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COST AND RETURNS ESTIMATION AND BREAK-EVEN POINT ANALYSIS OF MURRAH BUFFALO MILK PRODUCTION IN HARYANA

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ABSTRACT

The dairy sector in India plays a crucial role in the country's economy and rural livelihoods. Present study focuses on Murrah buffalo farming dynamics, analyzing milk production, consumption patterns, and economic aspects of 120 Murrah (pure and graded) buffalo farmers in Karnal and Hisar districts of Haryana, India. Results revealed that the average milk production and consumption per household per day were 22.75 kg and 5.42 kg, respectively. Farmers generated an average marketed surplus of 17.32 kg of milk per day per household, contributing to the local dairy economy. Furthermore, farmers preferred (68.33%) un-organized milk marketing channels, highlighting the need to strengthen dairy cooperatives and market infrastructure. The cost of milk production was estimated at ₹ 90,864.05 per annum per buffalo, with a net income of ₹ 22,227.97. The break-even point for milk production was 953.93 kg per buffalo per annum, representing 45.38% of the total milk production. Additionally, Murrah buffalo milk production generated an average of 215.12 man-days of employment per annum per household, emphasizing its role in rural employment generation. These findings highlight the significance of targeted interventions to enhance sustainability and livelihoods in Murrah buffalo farming, contributing to regional socio-economic development.

Keywords: *Bubalus bubalis*, buffaloes, Murrah, economics, milk production, net returns, marketed surplus

INTRODUCTION

The livestock sector holds significant importance in the Indian economy and constitutes a vital component of the agricultural sector. India has a rich genetic diversity of bovines, with an estimated population of 302.79 million (Livestock Census, 2019). Livestock ownership in India is relatively widespread among landless laborers and marginal farmers, although the private and organized sectors control a smaller proportion. Livestock serves as a reliable form of insurance against natural disasters such as droughts and famines. Additionally, the dairy sector plays a pivotal role in augmenting rural income by

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supplying nutritious milk, organic fertilizer in the form of dung for agriculture, fuel for rural households, and draft power for farming and transportation purposes (Patbandha *et al*., 2015).

India is known for its superior buffalo germplasm, hosting a population of 109.85 million buffaloes, which constitutes approximately 20.45% of the nation's total livestock count (Livestock Census, 2019). Buffaloes contribute significantly to the dairy sector, accounting for approximately 44.81% of the total milk production in the country (DAHD, 2023). India's milk production rose from 222.07 million tonnes in 2021 to 2022 to 230.58 million tonnes in 2022 to 2023, indicating a growth rate of 3.83%. The per capita milk availability has consistently risen since 2016-17, increasing from 351 grams per day to 459 grams per day by 2022 to 2023. Indigenous buffaloes exhibit a substantially higher average milk production (6.13 kg/ day/ animal) compared to indigenous cattle (5.31 kg/ day/animal), highlighting their significance as dairy animals in India due to their exceptional feed conversion efficiency and adaptability.

The Murrah stands out as one of the premier breeds among Indian buffaloes and has a population of 48.25 million in India, encompassing both purebred and graded animals. Furthermore, countries such as China, Brazil, Bulgaria, Bangladesh, and Egypt have adopted the Murrah breed as a means of enhancing their native buffalo stocks, owing to its superior milk production, reproductive capabilities, adaptability to diverse environmental conditions, and efficient feed conversion. This particular breed is primarily distributed across Haryana and neighboring regions including Punjab, Uttar Pradesh, and Delhi. The present study aims at analyzing the Murrah buffalo farming dynamics, including milk production, consumption, and economic aspects. With the significance of Murrah buffalo farming in India's dairy sector, this research aims to inform targeted policies for enhancing sustainability and livelihoods in the region.

METHODOLOGY

Sampling plan

The study was conducted in the two districts of Haryana, Karnal and Hisar, located in the eastern and western part of the state, respectively possess the highest buffalo populations (Livestock Census, 2019). Two blocks each from Hisar district, i.e. Hisar and Agroha, and Karnal district, i.e. Karnal and Gharunda, were selected using the multi-stage stratified random sampling, with two villages randomly chosen from each block. 15 Murrah farmers were then randomly selected from each village, resulting in a total sample size of 120 farmers. The respondents were personally interviewed using a structured pre-tested interview schedule. The study focused on dairy farmers owning at least one Murrah buffalo (pure/graded) in milk at the time of the interview. The selected respondents were post-classified into three groups such as Group 1 (1 to 2 milch Murrah), Group 2 (3 to 4 milch Murrah) and Group 3 (5 and above milch Murrah) based on Murrah buffalo holdings. The results indicated that approximately 46.67% of Murrah buffalo farmers fell into Group I, while the remaining 33.33% and 20% were classified under Group 2 and Group 3, respectively.

