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Economic Performance of Selected Dairy Breeds in Ayodhya Mandal, Uttar Pradesh

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ABSTRACT

The study estimated the milk production in the Ayodhya mandal of Uttar Pradesh for selected dairy breeds, Sahiwal, Murrah, and Crossbred (with jersey) during the years 2020-2021. Using a pre-tested structured schedule, primary data was collected on 108 dairy animals of the selected dairy breeds and their respective lactation groups. This study used the snowball sampling technique to select animals from different lactation groups and the budgetary technique to calculate the costs and returns. There was a significant increase in the cost of milk production, which was measured by the cost of milk per liter 1.18 times, 1.15 times, and 1.10 times, respectively, in the Sahiwal, Crossbred cow, and Murrah groups as compared to the first to third lactation groups, for milk production during the 7th lactation and above. For the same lactation group of Sahiwal, Crossbred cow, and Murrah, the net return per liter declined by 36 per cent, 17 per cent, and 21 per cent, respectively, for the same group of Sahiwal, Crossbred cow, and Murrah cows.

INTRODUCTION

The total milk production in India has increased more than 12 folds from 17 million tons in 1951-52 to 210 million tons in 2020-21 (GoI, 2021-22). Since the advent of the white revolution, the Indian dairy industry has undergone massive changes, becoming one of the world's top milk revolution players. Therefore, the dairy industry has enormous potential to provide job opportunities for a large population (Aski & Hirevenkanagoudar, 2010; Das et al., 2020; Mandi et al., 2022). Consequently, the livestock sector is contribution 4.11 per cent to the GDP of the country and 25.6 per cent to the agricultural GDP at constant price (GoI, 2021-22). The dairy industry contributes significantly to agricultural growth and is a powerful tool to improve rural socio-economic conditions (Mondal et al., 2022). About 90 per cent of this milk production is coming from milch bovine population of 303 million comprising cattle (63.78%) and buffaloes (36.22%). Among bovine population, India has a large population of Indigenous descriptive breeds which have survived over a long time and fit well into the agro-ecological environment of their habitat. There are about 50 recognized indigenous breeds of cattle and 19 buffalo in India (ICAR-NBAGR, 2022). The major indigenous cattle breeds of India are Gir, Red Sindhi, Sahiwal, Amrit Mahal, Umbalacheri, Deoni, Hariana, Ongole, Rathi, Vechur, etc. The major indigenous breeds of buffalo are mainly Bhadawari, Jafarabadi, Mehsana, Murrah, Surti, etc. In terms of national milk production, these indigenous breeds play an important role. According to the Government of India, in 2021-22, the amount of milk produced by indigenous breeds is about 41 per cent of the total milk production, with indigenous cattle contributing 8.82 per cent and indigenous buffalo contributing 32.13 per cent, respectively, to the total milk production (GoI, 2021-22). The value contributed by dairy sector to total agricultural output is also higher than other products including rice (Samal et al., 2014). The economics of milk

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production are based on single lactation studies, and therefore are not able to capture the advantages of these breeds in terms of productivity, physical characteristics, and management, but these traits were not captured in conventional economics of milk production. Many studies have been caried out to find the costs and returns from milk production but for a single lactation (Kumawat, 2016; Keerthi & Paramasivam, 2019; Kumari et al., 2020; Lalrinsangpuii et al., 2016; Singh et al., 2019; Mohapatra et al., 2020). In order to capture the whole productive life contribution, the present paper attempted to analyze costs and returns of milk production, breed-wise and lactation-wise in different lactations, and compare the same with crossbred cows.

METHODOLOGY

The ultimate sample units, the dairy animals in their different age group of a breed were selected to collect data on relevant variables. Indigenous cattle (Sahiwal), cross bred cattle (Jersey cross bred) and buffalo (Murrah) in Ayodhya mandal in Uttar Pradesh have been selected on the basis of concentration of the particular breed in this region. There were 108 animals selected from different age groups so that a complete representation of their productive lives could be covered by the sample size of 108 animals using Snowball sampling design**.** The age groups of each selected breed; are: 1-3 lactation number, 4-6 lactation number and ≥7 lactations. In making these age groups, it was assumed that economic parameters do not vary much within one lactation group and 12 animals in each lactation group were selected making a total sample size of 36 animals for each breed. An estimation of the costs and returns of milk production was made using a budgetary approach for each lactation group based on the costs of milk production. The costs and returns of animals falling in each lactation groups were aggregated and average was calculated per day per animal. Depreciation was calculated using Capital Recovery Cost (CRC) method, has given by Sirohi et al., (2015):

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

Where, R is the capital recovery cost, Z is the initial value of the capital asset, r is the interest rate, n is the useful life of the assets

In order to apportion it per animal, the animals in a herd were converted to Standard Animal Units (SAUs) using factors suggested by Sirohi et al., (2015) for the Northern region. Feed and fodder costs, labour costs, veterinary expenses, and miscellaneous expenses were included. For animals in different lactations, farmers directly provided data on variable expenses, labor requirements and labour costs for various farm, veterinary and miscellaneous expenses were recorded. Value of dung have been calculated for individual animals (Sirohi et al., 2015).

