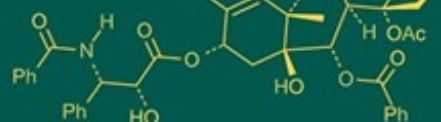
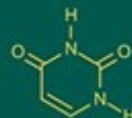


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
Indexing: Embase
IJABR 2026; 10(9): 820-826
www.biochemjournal.com
Received: 01-07-2026
Accepted: 18-08-2026
Published: 26-09-2026

The names and affiliations of all authors are provided below, following the references.

Dynamics of India's dairy sector: State-wise and species-wise trends in milk production and yield from 2007-08 to 2024-25

Radhey Shyam Meena¹, Jagpal Jogi², Narendra Kumar³, Khadan Singh Meena⁴, Khaire Navnath Pundlik⁵, Martha Pasar⁶, Parmar Ankitkumar Dineshbhai⁷

DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i9j.10188>

ABSTRACT

India's dairy sector plays an important role in nutritional security, rural livelihoods and agricultural income, contributing about 25% of global total milk production. Present study analysed the trends and growth in milk production and yield in India during 2007-08 to 2024-25 using secondary data from Basic Animal Husbandry Statistics (BAHS) reports published by Government of India. Overall and phase-wise changes in milk production, species-wise contribution, milk yield and state-wise production were examined. Total milk production increased from 107.93 million tonnes in 2007-08 to 247.87 million tonnes in 2024-25, representing an overall increase of 129.65% and an average annual growth rate of 5.02%. The highest phase-wise average annual growth rate was recorded during 2017-20 (6.29%). Per capita milk availability increased from 260 to 485 gm/person/day (37.87%), with Punjab recording the highest availability. Uttar Pradesh remained the leading milk-producing state, followed by Rajasthan. Tamil Nadu, Uttar Pradesh and Rajasthan recorded the highest production from exotic/crossbred cattle, buffalo and goat milk, respectively, while Rajasthan, Uttar Pradesh and Madhya Pradesh alternately recorded the highest indigenous/ND cattle milk production. Total cattle milk production surpassed buffalo milk production from 2019-20 onwards. During 2021-25, buffalo, exotic/crossbred cattle, indigenous/ND and goat contributed 44.37%, 31.98%, 20.48% and 3.17%, respectively. Exotic/crossbred cattle recorded the highest increase in milk production (237.46%). Milk yield increased across species, with exotic/crossbred cattle increasing from 6.47 to 9.05 kg/animal/day and buffalo from 4.41 to 6.48 kg/animal/day. Overall, India showed sustained growth in milk production and productivity, with an increasing contribution of cattle, particularly exotic/crossbred cattle. Species- and region-specific dairy development strategies may support the sustained growth of the dairy sector.

Keywords: Milk Production, Milk yield, Growth rate, Per capita availability, Dairy sector

Introduction

India's dairy sector is an important component of the livestock economy, contributing to nutritional security, rural livelihoods, employment and agricultural income (Samal and Pattanaik, 2014; Annual Report, 2025) [1, 2]. India is the world's largest milk-producing country and contributes about one-fourth (25%) of global milk production (BAHS, 2025; Annual Report, 2025) [1, 3]. Milk production is derived mainly from cattle and buffalo, with goats also making a notable contribution. India's transformation from a milk-deficit to a milk-surplus country has been supported by dairy infrastructure, cooperative development, genetic improvement, better feeding and management practices (Samal *et al.*, 2014; Kona *et al.*, 2025) [2, 4]. The composition of milk production has also changed, with increasing contribution from crossbred cattle, and considerable variation among states. Kaur *et al.*, (2018) [5] reported continuous growth in milk production and per capita milk availability, along with a shift towards crossbred cattle, while, Sserunjogi *et al.*, (2016) [6] highlighted regional variation and increasing contribution of crossbred cattle. Recent development indicates that improvements in animal productivity and changes in species contribution continues to shape India's dairy sector (Kona *et al.*, 2025) [4]. Therefore, present study was undertaken to analyse the trends and growth in milk production and milk yield in India during 2007-08 to 2024-25, with emphasis on overall and phase-wise growth, species-wise contribution and state-wise variation in production and productivity.