Analytical technique

The budgetary analysis was used for the estimation of cost and returns from milk production. The estimation is comprised of two major components, i.e. cost and returns.

1. Costs

There are two major costs a) fixed cost b) variable cost.

a) Fixed cost

These costs do not vary with the level of milk production and remain unchanged in the short term. Fixed costs are mainly depreciation costs incurred on durable assets used in the milk production process, rental value of the land and interest in the fixed capital investment. The Capital Recovery Cost (CRC) method was used to calculate the fixed cost (Sirohi *et al*., 2015). The formula for estimation is given below.

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

Where; R= Capital Recovery Cost, Z= Initial value of capital asset, r=Interest rate, n=Useful life of the assets.

b) Variable cost

Costs incurred on variable factors of production such as feed and fodder, labour cost, veterinary cost and miscellaneous expenditure.

Feed and fodder cost

It includes the cost of feeding green fodder, dry fodder and concentrating mixture (including mineral mixture and salt). The cost was estimated by multiplying the purchase price of feed and fodder (Rs. per kg) with the quantity of the feed and fodder fed to buffaloes considered. In the case of homegrown fodder (green/dry), the cost of fodder production was estimated. Whereas, in the case of homegrown feed material used in the preparation of the concentrate mixture, the imputed value of the feed material was considered.

Labour cost

There are two types of labour involved in buffalo husbandry, i.e., hired and family labour. The cost of hired labour was computed by considering time spent (in hours) in Murrah buffalo milk production activities out of total man-days working hours multiplied by the prevailing wage rate per day. In the case of family labour, the imputed value of family labour cost was estimated through time spent on activities related to Murrah buffalo milk production multiplied by the average wage paid to agricultural labour in the study area.

Veterinary and miscellaneous expenditure

Veterinary expenditure includes the cost of artificial insemination, natural services, vaccination, medicines (deworming and other), and fees for veterinary surgeons. The repair on fixed assets, water and electricity charges and other related costs was considered under miscellaneous expenditure.

2. Returns/income

It includes income from sale of milk and the imputed value of the calf and dung.

Income from sale of milk

The lactation yield of buffalo was estimated by using the peak yield of the buffalo multiplied by two hundred days. In the case of buffalo, which has yet to reach peak yield and dry buffalo, the lactation milk yield was calculated based on the peak yield of previous lactation. The income from milk is computed by the total lactation milk yield multiplied by the sale price of milk (per kg).

Income from dung

The total dung produced by the entire herd is apportioned to each buffalo on the farm by using the Standard Animal Unit (SAU). The income from dung was calculated using the total quantity of dung produced multiplied by the sale price of dung (per trolley) at the village. In the case of dung used for the owner's farm, then the imputed value based on the prevailing rates in the village was considered.

Income from calf

The newly born male or female buffalo calf is considered income for dairy farmers. Most of the farmers sell the male buffalo calf. The selling price of the male buffalo calf is considered as income to the farmers. In the case of female calf, dairy farmers further rear/maintain for milk production, the imputed value of the prevailing price of the 6 to 12 months female buffalo calf price was considered.

Break-Even Point (BEP) of milk production

The BEP is a point where no profit or loss status is achieved, and marginal returns (MR) are equal to marginal costs (MC). In this study, a break-even point analysis was done to estimate the minimum quantity of milk to be produced to cover the total cost in a year.

$$\text{BEP} = \frac{\text{Total Fixed Cost (Rs.)}}{\text{Average sale price of mik per kg (Rs.)} - \text{Average variable cost per kg of milk (Rs.)}}$$

Employment generation

Dairying creates significant employment opportunities for farmers and youths in the economy. The employment generation was estimated by recording the actual time spent in various operations of dairy activities for each household. Later, the total time spent by the family (men and women) and hired labour was converted into man-days by assuming eight working hours.

