

Growth Patterns and Species-Wise Transition in Milk Production: An Analysis of Uttar Pradesh

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Abstract

This study presents a comprehensive longitudinal analysis of the structural transformations within the dairy sector and livestock demographic profile of Uttar Pradesh, utilising secondary data extracted from the 18th (2007), 19th (2012), and 20th (2019) Livestock Censuses alongside Basic Animal Husbandry Statistics (BAHS 2025). The findings underscore Uttar Pradesh's sustained dominance in national milk output, expanding from 20.203 million tonnes (17.36% national share) in 2009–10 to 38.780 million tonnes (16.21%) in 2023–24. Concurrently, per capita milk availability in the state registered a substantial rise from 283 gm/day to 450 gm/day over the same period. Demographic dynamics reveal a structural shift in bovine composition: exotic and crossbred cattle experienced exponential growth of 109.79% (2007–12) and 71.58% (2012–19), reaching 2.848 million, whereas non-descript/indigenous cattle contracted by 15.25% during 2012–19 (5.590 million). Goat populations similarly declined by 7.10% in the recent inter-censal period. Species-wise production share between 2018–19 and 2024–25 demonstrates the structural supremacy of buffaloes, which consistently contribute the majority share (62.47% in 2024–25), followed by non-descript cattle (19.30%), exotic/crossbred cattle (14.73%), and goats (3.49%). The analysis highlights a dual trend: a rapid modernising transition toward high-yielding crossbred cattle alongside a resilient, buffalo-centric base driving long-term dairy growth in Uttar Pradesh.

Keywords: Milk Production, Structural Changes, Livestock Demographics, Per Capita Availability, Uttar Pradesh, BAHS.

1. Introduction

Agriculture and livestock have long been central to India's rural economy. They provide employment and income to rural households and contribute to food availability, nutrition and livelihood security. Among livestock-based activities, dairying has acquired particular importance because it provides a relatively regular source of income and can supplement earnings from crop cultivation. This role is especially relevant for small and marginal farmers, for whom agricultural income may vary considerably across seasons. The performance of the dairy sector is therefore closely linked with rural economic conditions, and changes in livestock numbers, breed composition and productivity can have wider implications for rural livelihoods and agricultural development. Within India, Uttar Pradesh has a significant place in the dairy economy. The state possesses a large livestock population and a substantial rural base engaged in animal husbandry. Its favourable agro-climatic conditions, availability of crop residues and established tradition of livestock rearing have supported dairy production over a long period. Uttar Pradesh has consistently remained one of the major milk-producing states and contributes considerably to the country's overall milk supply. Buffaloes have traditionally been an important component of this production system, while cattle, including both