Corresponding Author:
Parmar Ankitkumar Dineshbhai
Livestock Production and Management Section, ICAR- Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh, India

Methodology

Data source and study period

The study was based on secondary data on milk production, milk yield, per capita milk availability and species-wise and state-wise milk production in India for the period 2007-08 to 2024-25. Data were obtained from the Basic Animal Husbandry Statistics (BAHS) reports published by Department of Animal Husbandry and Dairying (DAHD), Ministry of Fisheries, Animal Husbandry and Dairying, Government of India. The BAHS reports from 2012 [7]-2025 were used to compile the required annual data.

Data analysis

The collected data were systemically compiled and analysed to assess temporal trends and growth in milk production and productivity. Overall changes were calculated by comparing the initial and terminal values of the study period. The analysis was further divided into four phases, viz. 2007-12, 2013-16, 2017-20 and 2021-25, to examine phase-wise changes in milk production. Species-wise contribution of buffalo, exotic/crossbred cattle, indigenous/non-descript (ND) cattle and goats were estimated as their percentage share of total milk production. State-wise analysis was carried out to identify major milk-

producing states and variations in species-specific milk production and yield. Average annual growth rates were calculated to assess the annual changes in milk production and milk yield. Descriptive statistics, percentages, growth rates and averages were used for interpretation, and the results were presented through tables and figures.

Overall milk production trend in India

India recorded substantial growth in milk production during study period, with total milk production increasing from 107.9 million in 2007-08 to 247.87 million tonnes in 2024-25, representing an overall increase of 129.65 %. The average annual growth rate (AAGR) averaged 5.02 % during 2007-25. The year-wise milk production and corresponding growth rates are presented in Table 1. When the study period was divided into different phases, the annual growth rates were 4.34%, 5.01%, 6.29% and 4.55% during 2007-12, 2013-16, 2017-20 and 2021-25, respectively. The highest annual growth rate was observed during 2017-20 (6.29%) phase, indicating a relatively rapid expansion in milk production during this period. Rashtriya Gokul Mission (RGM), launched in 2014, has supported bovine genetic improvement and productivity. India’s milk production grew at an average annual rate of 5.69% during 2014-15 to 2023-24, compared with about 2% globally (Annual Report, 2025) [1].

Table 1. Year-wise and phase-wise trends in milk production and its corresponding growth pattern from 2007 to 2025

Years	Total Production (Million tonnes)	Growth rate (%)
2007-08	107.93	-
2008-09	112.18	3.99
2009-10	116.43	3.74
2010-11	121.85	4.64
2011-12	127.90	5.01
2012-13	132.43	3.52
2013-14	137.69	4.00
2014-15	146.31	6.25
2015-16	155.48	6.29
2016-17	165.12	6.37
2017-18	176.06	6.59
2018-19	187.75	6.47
2019-20	198.44	5.70
2020-21	209.96	5.85
2021-22	222.07	5.76
2022-23	230.58	3.83
2023-24	239.30	3.77
2024-25	247.87	3.58
Phases	Average Production	Growth rate (%)
2007-2012	117.26	4.34
2013-2016	142.98	5.01
2017-2020	181.84	6.29
2021-2025	229.95	4.55
AAGR 5.02		
Overall growth rate 129.65		

Source: Basic Animal Husbandry Statistics, Animal husbandry statistics division, Government of India, M/O Fisheries, Animal Husbandry and Dairying, Department of Animal Husbandry and Dairying, Krishi Bhawan, New Delhi. AAGR: Average Annual Growth Rate.

