International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Comparative Analysis of Cow and Buffalo Milk Production Trends in India

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Abstract:
India continues to lead as the largest milk producer in the world, supported by a diverse dairy sector comprising various livestock species, with cows and buffaloes being the primary contributors. This study presents a species-wise analysis of milk production in the country, examining trends, productivity levels, and policy implications. Utilizing secondary data from the Basic Animal Husbandry Statistics 2024 and other official sources, the study classifies milk production by species and explores regional disparities, yield variations, and sectoral growth patterns. The findings indicate that indigenous buffaloes and crossbred cows together contribute more than 62% of the total milk output. Buffaloes are predominant in the northern and central regions, largely due to cultural preferences and their higher milk fat content, whereas crossbred cows are increasingly preferred in the southern and western states for their higher milk yields. Although indigenous and non-descriptive breeds also play a role in milk production, their productivity remains comparatively low. The study highlights the importance of implementing species-specific breeding initiatives, regionally tailored policies, and better livestock management practices. Such measures are vital for enhancing milk production, increasing farmer income, and ensuring the long-term sustainability of India's dairy sector.

Keywords: Milk Production, Dairy Sector, Crossbred Cows, Indigenous Buffaloes, Species-wise, Livestock Productivity, Breed Improvement.

Introduction:

India holds the distinction of being the largest milk producer globally, making a substantial contribution to the world's milk supply and serving as a critical source of livelihood for millions of rural households. The Indian dairy sector is notably diverse, comprising various milk-producing species, with cows and buffaloes accounting for the majority of the total milk production. These two species differ markedly in terms of milk yield, fat content, adaptability to local environments, and the economic benefits they provide to farmers. Over the last two decades, India has experienced a structural transformation in its dairy production, marked by the rising adoption of crossbred cows, particularly in the southern and western regions, resulting in increased cow milk output. Meanwhile, buffaloes continue to dominate in the northern and central parts of the country due to their high-fat milk, utility as draught animals, and cultural preference. Despite these developments, there remains an ongoing debate about which species offers greater productivity, sustainability, and profitability across different agro-climatic and socio-economic contexts. A species-wise analysis of milk production is crucial for formulating effective

policies, guiding investments, and designing targeted interventions in the dairy sector. However, comprehensive comparative studies on the roles of cows and buffaloes in India's evolving milk economy remain limited, particularly in the context of technological advancements, breed improvement programs, and changing market conditions. This study seeks to address that gap by examining trends, regional disparities, productivity indicators, and the broader policy implications of species-wise milk production in India. By focusing on cows and buffaloes—the two dominant contributors to the dairy sector—the study aims to offer a detailed understanding of how species-specific approaches can improve milk yield, enhance farmer incomes, and drive overall growth in the sector.

Objectives

- To know the current status of Dairy Farming in India.
- To examine species-wise trends in milk production across India.

Methodology:

This study is based on secondary data only, which was collected from various sources such as the Basic Animal Husbandry Statistics 2024, Government of India, and relevant articles. Data visualization techniques, such as bar charts and stacked graphs, were used to present trends in milk production. The data was categorized species-wise for different types of livestock.

Review of Literature

Jitendra Kumar Singh et al. (2017) critically reviewed the cost and returns of milk production from cows and buffaloes, along with an analysis of the break-even point of dairy enterprises in the Faizabad district of Eastern Uttar Pradesh, India. In the study, livestock owners were categorized as small, medium and large based on the number of cows and buffaloes they owned. The input-output ratio for milch cows was found to be highest among large livestock owners, followed by medium and small categories. A similar trend was observed in the case of buffaloes. The study highlighted that the average cost of milk production was lower for cows compared to buffaloes, while the gross returns were higher for large households in both cases. Overall, the input-output ratio and profitability were more favorable among larger livestock owners for both cows and buffaloes.