RESULTS AND DISCUSSIONS

Milk production, consumption and marketed surplus

Milk is a perishable commodity and requires quick disposal or conversion into products. Hence, it is necessary to understand the production, consumption and marketed surplus of milk in the study area. The average production, consumption, and marketed surplus of milk among Murrah buffalo farmers is given in Table 1. Overall, the average milk production per household per day was 22.75 kg. This figure serves as a crucial indicator of the productivity levels achievable by Murrah buffalo farmers in the study area. It suggests a significant output potential, contributing to both household sustenance and commercial dairy activities. Results also revealed that the average milk consumption per household, encompassing both raw milk and milk products, was 5.42 kg per day for Murrah buffalo farmers. This consumption figure provides insights into the dietary habits and nutritional intake practices among these households. The relatively high consumption rate highlights the importance of dairy products as a dietary staple in the region. Furthermore, the milk availability per capita and consumption per capita are almost the same, implying an equilibrium between milk production and household consumption. This balance indicates efficient utilization of dairy resources and suggests a well-adjusted dairy production system within the study area. The average marketed surplus of milk sold by Murrah buffalo farmers is 17.32 kg per day. This surplus not only contributes to the income generation of farmers but also addresses

the broader market demand for dairy products, supporting the local dairy industry and economy. Moreover, it has also been noted that more than 75% of the milk is available for non-producers through different milk marketing channels in the study area, highlighting the substantial contribution of Murrah buffalo farming to the regional dairy market. This surplus availability reveals the importance of efficient milk marketing channels and strategies for ensuring optimal utilization of dairy resources and sustaining the dairy economy in the region.

Economics of Murrah buffalo milk production

Cost of milk production

The cost and returns, as well as the Break-Even point of Murrah buffalo milk production, are presented in Table 2. The gross cost is estimated at ₹ 90,864.05 per annum per milch buffalo. This gross cost comprises total fixed and variable costs, accounting for 11.37% and 88.63%, respectively. Similar findings have been reported by Agrawal and Raju (2021); Rathore *et al.* (2020); Lakshmipriya *et al.* (2022) in their studies. The Total Variable Cost (TVC) includes expenses such as feed and fodder, payments for hired and family labour (imputed value), and veterinary and miscellaneous expenditures. Among these, the highest share of feed and fodder cost accounts for 71.68% of the gross cost. This observation aligns with previous studies by Kumar *et al.* (2015); Lal and Chandel (2016); Singh and Kaur (2020); Mohapatra *et al.* (2021), which noted that feed and fodder costs typically comprise 65 to 75% of the gross cost. Labour costs, including both family and hired labour, constitute 13.63% of the gross cost, while expenditures on veterinary and miscellaneous items make up 3.32%. Furthermore, an inter-group analysis revealed that the gross cost was slightly higher for Group 1 farmers, followed by those in the Group 2 and 3 categories of respondents in the study area. These findings emphasized the significant contributions of feed and fodder costs to the overall expenses of Murrah buffalo milk production, highlighting the importance of efficient management strategies in optimizing production costs. Additionally, the observed variations in gross costs among different farmer groups suggest potential areas for targeted interventions to enhance cost-effectiveness and profitability in Murrah buffalo farming.

Returns from milk production

The returns from Murrah buffalo milk production encompass sales of milk, income generated from dung, and revenue from the sale of calves aged 6 to 12 months, all categorized as miscellaneous income. In the present study, the imputed value of dung was considered, given that many dairy farmers utilize buffalo dung for their agricultural land, thereby contributing to crop production. Similarly, the imputed value of female calves was factored in, as dairy farmers typically retain them for future milk production. The net cost of buffalo milk production was computed after deducting miscellaneous income, resulting in an average net cost of ₹ 81,315.34 per buffalo per annum. Lactation length milk yield was determined using the peak milk yield method, wherein the peak yield of the buffalo was multiplied by 200 days and divided by 365 days to ascertain the per-day milk production. The average lactation length of buffaloes in the study area was observed to be 8 to 9 months (240 to 270 days), with an average total milk production of 2102.10 kg per annum. With an average milk sale price of ₹ 49.10 per kg, the gross income from milk production was estimated at ₹ 1,03,213.94 by multiplying total milk production by the average milk price. The net income per

Murrah buffalo after deducting net cost from gross income was found to be ₹ 22,898.60 per annum. Inter-group analysis revealed that the net cost was ₹ 78,358.94 per annum for Group 3 farmers, while for Group 1 and 2 farmers, the net cost was ₹ 80,022.45 and ₹ 82,564.63 per annum, respectively. Interestingly, the net income was highest for Group 3 (₹ 29,750.64) farmers compared to Group 1 (₹ 16,166.81) and Group 2 (₹22,831.12) farmers. This disparity in net income may be attributed to the presence of high milk-yielding buffaloes and the operation of economies of scale within larger buffalo herds among Group 3 farmers.