Per capita milk availability in India

The per capita availability of milk in India also showed a substantial increasing trend, rising from 260 gm/person/day in 2007-08 to 485 gm/person/day in 2024-25 (Fig. 1), representing an overall increase of

86.53% according to last India’s human population census 2011 (1.21 billion). The average annual growth rate was around 3.74% during 2007-08 to 2024-25. This increase in per capita milk availability indicates a considerable improvement in the availability of milk for the population over the study period.

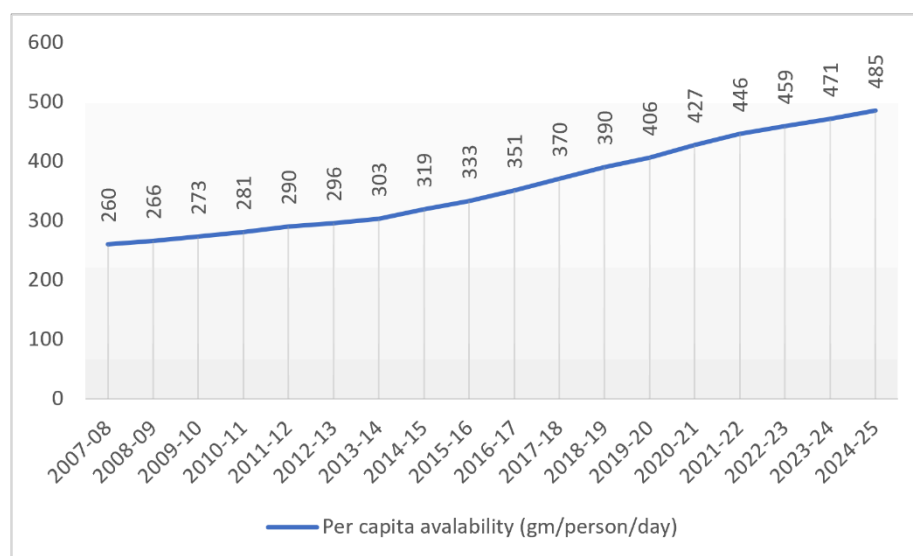


Figure 1. Per capita availability of Milk in India during 2007-25

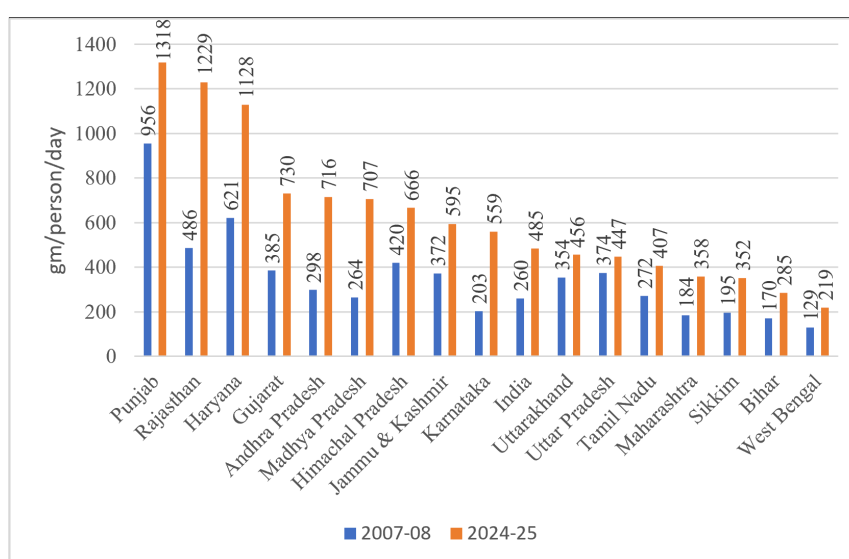


Figure 2. Per capita availability of Milk in different states of India during 2007-25