Balusami, C. (2014) conducted a study to assess the variation in milk quality traits at different stages of lactation in non-descript and Murrah buffaloes across five districts of the North East zone of Tamil Nadu. The stage of lactation showed a significant effect on fat, protein, and total solids percentage in both non-descript and graded Murrah buffaloes.India is fortunate to have a rich buffalo genetic resource, with about 20 well-defined breeds and a sizeable population of 108.7 million (Livestock Census, 2012). Approximately 56 percent of the total milk produced in the country comes from buffaloes, which constitute nearly 34.59 percent of the bovine population. The study concluded that the milk fat and solids-not-fat (SNF) percentages of non-descript buffaloes were higher than those of graded Murrah buffaloes. Furthermore, the stage of lactation had a significant effect on fat and total solids percentages in both non-descript and graded Murrah buffaloes. Milk samples collected during the third stage of lactation showed significantly higher mean fat and SNF content in both buffalo types.

Mansha Barman's study analyzed the casein protein content in milk from different domesticated cow, buffalo, and goat breeds in the Jabalpur Division using the is oelectric precipitation method. The study examined casein levels in milk from various milch animals in the Jabalpur district, including cows,

buffaloes, and goats. India possesses a wide variety of cattle due to its genetic diversity and environmental adaptability. Historically, the Asian river water buffalo has been a primary source of milk in the country. In this region, common breeds include Gir, Hybrid Gir, Desi Cow, Haryanvi Cow, Murrah Buffalo, Sahiwal, Jersey, Beetal Goat, Jamunapari Goat, Sangamneri Goat, and Black Bengal Goat. The study found that goat milk yielded a relatively higher amount of casein protein compared to milk from cows and buffaloes. Among cow breeds, certain types showed higher casein content, while others had relatively lower levels. Buffalo milk generally showed a moderate casein yield.

Bhimraj Jakhar (2020) discussed the production performance of cows and buffaloes at the Gowshala. The study revealed that crossbred cows on the farm contributed the most to milk production. The main contributors to milk production were cattle, buffaloes, and goats. The analysis showed that nearly 36 percent of the milk production came from indigenous buffaloes, followed by 26 percent from crossbred cattle. Indigenous cattle contributed 12 percent of the total milk production in the country, whereas nondescript cattle and nondescript buffaloes contributed 9 percent and 13 percent,

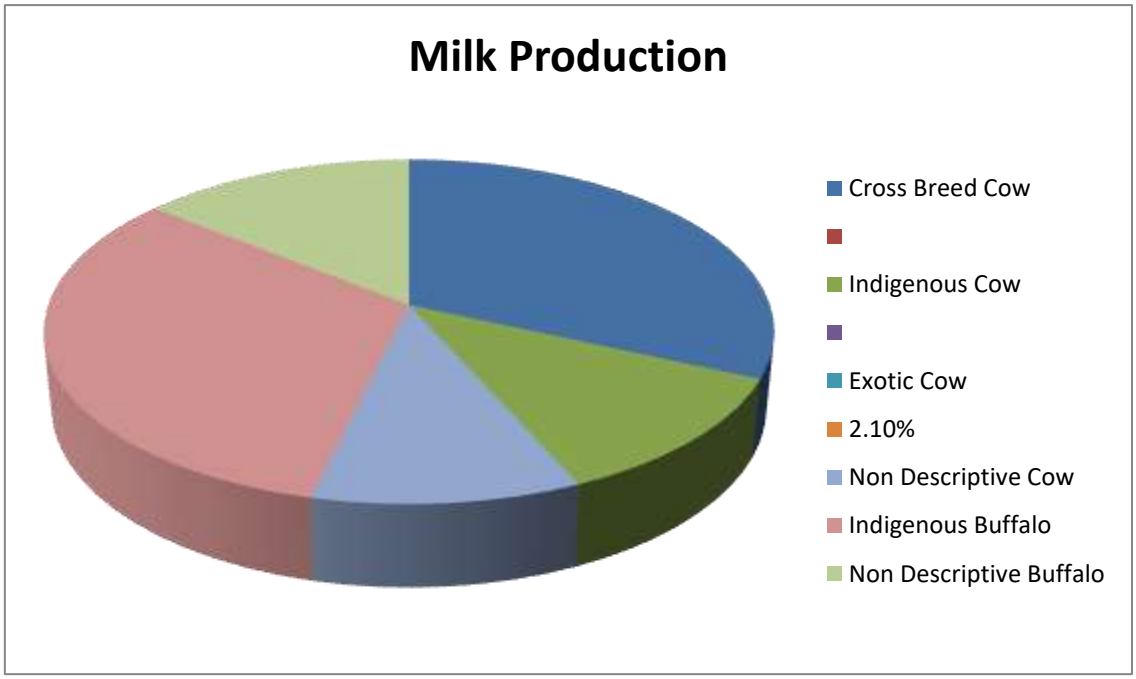
Table 1. Species wise milk production in India