Break-even point of milk production

The Break-Even Point (BEP) in milk production signifies the minimum quantity of milk necessary to offset the total costs associated with milk production. The average quantity of milk required per buffalo per annum to cover total costs was found to be 953.93 kg. Among different categories of farmers, Group 1 required a higher quantity of milk (i.e., 1439.11 kg per annum per buffalo), followed by Group 2 (947.67 kg per annum per buffalo) and Group 3 (673.99 kg per buffalo per annum). On average, the BEP represents 45.38% of the total milk production in the study area. Inter-group analysis revealed that about 30.83% of total milk constitutes the BEP for Group 3 farmers, whereas 71.16% and 45.17% of the total milk make up the BEP for Group 1 and 2 categories of farmers, respectively. The BEP as a percentage of total milk production was highest for Group 1 farmers due to the lower milk productivity of their buffaloes. High-yielding buffaloes can effectively reduce the total costs incurred in milk production and consequently lower the BEP.

Average annual employment generation from Murrah buffalo milk production

The Table 3 depicts the annual average employment generation from Murrah buffalo milk production, with an average of approximately 215.12 man-days per annum of employment generated in the study area. Disaggregated data on employment generation reveals that about 85.21% of the employment stemmed from family labour involved in Murrah buffalo milk production, while the remaining 14.79% was generated from hired labour. Further inter-group analysis revealed that Group 1 farmers generated about 127.36 man-days per annum of employment, with hired and family labour contributing 86.38% and 13.62%, respectively. In the case of Group 2 dairy farmers, the annual average employment was 190.66 man-days, with approximately 84.89% generated from family labour and the remaining 15.11% from hired labour involved in Murrah buffalo milk production activities. The highest employment generation was observed in Group 3 dairy farmers, totaling 327.71 man-days, with about 84.93% and 15.07% of man-days employment generated by family and hired labour, respectively. Across all categories of dairy farmers, involvement of family labour in dairying activities accounted for more than 80% of the employment, highlighting the significant role of family labour in sustaining Murrah buffalo milk production.

CONCLUSION

The findings of the study highlight several critical policy considerations for enhancing the sustainability and efficiency of Murrah buffalo milk production. Firstly, policy interventions should prioritize supporting smallholder dairy

Table 1. Production, consumption and marketed surplus of milk among Murrah buffalo farmers.

S. No.	Particulars	Group 1	Group 2	Group 3	Overall
1	Milk production per household (In kg)	10.61 (100.00)	18.46 (100.00)	39.17 (100.00)	22.75 (100.00)
2	Milk consumption per household (In kg)	4.45 (41.99)	5.02 (27.21)	6.79 (17.34)	5.42 (23.84)
3	Marketed surplus of the milk (In kg)	6.15 (58.01%)	13.44 (72.79%)	32.38 (82.66%)	17.32 (76.16%)

Note: Figure in parenthesis shows per cent to total milk production.

Table 2. Cost and returns of Murrah buffalo milk production in study area. (₹ /buffalo/year).

S. No.	Particulars	Group 1	Group 2	Group 3	Overall
1	Total Fixed Cost (TFC)	11503.86 (12.46)	10312.78 (11.34)	9173.28 (10.27)	10329.97 (11.37)
	Cost on green fodder	17543.23 (19.00)	17760.37 (19.53)	17147.40 (19.19)	17483.66 (19.24)
	Cost on dry fodder	15184.00 (16.45)	16407.20 (18.05)	17048.54 (19.08)	16213.25 (17.84)
	Cost on concentration mixture (includes mineral mixture and salt)	31295.43 (33.90)	30333.58 (33.36)	32682.71 (36.58)	31437.24 (34.60)
	Labour cost	13699.02 (14.84)	13115.24 (14.43)	10332.21 (11.56)	12382.16 (13.63)
	Veterinary and miscellaneous expenditure	3092.73 (3.35)	2987.60 (3.29)	2972.99 (3.33)	3017.77 (3.32)
	Total Variable Cost (TVC)	80814.41 (87.54)	80603.98 (88.66)	80183.84 (89.73)	80534.08 (88.63)
3	Gross cost (Gc=TVC+TFC)	92318.27 (100.00)	90916.76 (100.00)	89357.15 (100.00)	90864.05 (100.00)
4	Miscellaneous income [Imputed value of dung (D_I) and calf (C_I)]	9753.64	10894.31	10998.17	10548.71
5	Net cost [Nc = Gc – (D_I+ C_I)]	82564.63	80022.45	78358.94	81315.34
	Average total milk production per buffalo (kg/year) [TM]	2022.43	2098.01	2185.87	2102.10
	Average milk sale price (Pr) (₹ /kg)	48.82	49.02	49.46	49.10
6	Gross income (G_I = Mp*Pr) (Rs./year)	98731.44	102853.57	108109.59	103213.94
7	Net income ($N_I = G_I – N_C$) per standard lactation (₹ /year)	16166.81	22831.12	29750.64	22898.60
8	Break Even Point (BEP) of milk production (kg/year) [BEP_M]	1439.11	947.67	673.99	953.93
9	Percentage of BEP milk to total milk production BEP_{MTM} = (BEP_M/ TM)*100	71.16	45.17	30.83	45.38

Note: Figure in parenthesis shows per cent to gross cost.