Among the states, Punjab recorded the highest per capita milk availability throughout the study period, increasing from 956 gm/person/day in 2007-08 to 1318 gm/person/day in 2024-25, representing an overall increase of 37.87% (Fig. 2). In 2024-25, the per capita milk availability in Punjab, Rajasthan, Haryana, Gujarat, Andhra Pradesh, Madhya Pradesh, Himachal Pradesh, Jammu & Kashmir and Karnataka was higher than the national average of 485 gm/person/day. The Increase in per capita availability may be attributed to the sustained growth in milk production, supported by improvements in animal productivity, genetic improvement, feeding and healthcare practices, as well as the expansion of dairy cooperatives and organized milk marketing systems. Government interventions (launching of scheme like Rashtriya Gokul Mission) and increasing demand for milk and milk products have also contributed to the continued expansion of the dairy sector.

Major milk producing states of India

During the study period from 2007-08 to 2024-25, Uttar Pradesh remained the leading milk producing state in India. Milk production in the state increased from 18.86 million tonnes in 2007-08 to 38.82 million tonnes in 2024-25, with an average contribution of approximately 16.66% to the country's total milk production during the study period. The state recorded an overall growth of 105.80% with an average annual growth rate of 4.36%. Rajasthan ranked second in milk production, contributing an average of 12.33% to the national milk production over the study period. Other major contributing states were Madhya Pradesh, Gujarat, Maharashtra, Andhra Pradesh and Punjab, with their average contribution ranging from 6.51% to 7.78%. Collectively, these major milk producing states accounted for approximately 65.62% of India's total milk production during the study period (Table 2).

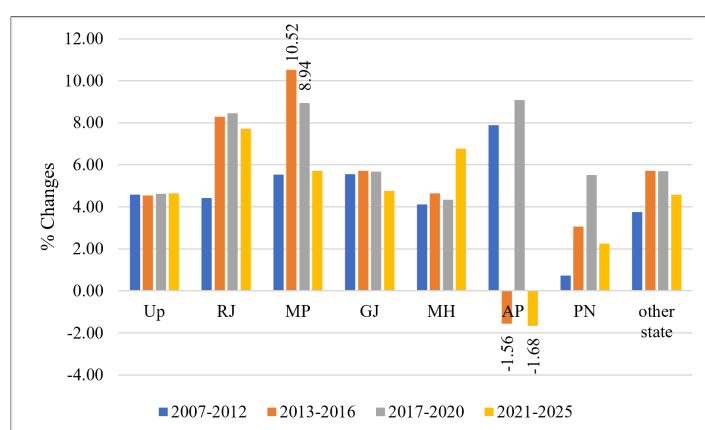
Table 2. Production and growth of milk in major milk-producing states of India during 2007-25

Particulars	UP	RJ	MP	GJ	MH	AP	PN	Other states
Milk Production (Million tonnes)								
2007-08	18.86	11.38	6.57	7.91	7.21	8.39	9.28	37.76
2007-12*	20.44	12.48	7.25	8.86	7.77	10.44	9.41	40.60
2013-16*	24.78	15.99	10.34	11.34	9.38	11.56	10.22	49.37
2017-20*	29.80	23.13	15.29	14.03	11.30	14.05	12.27	62.07
2021-25*	35.81	33.75	20.21	17.49	15.14	14.70	14.13	78.73
2024-25	38.82	36.74	22.60	19.29	16.63	13.95	14.87	84.98
Average contribution (%)	16.66	12.33	7.62	7.69	6.51	7.78	7.03	34.38
AAGR (%)	4.36	7.25	7.56	5.39	5.07	3.13	2.84	4.91
Overall growth rate (%)	105.80	222.94	243.82	143.88	130.59	56.26	60.25	125.03

*Average milk production during the respective phase. UP: Uttar Pradesh, RJ: Rajasthan, MP: Madhya Pradesh, GJ: Gujarat, MH: Maharashtra, AP: Andhra Pradesh and PN: Punjab.