Gross Cost (GC) = Total Fixed Cost (TFC) + Total Variable Cost (TVC)

Net Cost (NC) = GC – Value of the dung

Gross Returns (GR) = (Milk produced/animal /day) × Price of Milk received by farmer

Net Returns = Gross Returns -Net Cost

Net return per liter of milk calculated by dividing net returns per day by the average milk yield (AMY) of the respective breed in given lactation group.

RESULTS

Costs and returns of milk production from Sahiwal in different lactation groups

Table 1 presents the total costs and return of milk production from Sahiwal in different lactation groups. As evident from table, the total gross cost of maintenance of Sahiwal animal was Rs. 117.62 per day during 1st to 3rd lactation group. It increased to Rs. 134.80 per day during 4th to 6th lactation and then decreased to Rs. 112.00 per day. It got decreased by almost 16.91 per cent during ≥7th lactation group as compare to cost during 4th to 6th lactation. The major reason for increase and subsequent decrease in maintenance cost was mainly the change in feed and fodder costs. The feed and fodder cost counted for 53 to 64 per cent in the gross costs of maintenance of Sahiwal cow during different lactation groups. It was Rs. 65.19 and Rs. 77.19 per day during 1st to 3rd and 4th to 6th lactation but reduced to Rs. 60.19 per day during ≥7th lactation registering a decrease of about 22.02 per cent compare to previous lactation group. The net cost is Rs. 104.15, Rs. 119.35 and Rs. 98.99 per day and net return per liter Rs. 13.16, Rs. 14.82 and Rs. 8.52 per day in 1-3rd, 4-6th and ≥7th respectively.

Costs and returns of milk production from cross bred in different lactation groups

Table 2 presents the total costs and return of milk production from Cross bred in different lactation groups. As evident from table, the total gross cost of maintenance of Cross bred animal was Rs. 152.69 per day during 1st to 3rd lactation group. It increased

Table 1. Costs and returns in milk production from sahiwal cow across lactation stages (Rs./animal/day)

Cost component	1-3rd	4-6th	≥7th
Total fixed cost (TFC)	12.08	12.75	12.73
Green fodder (F1)	10.68	12.58	10.43
Dry fodder (F2)	31.36	34.84	29.91
Concentrate (F3)	23.15	29.77	19.86
Mineral mixture (F4)			
Feed and fodder cost (V1=F1+F2+F3+F4)	65.19	77.19	60.19
Labor cost (V2)	37.31	41.44	35.39
Veterinary cost (V3)	1.83	2.13	2.54
Miscellaneous cost (V4)	1.21	1.29	1.16
Total variable cost (TVC=V1+V2+V3+V4)	105.54	122.05	99.28
Gross cost (A=TFC+TVC)	117.62	134.80	112.00
Value of dung (B)	13.46	15.45	13.02
Net cost (C=A-B)	104.15	119.35	98.99
Average milk production L/animal/day (E)	4.71	6.14	3.78
Gross return (D)	166.18	210.38	131.17
Net return (E=D-C)	62.02	91.03	32.18
Cost of milk production (Rs./L)	22.10	19.43	26.20
Net return/L (Rs.)	13.16	14.82	8.52

Table 2. Costs and returns in milk production from cross bred cattle across lactation stages (Rs./animal/day)

Cost component	1-3rd	4-6th	≥7th
Total fixed cost (TFC)	18.64	17.23	19.83
Green fodder (F1)	18.11	22.27	17.41
Dry fodder (F2)	38.49	44.42	39.87
Concentrate (F3)	37.49	52.92	32.76
Mineral mixture (F4)	4.28	3.99	
Feed and fodder cost (V1=F1+F2+F3+F4)	98.37	123.60	90.04
Labor cost (V2)	30.87	30.97	30.13
Veterinary cost (V3)	2.69	3.35	3.56
Miscellaneous cost (V4)	2.12	2.17	2.09
Total variable cost (TVC=V1+V2+V3+V4)	134.05	160.09	125.81
Gross cost (A=TFC+TVC)	152.69	177.31	145.65
Value of dung (B)	20.84	24.87	20.60
Net cost (C=A-B)	131.85	152.44	125.05
Average milk production L/animal/day (E)	6.74	8.67	5.53
Gross return (D)	193.17	256.19	167.19
Net return (E=D-C)	61.32	103.75	42.14
Cost of milk production (Rs./L)	19.57	17.59	22.60
Net return/L (Rs.)	9.10	11.97	7.62