Table 3. Average annual employment generation from Murrah buffalo milk production.

Particulars	Group 1	Group 2	Group 3	Overall
Family labour	110.00 (86.38)	161.54 (84.89)	278.33 (84.93)	183.29 (85.21)
Hired labour	17.35 (13.62)	28.75 (15.11)	49.38 (15.07)	31.82 (14.79)
Total	127.36 (100.00)	190.29 (100.00)	327.71 (100.00)	215.12 (100.00)

Note: Number in parenthesis shows percent to respective totals.

farmers through access to training, technology, and financial resources to boost productivity and income levels. Additionally, targeted investments in infrastructure development, including veterinary services, feed and fodder availability, and milk processing facilities, are essential to ensure product quality and market access. Encouraging the adoption of organized milk marketing channels through incentives and capacity-building programs can streamline supply chains and improve price realization for farmers. Addressing challenges related to input costs, such as feed and fodder, through sustainable agricultural practices and subsidized inputs is crucial. Finally, fostering collaboration among dairy cooperatives, private companies, and Farmers' Producers Organizations (FPOs) can strengthen market linkages and promote inclusive growth in the dairy sector, thereby contributing to regional socio-economic development.

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REFERENCES

Agrawal, A. and R. Raju. 2021. Assessment of production and utilization pattern of milk and milk products in Madhya Pradesh. *Indian J. Econ. Dev.*, **17**(2): 237-244.

Brar, R.S., I. Kaur, V.P. Singh and N. Kaur. 2018. Factors affecting choice of milk marketing channels by dairy farmers in Punjab. *Journal of Krishi Vigyan*, **6**(2): 123-129. DOI: 10.5958/2349-4433.2018.00026.0

Department of Animal Husbandry, Dairying and Fisheries. 2022. *Annual Report 2022-2023*, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India, India. Available on: https://dahd.gov.in/sites/default/files/2023-06/FINALREPORT2023ENGLISH.pdf

Kumar, A., A.K. Mishra, S. Parappurathu and G.K. Jha. 2018. Farmers' choice of milk-marketing channels in India. *Econ. Polit. Wkly.*, **53**(51): 58-67.

Kumar, M., A. Dhillon and V.P. Luhach. 2015. Economic analysis of milk production in Rewari district of Haryana. *Indian J. Dairy Sci.*, **68**(5): 496-501.

Lakshmipriya, P., D.K. Sinha, K.M. Singh, R.P. Singh and N. Ahmad. 2022. Economic analysis of milk production: A study of south India. *Econ. Aff.*, **67**(5): 711-720. DOI:

10.46852/0424-2513.5.2022.4

Lal, P. and B.S. Chandel. 2016. Economics of milk production and cost elasticity analysis in Sirsa district of Haryana. *Econ. Aff.*, **61**(3): 405-411. Available on: https://ndpublisher.in/admin/issues/EAV61N3h.pdf

Livestock Census. 2019. *Basic Animal Husbandry Statistics, 2019.* Government of India, Ministry of Agriculture, Department of Animal Husbandry, Dairying and Fisheries, Krishi Bhawan, New Delhi, India.

Mohapatra, S., R. Sendhil, A. Singh, A.K. Dixit, R. Malhotra and K. Ponnusamy. 2021. An economic analysis of milk production in Haryana. *Indian J. Dairy Sci.*, **74**(2).

Patbandha, T.K., K. Ravikala, B.R. Maharana, S. Marandi, A.R. Ahlawat and P.U. Gajbhiye. 2015. Effect of season and stage of lactation on milk components of Jaffrabadi buffaloes. *Bioscan*, **10**(2): 635-638.

Rathore, R., R. Malhotra, U. Chaudhary and R. Jangid. 2020. A comparative study on economics of milk production among self-help group members and non-members in Rajasthan. *Indian J Dairy Sci*, **73**(6): 592-599. DOI: 10.33785/IJDS.2020.v73i06.012

Singh, J. and P. Kaur. 2020. An economic analysis of milk production among different breeds of milch animals in Punjab. *Journal of Agricultural Development and Policy*, **30**(1): 68-74.