Among these states, Madhya Pradesh recorded the highest overall increase in milk production, rising from 6.57 million tonnes in 2007-08 to 22.60 million tonnes in 2024-25, representing an overall increase of 243.82% and an average annual growth rate of 7.56%. The period-wise analysis showed a consistent increase in average milk production across the major milk producing states. Madhya Pradesh recorded particularly high growth during 2013-2016 and 2017-2020, with growth rate of 10.52 % and 8.94 %, respectively, contributing to its

highest overall increase and average annual growth rate during the study period. In contrast, Andhra Pradesh recorded negative growth during 2013-2016 (-1.56%) and 2021-2025 (1.68%), which may be partly associated with the bifurcation of Andhra Pradesh and the formation of Telangana, resulting in changes in state boundaries and the corresponding allocation of livestock and milk production data (Fig. 3).

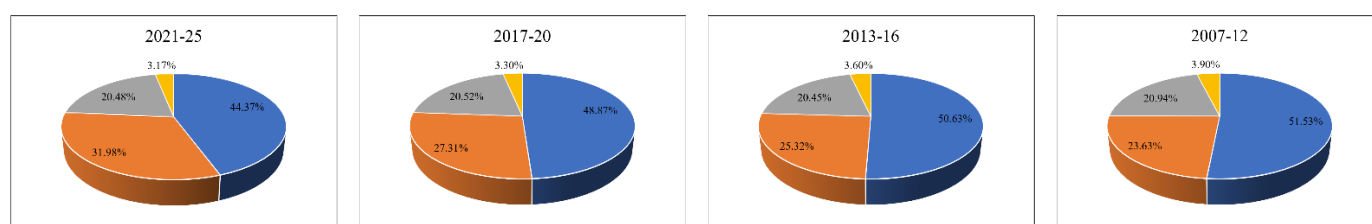
**Figure 3.** Phase-wise changes of milk production in major milk-producing states of India

Species-wise milk production trend in India

The species-wise trend in milk production revealed a shift in the major contributing species during study period. Buffalo remained the leading contributor to India's total milk production from 2007-08 to 2018-19; however, from 2019-2020 onwards, total cattle milk production surpassed buffalo milk production. The period-wise contribution of buffalo, exotic/crossbred cattle, indigenous/ND cattle and goats to total milk production is presented in Fig. 4. The contribution of buf-

falo declined progressively from 51.53% during 2007-2012 to 44.37% during 2021-2025. In contrast, the contribution of exotic/crossbred cattle increased from 23.63% to 31.98% during the corresponding periods. The contribution of indigenous/ND cattle remained relatively stable, ranging from 20.45% to 20.94%, while goat contributed approximately 3.17-3.90% across the periods.

