THE SCIENCE WORLD
A Monthly e Magazine
ISSN:2583-2212
Short communication
January, 2026 Vol.6(1), 249-252

A Comparative Economic Evaluation of Milk Production from Buffaloes and Crossbred Cows in Banaskantha District of Gujarat

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DOI:10.5281/ScienceWorld.18432798

Abstract

Dairying constitutes a pivotal component of rural economies in India, with Banaskantha district exemplifying high cooperative integration. Using a multistage sampling of 120 households, the data indicates a distinct trade-off between production efficiency and net profitability. While Crossbred Cows (CBC) demonstrated a lower cost of production per liter (₹25.54) compared to Buffaloes (₹33.70), the latter proved significantly more profitable. Buffalo farming generated a net daily income of ₹89.70 per animal, nearly triple the ₹30.27 earned from Crossbred Cows. This enhanced profitability in buffalo rearing is principally attributable to premium pricing of buffalo milk, driven by its higher fat.

Keywords: Dairy Economics, Buffalo vs. Crossbred Cow, Net income, Banaskantha

1. Introduction

The livestock sector remains a cornerstone of India's rural economy, providing sustainable livelihoods, supplementary income, and enhanced nutritional security to millions of farming households, particularly for landless and marginal farmers. India has solidified its position as the global leader in milk production, achieving an output of approximately 239.3 million tonnes in 2023–24, reflecting a remarkable growth trajectory of over 63% since 2014–15 (DAHD, 2024; NDDB, 2025). This expansion is underpinned by the cooperative model, which has revolutionised dairy value chains, especially in states like Gujarat, where organised procurement and processing through entities such as the Gujarat Cooperative Milk Marketing Federation have empowered smallholders and ensured stable market access (Modi *et al*., 2025; Brickwork Ratings, 2025). The sector is currently witnessing a paradigm shift driven by mechanization and the introduction of new technologies intended to boost production. However, this modernization brings challenges; input costs are rising disproportionately to net returns, squeezing farm profit margins.

Contemporary challenges, including rising input costs, feed scarcity, and climate variability, necessitate evidence-based decisions on species preference. Recent national trends highlight the growing role of cooperatives in sustaining productivity growth, with Gujarat consistently outperforming the national average through institutional support (Modi *et al*., 2025). Comparative economic assessments using standardised methodologies from the same agro-ecological and market context are essential to guide farmers amid these dynamics and inform policy for resilient dairy development (Anbukkani, 2018; Ghule *et al*., 2012).

2. Materials and Methods

Data were procured from dairy farmers in Palanpur and Vadgam talukas via structured questionnaires and personal interviews in 2020. These locations were purposively selected due to the rapid commercialization of dairy activities in the area. A total of 120 respondents were selected randomly from 12 villages (six per taluka). Farmers were stratified by landholding: marginal (≤1 ha), small (1.01–2 ha), medium (2.01–4 ha), and large (>4 ha).

Costs encompassed fixed cost (interest and depreciation on animals, infrastructure, and equipment) and variable cost (feed and fodder, labour, veterinary services, breeding, water and electricity, and miscellaneous). Income derived from milk sales (at cooperative rates), manure, gunny bags, and surplus animals. Net income was derived by deducting total rearing costs from gross income. Aggregated district-level estimates for milch animals facilitated inter-species comparison.

3. Results and Discussion

3.1 Cost of Milk Production

Crossbred cows demonstrated a substantially higher average daily milk yield of 8.20 litres per animal compared to 4.95 litres for buffaloes, representing an increase of approximately 66% and highlighting the genetic advantage of crossbred cattle in volumetric productivity under similar management conditions. This disparity translates to an estimated annual lactation yield of around 2,991 litres for crossbred cows versus 1,807 litres for buffaloes, underscoring the potential for greater output scale with exotic/crossbred genetics.

The average cost of milk production per milch animal per year was higher for crossbred cows at Rs. 76,397.93 compared to Rs. 60,928.12 for buffaloes, primarily due to elevated variable cost (Table 1).

Table 1: Comparative milk yield and cost of milk production

Parameter	Buffalo	Crossbred Cow
Average daily milk yield (litres/animal	4.95	8.20
Estimated annual yield (litres/animal)	1,807	2,991

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Fixed cost (Rs./animal/year)	7,220.72	7,240.81
Variable cost (Rs./animal/year)	53,707.40	69,157.13
Average cost of milk production (Rs./animal/year)	60,928.12	76,397.93
Cost per litre of milk production (Rs.)	33.70	25.54

3.1.1 Fixed Cost

Fixed cost, which includes interest and depreciation on infrastructure and equipment, remained virtually equivalent between the two species at Rs. 7,220.72 for buffaloes and Rs. 7,240.81 for crossbred cows, as investments in sheds, machinery, and capital assets are largely comparable across dairy enterprises (Ghule *et al*., 2012; Anbukkani, 2018).

3.1.2 Variable Cost

In contrast, variable cost approximately 29% higher for crossbred cows (Rs. 69,157.13 *versus* Rs. 53,707.40), reflecting their greater metabolic demands to support intensified lactation and higher body maintenance (Kaur and Singh, 2018). This cost structure results in a lower cost per litre of milk production for crossbred cows (Rs. 25.54) than buffaloes (Rs. 33.70), illustrating economies achieved through higher yields.

3.2 Net Income

Despite these unit-cost advantages and superior volumetric output in crossbred cows, buffaloes provided markedly higher net income, reaching Rs. 32,743.07 per milch animal per year (Rs. 89.70 per animal per day), nearly threefold that of crossbred cows at Rs. 11,049.25 per milch animal per year (Rs. 30.27 per animal per day) (Table 2).

Table 2: Comparative net income

Parameter	Buffalo	Crossbred Cow
Net income (Rs./animal/year)	32,743.07	11,049.25
Net income (Rs./animal/day)	89.70	30.27

This pronounced profitability differential in favour of buffaloes can be attributed predominantly to the higher procurement prices offered by cooperatives for buffalo milk, which compensate for lower yields through elevated fat and solids content preferred by consumers (Lalrinsangpuii *et al*., 2016; Kaur and Singh, 2018). Similar patterns have been observed in other regions, where buffalo enterprises often yield superior net income despite higher per-unit costs, reinforcing the role of market pricing in species viability (Anitha and Anbukkani, 2022; Naresha *et al*., 2023).

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4. Conclusion

This comparative analysis challenges the prevailing assumption that high-yield breeds are automatically the most profitable choice for dairy farmers. While Crossbred Cows offer a lower cost of production per unit of milk, it struggles against high input costs (feed) and lower per-liter market prices. Conversely, the Buffalo farming delivers significantly higher net returns driven by high-fat milk premiums and greater economic stability, particularly for marginal and smallholders who lack the resources to achieve the economies of scale required for profitable CBC farming.

For policy and extension services, this implies a dual strategy: promoting Buffalo rearing for small-scale, resource-limited farmers to ensure livelihood security, while encouraging high-tech, large-scale intensification for CBC farming where input efficiencies can be maximized.

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