to Rs. 177.31 per day during 4th to 6th lactation and then decreased to Rs. 145.65 per day. It got decreased by almost 17.85 per cent during ≥7th lactation group as compare to cost during 4th to 6th lactation. The major reason for increase and subsequent decrease in maintenance cost was mainly the change in feed and fodder costs. The feed and fodder cost counted for 61 to 69 per cent in the gross costs of maintenance of Cross bred cow during different lactation groups. It was Rs. 98.37 and Rs. 123.60 per day during 1st to 3rd and 4th to 6th lactation but reduced to Rs. 90.04 per day during ≥7th lactation registering a decrease of about 27.15 per cent compare to previous lactation group. The net cost is Rs. 131.85, Rs. 152.44 and Rs. 125.05 per day and net return per litre Rs. 9.10, Rs. 11.97 and Rs. 7.62 per day in 1-3rd, 4-6th and ≥ 7th respectively.

Table 3. Costs and returns in milk production from murrah buffalo across lactation stages (Rs./animal/day)

Cost component	1-3rd	4-6th	≥7th
Total fixed cost (TFC)	13.56	11.89	12.60
Green fodder (F1)	16.39	17.65	17.91
Dry fodder (F2)	40.47	45.18	40.06
Concentrate (F3)	36.21	49.45	31.73
Mineral mixture (F4)	0.63	0.63	
Feed and fodder cost (V1=F1+F2+F3+F4)	93.69	112.91	89.71
Labor cost (V2)	37.31	41.44	36.38
Veterinary cost (V3)	2.32	2.82	2.85
Miscellaneous cost (V4)	1.38	1.47	1.16
Total variable cost (TVC=V1+V2+V3+V4)	134.70	158.64	130.10
Gross cost (A=TFC+TVC)	148.26	170.53	142.71
Value of dung (B)	19.78	22.03	20.29
Net cost (C=A-B)	128.47	148.50	122.41
Average milk production L/animal/day (E)	4.78	6.19	4.13
Gross return (D)	208.48	270.72	177.38
Net return (E=D-C)	80.00	122.22	54.96
Cost of milk production (Rs./L)	26.86	23.99	29.65
Net return/L (Rs.)	16.72	19.74	13.31

Costs and returns of milk production from murrah buffalo in different lactation groups

Table 3 presents the total costs and return of milk production from Murrah in different lactation groups. As evident from table, the total gross cost of maintenance of Murrah animal was Rs. 148.26 per day during 1st to 3rd lactation group. It increased to Rs. 170.53 per day during 4th to 6th lactation and then decreased to Rs. 142.71 per day. It got decreased by almost 16.31 per cent during ≥7th lactation group as compare to cost during 4th to 6th lactation. The major reason for increase and subsequent decrease in maintenance cost was mainly the change in feed and fodder costs. The feed and fodder cost counted for 62 to 66 per cent in the gross costs of maintenance of Murrah buffalo during different lactation groups. It was Rs. 93.69 and Rs. 112.91 per day during 1st to 3rd and 4th to 6th lactation but reduced to Rs. 89.71 per day during ≥7th lactation registering a decrease of about 20.54 per cent compare to previous lactation group. The net cost is Rs. 128.47, Rs. 148.50 and Rs. 122.41 per day and net return per litre Rs. 16.72, Rs. 19.74 and Rs. 13.31 per day in 1-3rd, 4-6th and ≥7th respectively.

DISCUSSION

Murrah buffalo were more profitable in later lactations as compared to other breeds. Crossbred though was having the net return from milk production per day per animal up to 4th to 6th lactation but exhibited a sharp dip in milk production and profit per animal with the increase in lactation number Sahiwal found to be more consistent in milk production throughout the lactation period as compared to crossbred. Farmers also reported frequent health issues during late lactations in case of crossbred cattle as compared to other two breeds thereby increasing the cost of milk production.

CONCLUSION

The per day maintenance cost of Sahiwal was the lowest among all the three breeds. Hence, Sahiwal is the alternative to farmers having limited resource in the resource scarce areas. These breeds should be conserved as these breeds require lower per day cost of maintenance and thrive better in poor endowment regions. From the study, it can be concluded that indigenous breeds are bound to fetch higher returns to resource poor farmers if production is linked to markets with demand preferences for organic and indigenous cow milk.

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