Goat
Indigenous/ND cattle
Exotic/Crossbred cattle
Buffalo

**Figure 4.** Phase-wise contribution of different species in total milk production

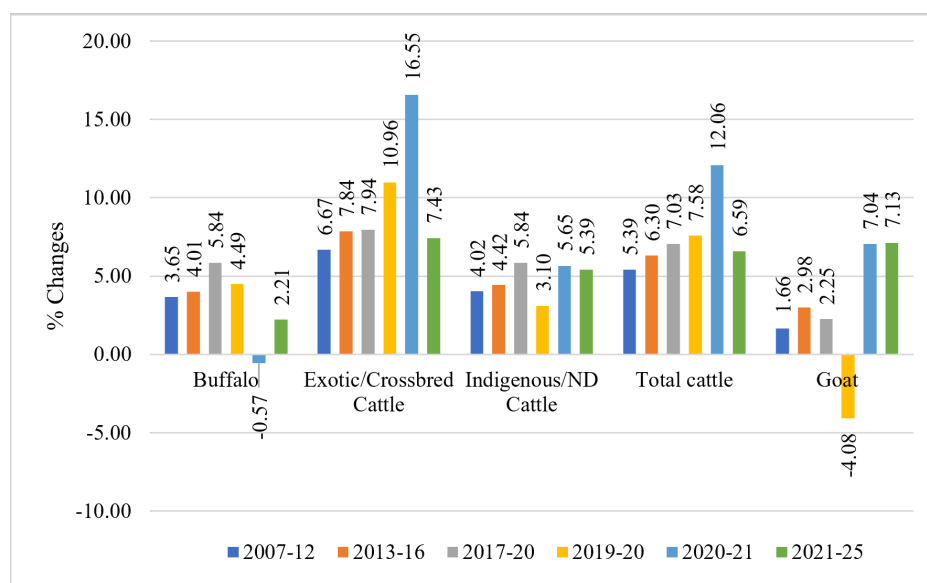


Figure 5. Phase-wise average annual growth rate (%) of milk production of different species

The observed shift was associated with the comparatively higher growth in milk production from exotic/crossbred cattle, particularly during 2019-20 (+10.96%) and 2020-21 (+16.55%), whereas buffalo milk production recorded a marginal negative growth in 2020-21 (-0.57%). The period-wise analysis further showed that average buffalo milk production (101.93 million tonnes) was lower than total cattle milk production (120.72 million tonnes) during 2021-25 period. Similarly, the average annual growth rate of buffalo milk production during 2021-25 was relatively lower (+2.21%) than that of total cattle milk production (6.59%), indicating the increasing contribution of cattle to national milk production (Table 3; Fig. 5).

Over the entire study period, buffalo milk production increased from 56.63 million tonnes in 2007-08 to 106.95 million tonnes in 2024-25,

representing an overall increase of 88.86% and an average annual growth rate of 3.83%. Milk production from exotic/crossbred cattle increased substantially from 24.01 to 81.04 million tonnes, corresponding to an overall increase of 237.46% and an average annual growth rate of 7.47%. Similarly, milk production from indigenous cattle increased from 22.81 to 51.66 million tonnes, corresponding to an overall increase of 126.49%, and an average annual growth rate of 4.94%. Goat milk production also increased from 4.48 million tonnes in 2007-08 to 8.22 million tonnes in 2024-25, corresponding to an overall increase of 83.54% and an average annual growth of 3.72 % (Table 3).

Table 3. Production and growth of milk production of different species in India from 2007 to 2025

Particulars	Buffalo	Exotic/Crossbred Cattle	Indigenous/ND Cattle	Total Cattle	Goat
Milk Production (Million tonnes)					
2007-08	56.63	24.01	22.81	46.82	4.48
2007-12*	60.40	27.75	24.55	52.30	4.56
2013-16*	72.32	36.29	29.23	65.52	5.14
2017-20*	88.82	49.77	37.29	87.05	5.97
2021-25*	101.93	73.58	47.14	120.72	7.30
2024-25	106.95	81.04	51.66	132.70	8.22
Average contribution (%)	48.75	27.14	20.61	47.75	3.49
AAGR (%)	3.83	7.47	4.94	6.34	3.72
Overall growth rate (%)	88.86	237.46	126.49	183.40	83.54

*Average milk production during the respective phase or period. ND: Non-descript. AAGR: Average Annual Growth Rate.

State-wise analysis revealed distinct patterns in milk production among species. Tamil Nadu, Uttar Pradesh and Rajasthan consistently recorded the highest milk production from exotic/crossbred cattle, Buffalo and Goats, respectively. However, the leading state for indigenous/ND cattle varied across the study period, with Rajasthan, Uttar Pradesh and Madhya Pradesh alternately recording the highest production across different periods. These variations highlight substantial differences in species-wise milk production across states and indicate the importance of region-specific strategies for improving dairy productivity and production

Species-wise milk yield trend in India

The milk yield of the all-dairy animals in India increased substantially during the study period (2007-08 to 2024-25). The average daily milk yield of buffalo increased from 4.41 kg/animal/day in 2007-08 to