indigenous and improved varieties, also contribute to the state's milk output. Consequently, the importance of dairying in Uttar Pradesh extends beyond milk production and is closely connected with employment generation, household income and rural food security. The livestock structure of the state, however, has changed considerably over time. Data from successive Livestock Censuses indicate differences in the population of indigenous cattle, exotic and crossbred cattle, buffaloes and goats. These changes reflect the influence of several factors, including the demand for milk, differences in animal productivity, breeding practices, availability of feed and fodder, input costs and livestock development programmes. Farmers' choices regarding the type and number of animals to maintain are also influenced by the economic returns obtained from different species and breeds. The increasing presence of exotic and crossbred cattle alongside changes in indigenous livestock populations therefore represents an important aspect of the transformation occurring within Uttar Pradesh's livestock economy. Changes in livestock numbers need to be considered together with their contribution to milk production. A rise in the population of a particular species does not necessarily result in a similar increase in milk output because productivity varies considerably across species and breeds. Buffaloes, indigenous cattle and crossbred cattle differ in their milk yield and their relative contribution to total production can change even when their population growth is limited. For this reason, an assessment based only on livestock population cannot fully explain the changing structure of the dairy sector. Examining animal numbers alongside milk production and species-wise output provides a more meaningful basis for understanding whether changes in dairy production are associated with herd expansion, changes in species composition, improvements in productivity, or a combination of these factors. Milk availability represents another important aspect of the state's dairy performance. Per capita milk availability provides an indication of the quantity of milk available in relation to the population and therefore offers a useful measure for examining changes in the supply of milk over time. The trend becomes more informative when Uttar Pradesh is compared with the national average. Such a comparison helps determine whether improvements in milk availability within the state have occurred at a pace similar to or different from the broader national trend. However, changes in per capita availability should be interpreted alongside population growth, total milk production and changes in the livestock base in order to understand the factors responsible for the observed movement. The Livestock Census provides a valuable source of information for analysing these changes. Successive census rounds allow comparisons of livestock populations across different periods and provide evidence of changes in the relative importance of major species and cattle categories. The 18th, 19th and 20th Livestock Censuses are particularly useful for examining changes in cattle, buffalo and goat populations, including the distinction between indigenous and exotic/crossbred cattle. When these data are considered together with milk production statistics, they help establish a clearer relationship between changes in the livestock base and the performance of the dairy sector. This is important for understanding the direction in which the livestock economy of Uttar Pradesh is moving and the types of animals that are increasingly contributing to milk production. The period examined in this study is important because Uttar Pradesh has experienced changes in both milk production and livestock composition. The state has retained a substantial position in India's milk economy, while the composition of its livestock population has also undergone noticeable changes. The expansion of exotic and crossbred cattle, the continued importance of buffaloes, changes in indigenous cattle numbers and variations in goat populations indicate that the livestock sector is not static. These developments raise an important question concerning the sources of growth in milk production: whether the increase is mainly associated with a larger livestock base, a shift towards more productive species and breeds, higher productivity, or changes in several of these factors simultaneously. Existing assessments of Uttar Pradesh's dairy sector have often concentrated on milk production, livestock population or individual aspects of dairy development. While such studies are useful, examining these indicators separately may not provide a complete picture of the structural changes taking place in the sector. A rise in milk production, for example, does not by itself explain changes in the composition of the livestock population. Similarly, a decline in the number of a particular livestock category cannot be evaluated solely on the basis of population change without considering its contribution to milk output.

The present study therefore brings these aspects together to examine the changing relationship between milk production and livestock demographics in Uttar Pradesh. Against this background, the present study focuses on the structural changes in milk production and livestock demographics of Uttar Pradesh. It uses secondary information from the 18th, 19th and 20th Livestock Censuses, Basic Animal Husbandry Statistics (BAHS) 2025, and relevant data available through the National Dairy Development Board (NDDB). The study covers changes in milk production, the state's share in national milk output, per capita milk availability, livestock population and species-wise milk production. Combining these indicators makes it possible to examine both the growth of the dairy sector and the changes occurring within its underlying livestock structure. The analysis is organised around four major dimensions. The first examines the trend in milk production in Uttar Pradesh and the state's share in India's total milk production. The second considers the movement of per capita milk availability in Uttar Pradesh in relation to the national level. The third examines changes in the population of exotic/crossbred cattle, indigenous cattle, buffaloes and goats across successive Livestock

Census periods. The fourth focuses on the species-wise contribution to total milk production in Uttar Pradesh. These dimensions together provide a broader basis for assessing the changing structure of the state's dairy economy. The study is relevant from both economic and policy perspectives. Understanding the changing composition of livestock can help explain the factors supporting Uttar Pradesh's continued position as a major milk-producing state. It can also provide useful evidence for policies concerning breed development, feed and fodder availability, livestock health services, dairy infrastructure and support to small and marginal livestock holders. In particular, examining changes in livestock populations together with their contribution to milk production can help identify whether the state's dairy growth is increasingly dependent on particular species or improved breeds. The study consequently seeks to provide an empirical account of the changing livestock and milk production structure of Uttar Pradesh and to place these changes within the broader context of the state's continuing contribution to India's dairy economy.

