00)	0.90 (0.88)
Miscellaneous (V4)	0.93 (0.96)	1.93 (1.92)	3.21 (2.97)	2.15 (2.10)
Total Variable Cost (TVC=V1+V2+V3+V4)	84.04 (86.90)	87.16 (86.85)	93.32 (86.39)	88.58 (86.69)
Gross Cost (A=TFC+TVC)	96.70 (100.00)	100.35 (100.00)	108.01 (100.00)	102.17 (100.00)
Value of Dung (B)	3.04	3.36	4.00	3.51
Net Cost (C=A-B)	93.66	96.99	104.01	98.66
Price of milk	27.00	27.13	27.4	27.19
Average milk production L/ animal/day (E)	3.90	4.17	4.62	4.29
Gross Return (D)	105.30	113.13	126.58	116.03
Net Return (D-C)	11.64	16.14	22.57	17.37
Cost of milk production(₹/Litre)(C/E)	24.01	23.25	22.51	23.17
Return(₹/ litre)	2.98	3.87	4.88	4.03

Note: Small (1-3 milch animals); Medium (4-6 milch animals); Large (7 & above milch animals)

Figures in parentheses indicate percentage to the total

**Table 4:** Cost of Milk production and Returns from Milch Crossbred Cow (₹/animal/day)

Cost/Returns Components	Herd size Category			
	Small	Medium	Large	Overall
Total Fixed Cost (TFC)	22.53 (13.51)	23.56 (14.15)	26.90 (15.07)	23.88 (14.12)
Green Fodder (F1)	44.62 (41.58)	44.85 (41.37)	45.75 (40.54)	44.84 (41.33)
Dry Fodder (F2)	7.48 (6.97)	7.00 (6.45)	6.9 (6.11)	7.24 (6.64)
Concentrate (F3)	55.20 (51.44)	56.54 (52.16)	60.20 (53.34)	56.81 (52.13)
Feed & Fodder Cost (V1=F1+F2+F3)	107.30 (64.35)	108.39 (65.13)	112.85 (63.22)	108.97 (64.43)
Labour Cost (V2)	32.93 (19.75)	29.55 (17.75)	32.39 (18.14)	31.44 (18.59)
Veterinary cost (V3)	0.77 (0.46)	1.77 (1.06)	1.31 (0.73)	1.26 (0.74)
Miscellaneous (V4)	3.19 (1.91)	3.15 (1.89)	5.03 (2.81)	3.57 (2.11)
Total Variable Cost (TVC=V1+V2+V3+V4)	144.19 (86.48)	142.86 (85.84)	151.58 (84.92)	145.23 (85.87)
Gross Cost (A=TFC+TVC)	166.72 (100.00)	166.42 (100.00)	178.48 (100.00)	169.11 (100.00)
Value of Dung (B)	4.70	4.79	5.23	4.85
Net Cost (C=A-B)	162.02	161.63	173.25	164.26
Price of milk	24.00	24.00	24.30	24.06
Average milk production L/ animal/day (E)	8.51	8.85	9.65	8.89
Gross Return (D)	204.24	212.40	234.49	214.03
Net Return (D-C)	42.22	50.77	61.24	49.77
Cost of milk production (₹/Litre) (C/E)	19.03	18.26	17.95	18.49
Return (₹/litre)	4.96	5.73	6.34	5.57

Note: Small (1-3 milch animals); Medium (4-6 milch animals); Large (7 & above milch animals)

Figures in parentheses indicate percentage to the total

## Conclusion

The cost per litre of milk in case of local cows was found to be decreasing across herd sized category. But the net return was lowest in case of small sized category because of more percentage of dry animals. In case of buffalo the cost per litre of milk was found to be more in case of small sized category and lowest for large sized category. The net return was highest from the large sized category and lowest from small sized category. Similarly, the cost per litre was lowest for large category and highest for small category in case of cross bred cows. Similarly, net return was found to be highest for large category and lowest for small category. The study pronounced that the productivity of the buffaloes and local cows maintained by all categories of dairy farms was lower than crossbred cows across all categories of dairy farms. Therefore, there is a need to make

efforts to increase the productivity of buffaloes and local cows by upgrading the animals and adoption of scientific dairy farming practices and providing more feed and fodder to the animals.

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