6.48 kg/animal/day in 2024-25, representing an increase of 46.94% and an average annual growth rate of 2.41 %. Among cattle, indigenous/ND cattle showed a greater improvement in milk yield than exotic/crossbred cattle. The milk yield of indigenous/ND cattle increased from 2.11 to 3.86 kg/animal/day, corresponding to an overall increase of 82.94% and an average annual growth rate of 3.64 %. In comparison, the milk yield of exotic/crossbred cattle milk yield increased from 6.47 to 9.05 kg/animal/day, representing an overall increase of 39.88% and an average annual growth rate of 2.03%. Goat milk yield also increased from 0.39 kg/animal/day in 2007-08 to 0.57 kg/animal/day in 2024-25, with an overall increase of 46.15% and an average annual growth rate of 2.40% (Table 4).

The average milk yield during the entire study period was highest for exotic/crossbred cattle (7.57 kg/animal/day) followed by buffalo (5.25 kg/animal/day), indigenous/ND cattle (2.80 kg/animal/day) and

goat (0.45 kg/animal/day). Although indigenous/ND cattle had a lower absolute milk yield than buffalo throughout the study period, their rate of improvement was comparatively higher, as reflected by

the greater average annual growth rate. This indicates a gradual improvement in the productivity of indigenous/ND cattle over the study period.

Table 4. Milk Yield and its changes in different species of India during 2007 to 2025

Particulars	Buffalo	Exotic/Crossbred Cattle	Indigenous/ND Cattle	Goat
Milk Yield (Kg/Day)				
2007-08	4.41	6.47	2.11	0.39
2007-12*	4.43	6.72	2.19	0.40
2013-16*	4.99	7.10	2.54	0.45
2017-20*	5.51	7.84	2.96	0.46
2021-25*	6.06	8.59	3.48	0.50
2024-25	6.48	9.05	3.86	0.57
2007-25*	5.25	7.57	2.80	0.45
AAGR (%)	2.41	2.03	3.64	2.40
Overall growth rate (%)	46.94	39.88	82.94	46.15

*Average milk yield during respective phase. ND: Non-descript. AAGR: Average Annual Growth Rate.

State-wise analysis showed that Punjab consistently recorded the highest milk yield of exotic/crossbred cattle, indigenous/ND cattle and goats during the study period, with ranges of 10.41-14.10, 6.01-9.36 and 1.15-1.60 kg/animal/day, respectively. Buffalo milk yield was highest in Punjab during initial period, from 2007-08 to 2014-15, ranging from 8.50-8.72 kg/animal/day. Thereafter, Haryana recorded the highest buffalo milk yield during 2014-15 to 2024-25, with values ranging from 8.21 to 11.07 kg/animal/day. The state-wise pattern therefore indicates considerable variation in species-specific milk productivity for cattle and goats, while the leading position in buffalo milk yield shifted from Punjab to Haryana during the later part of the study period.

Conclusion

The study revealed a sustained and substantial growth in India's milk production and productivity during 2007-08 to 2024-25. Total milk production more than doubled, with the highest average annual growth observed during 2017-2020, while per capita milk availability also increased considerably. Uttar Pradesh remained the leading milk-producing state, followed by Rajasthan, whereas Madhya Pradesh showed substantial growth. Species-wise analysis indicated a gradual change in the composition of national milk production, with total cattle milk production surpassing buffalo milk production from 2019-20 onwards. The increasing contribution of exotic/crossbred cattle was particularly notable, as this category recorded the highest growth in milk production. Milk yield increased across buffalo, exotic/crossbred cattle, indigenous/ND cattle and goats, with indigenous/ND cattle showing a comparatively higher rate of improvement in productivity. Considerable state-wise variation was also observed in species-specific milk production and yield, with Punjab consistently recording high milk productivity across major dairy species, while Haryana emerged as the leading state for buffalo milk yield during the later period. Overall, the findings demonstrate the continued expansion and productivity improvement of India's dairy sector, accompanied by a changing species-wise contribution to national milk production. Sustained efforts to improve animal productivity, strengthen region- and species-specific dairy development, and enhance production efficiency would support the continued growth of the Indian dairy sector.