Species	**Milk Production**
Cross Breed Cow	31.11%
Indigenous Cow	11.36%
Exotic Cow	2.10%
Non Descriptive Cow	10.11%
Indigenous Buffalo	31.49%
Non Descriptive Buffalo	13.83%

Soures : Basic Animal Husbandry Statistics 2024

Table explanation: The table illustrates the species-wise contribution to total milk production in India, emphasizing the varying shares of different cattle and buffalo types. Indigenous buffaloes top the list, contributing 31.49% of total milk output, closely followed by crossbred cows at 31.11%. This near parity highlights the effectiveness of breed improvement initiatives and the widespread adoption of high-yielding crossbred cows across various regions. Indigenous cows, by contrast, contribute only 11.36%, reflecting their relatively lower productivity. Non-descript cows, which lack defined breed characteristics or are of mixed origin, account for 10.11% of milk production. Their lower output is often attributed to inadequate scientific management and breeding attention. Exotic breeds such as Holstein Friesians and Jerseys contribute a modest 2.10%, mainly because they are less adaptable to Indian agro-climatic conditions and are generally limited to specialized commercial dairy farms. On the buffalo side, non-descript buffaloes make up 13.83% of milk production, indicating a significant role despite the absence of organized breeding. Overall, crossbred cows and indigenous buffaloes emerge as the primary contributors, together accounting for more than 62% of the country's milk production. This dual dependence on scientifically enhanced cattle and traditionally preferred buffaloes underscores the

importance of species-specific development programs and regionally tailored breeding strategies to boost overall dairy productivity.



Soures: Basic Animal Husbandry Statistics 2024

Chart Explanation: The pie chart titled "Milk Production" provides a visual representation of the species-wise contribution to milk production in India, highlighting the roles played by various categories of cows and buffaloes. Crossbred cows contribute a substantial share of 31.11%, reflecting the impact of successful crossbreeding programs in states such as Punjab, Haryana, Karnataka, and Tamil Nadu, where high-yielding breeds like Holstein Friesian and Jersey have been effectively introduced and adapted. Indigenous buffaloes slightly exceed this contribution, accounting for 31.49% of total milk production, underscoring the continued dominance of buffalo-based dairying in northern and central India, where buffalo milk is highly valued for its superior fat content and market preference. Non-descriptive buffaloes add another 13.83%, indicating that a significant portion of milk production still originates from animals lacking defined breed characteristics. Similarly, non-descriptive cows contribute 10.11%, pointing to the ongoing need for breed classification and improvement programs. Indigenous cows, with a contribution of 11.36%, continue to show lower productivity compared to crossbred and buffalo counterparts due to their limited milk yield. Exotic cows, such as Holstein Friesians and Jerseys, make up only 2.10% of production, largely due to challenges related to climate adaptability and management under Indian conditions. Collectively, buffaloes (both indigenous and non-descriptive) account for 45.32% of the nation's milk output, while various categories of cows contribute 54.68%. This breakdown highlights the critical need for balanced breeding strategies, targeted genetic enhancement, and region-specific dairy development policies to optimize milk productivity and ensure long-term sustainability in the Indian dairy sector.