Conflict of interest

The author(s) declare that there is no conflict of interest regarding the publication of this article.

References

1. Annual Report. Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India; 2025.

2. Samal L, Pattanaik AK. Dairy production in India-existing scenario and future prospects. *International Journal of Livestock Research*. 2014;4(2):105-113.
3. Basic Animal Husbandry Statistics. Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Krishi Bhawan, New Delhi, Government of India; 2025.
4. Kona SSR, Ravikiran G, Sasidhar PVK, Sivakumar AVN, Rao VH. Perspectives in milk production in India. *Theriogenology*. 2025;231:116-126.
5. Kaur M, Singla N. Growth and structural transformations in dairy sector of India. *Indian Journal of Dairy Science*. 2018;71(4):422-429.
6. Sserunjogi B, Kaur P. Growth drivers of dairy production in India—An appraisal. *Indian Journal of Economics and Development*. 2016;12(4):687-694.
7. Basic Animal Husbandry Statistics. Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, Krishi Bhawan, New Delhi, Government of India; 2012.
8. Basic Animal Husbandry and Fisheries Statistics. Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, Krishi Bhawan, New Delhi, Government of India; 2013.
9. Basic Animal Husbandry and Fisheries Statistics. Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, Krishi Bhawan, New Delhi, Government of India; 2014.
10. Basic Animal Husbandry and Fisheries Statistics. Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture and Farmers Welfare, Krishi Bhawan, New Delhi, Government of India; 2015.
11. Basic Animal Husbandry and Fisheries Statistics. Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture and Farmers Welfare, Krishi Bhawan, New Delhi, Government of India; 2016.
12. Basic Animal Husbandry and Fisheries Statistics. Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture and Farmers Welfare, Krishi Bhawan, New Delhi, Government of India; 2017.
13. Basic Animal Husbandry and Fisheries Statistics. Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture and Farmers Welfare, Krishi Bhawan, New Delhi, Government of India; 2018.

14. Basic Animal Husbandry Statistics. Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Krishi Bhawan, New Delhi, Government of India; 2019.
15. Basic Animal Husbandry Statistics. Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Krishi Bhawan, New Delhi, Government of India; 2020.
16. Basic Animal Husbandry Statistics. Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Krishi Bhawan, New Delhi, Government of India; 2021.
17. Basic Animal Husbandry Statistics. Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Krishi Bhawan, New Delhi, Government of India; 2022.
18. Basic Animal Husbandry Statistics. Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Krishi Bhawan, New Delhi, Government of India; 2023.
19. Basic Animal Husbandry Statistics. Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Krishi Bhawan, New Delhi, Government of India; 2024.

How to cite this article: Meena RS, Jogi J, Kumar N, Meena KS, Pundlik KN, Pasar M, et al. Dynamics of India's dairy sector: State-wise and species-wise trends in milk production and yield from 2007-08 to 2024-25. *International Journal of Advanced Biochemistry Research*. 2026;10(9):820-826. doi: <https://www.doi.org/10.33545/26174693.2026.v10.i9j.10188>

Authors

Radhey Shyam Meena

Animal Husbandry and Dairying, Dr. Bhimrao Ambedkar University, Agra, Uttar Pradesh, India

Jagpal Jogi

Subject Matter Specialist, Krishi Vigyan Kendra, Danta, Barmer, Rajasthan, India

Narendra Kumar

Department of Animal Husbandry and Dairying, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh, India

Khadan Singh Meena

Animal Husbandry and Dairying, Raja Mahendra Pratap Singh University, Aligarh, Uttar Pradesh, India

Khaire Navnath Pundlik

Livestock Production and Management Section, ICAR- Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh, India

Martha Pasar

Department of Livestock Production and Management, ICAR-National Dairy Research Institute, Karnal, Haryana, India

Parmar Ankitkumar Dineshbhai

Livestock Production and Management Section, ICAR- Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh, India