Discussion and Analysis:

The species-wise distribution of milk production in India highlights a dual reliance on indigenous buffal-

oes (31.49%) and crossbred cows (31.11%), which together contribute over 62% of total output. This reflects both the traditional preference for buffalo milk and the success of crossbreeding programs introducing high-yielding exotic genetics. While crossbred cows thrive in regions with strong veterinary infrastructure, buffaloes remain crucial in rural areas due to their adaptability and high-fat milk. Non-descriptive buffaloes (13.83%) and cows (10.11%) still contribute significantly, despite lower productivity, indicating a gap in breed standardization and access to scientific breeding. Indigenous cows contribute 11.36%, valued for resilience but limited by low yields, while exotic cows remain marginal at 2.10% due to poor climate adaptability. Overall, the near-equal share of cows (54.68%) and buffaloes (45.32%) underscores the need for balanced dairy development policies, combining genetic enhancement with region-specific adaptability.

Current Statues of Milk Production in India India has retained its position as the world's largest milk producer, recording a total milk production of 239.30 million tonnes in 2023–24, which accounts for approximately 25% of the global milk output (Source: FAO). This marks a year-on-year growth of 3.78%, reflecting steady expansion in the country's dairy sector. The per capita availability of milk has reached 471 grams per day, indicating improved nutritional access and a strengthening domestic supply. In terms of productivity, exotic and crossbred cattle yield an average of 8.12 kg of milk per day, significantly higher than the 4.01 kg yielded by indigenous and non-descript cattle, highlighting the benefits of breed improvement. Notably, milk production from exotic and crossbred cattle rose by 8%, while production from indigenous and non-descript cattle saw a substantial increase of 44.76% compared to the previous year. These gains suggest advancements in management practices, nutrition, and breeding efforts. However, milk production from buffaloes declined by 16%, possibly due to challenges such as feed shortages, health issues, or adverse climatic conditions impacting buffalo productivity. At the state level, Uttar Pradesh remains the top milk-producing state, contributing 16.21% of the national output, followed by Rajasthan (14.51%), Madhya Pradesh (8.91%), Gujarat (7.65%), and Maharashtra (6.71%). Collectively, these five states account for nearly 54% of India's total milk production, underscoring their vital role in supporting the nation's dairy economy.

Conclusion:

India's dairy sector is characterized by its remarkable diversity, both in terms of livestock species and regional production patterns. A species-wise analysis of milk production shows that indigenous buffaloes and crossbred cows are the leading contributors, together accounting for over 62% of the country's total milk output. This highlights the dual importance of conserving traditional breeds while advancing scientific breeding programs to boost productivity. Buffaloes continue to dominate in northern and central regions due to their high-fat milk and cultural significance, whereas crossbred cows have gained prominence in the southern and western parts of the country because of their higher milk yield and compatibility with modern dairy practices. Although indigenous and non-descriptive breeds of both cattle and buffaloes still play a notable role, their relatively low productivity underscores the need for improved management, nutrition, and targeted genetic enhancement. These trends carry important policy implications. Achieving sustainable growth in the dairy sector requires a balanced, region-specific strategy that aligns with the strengths and limitations of each livestock type. Focused investment in areas such as breed improvement, fodder development, veterinary care, and farmer training can significantly enhance productivity and rural incomes. Additionally, strengthening species-level data collection and monitoring systems will support better policymaking and more effective interventions. Ultimately,

integrating scientific innovation with traditional knowledge through species-specific strategies is key to increasing milk production, improving rural livelihoods, and ensuring the long-term sustainability of India's dairy sector.

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