2. Review of Literature

Kumari et al. (2017) highlight significant structural shifts in India's livestock economy in the empirical literature on agricultural and dairy economics. Kumari et al. (2017) analysed the historical growth rates of milk production in Uttar Pradesh, identifying a strong growth trajectory driven by bovine population expansion. Similarly, various macro-level studies emphasise that while buffaloes traditionally form the mainstay of milk output in northern India, crossbreeding interventions have accelerated yield capabilities over recent census cycles. However, post-2019 decadal adjustments and recent BAHS (2025) trends necessitate an updated empirical assessment to evaluate whether these structural trends have persisted. This study bridges this gap by offering a fresh decadal evaluation based on the latest available livestock censuses and production estimates up to 2024–25. **Jothi (2021)**. The present study is conducted on 120 members of primary milk marketing co-operative societies selected from the Vazhakulam Block Panchayath of Ernakulam District of Kerala. A well-structured questionnaire cum interview schedule is used for data collection. The major problems faced by the farmers are divided into three main heads, namely Economic Constraints, Marketing Constraints, and Veterinary Constraints. The findings have revealed that 66.7% of farmers incur more than Rs. 8,000 for animal maintenance, and 55.83% of farmers receive a procurement price of less than Rs. 35/litre. It is observed from the study that a continued rise in the price of feed is ranked first, and it is followed by huge daily expenses and low profit. The major marketing problem faced by the farmers is the low procurement price of milk, and it is followed by a lack of cold storage facilities in the societies. Further, the lack of a veterinary facility at the doorstep at the time of an emergency is the major veterinary problem faced by the farmers. It is suggested that the societies should increase the subsidy of cattle feed to the farmers, arrange proper veterinary facilities, and increase the procurement price of milk according to the increased cost of production of milk. Arrangement of proper cold storage facilities will avoid the spoilage of milk produced by the members. **Pingale, Singh, (2022)**. Dairying has played a significant role in providing a livelihood to farmers in India. About 80 million rural Indian households are engaged in milk production, with a very high proportion being landless, small, and marginal farmers. The study aims to analyse the challenges the dairy industry faces in generating employment and expanding its business. The paper has taken data from an annual survey of industries over 20 years and a case study with a detailed interview of a cooperative society working in the dairy sector. The analysis is based on an autoregressive distributed lag model. With the help of the analysis, the study found that the dairy industry has the potential to generate employment. During the interaction for the case study, it was observed that dairy industry firms produce value-added products to yield profits, which is limited due to low investments. However, the lack of advertisements for these products results in restrained sales and limits the income of the farmers. **Asmara, Purnamadewi (2017)**. The main objective of Milk Producers Cooperative (MPC) is to provide services to the members and improve the performance of the dairy farm of MPC members. The purposes of this study were: (1) to analyse dairy farm performance of MPC members, (2) to analyse performance of MPC services, and (3) to analyse the relationship between service performance of MPC and dairy farm performance of MPC members. The main data used were primary. The analytical methods used included: descriptive analysis, profit analysis and R/C Ratio, and Chi-Square. The study showed that the productivity and profitability of large-scale dairy farms were higher than those of small-scale. The performance of the small-scale dairy farms of MPC members was relatively low both in terms of productivity and profitability. Most members judged that the performance of MPC services was good. There was a positive relationship between the MPC service performance (milk marketing, finance, technical assistance, and education/training) and the performance of the dairy farms of MPC members. Coaching and more intensive services should continue to be given by the MPC to the members, especially the members with small-scale dairy farms. **Azarruddin, Mulani (2021)** worked on the dairy supply chain, as all other agri-businesses is complex. Technically, the dairy chain starts with raw milk production & ends when other processors, institutions & consumers utilise products which are created in the value chain. As consumers' habits and decisions are not static, it imposes urgency for change in the supply chain to have consumers' ever-changing needs met. However, this ever-changing demand has a direct effect on the people within the supply chain; they have to change (or adjust accordingly. Supply

chain is an integrated manufacturing process wherein raw materials are converted into final products, then delivered to customers. At its highest level, a supply chain is comprised of two basic integrated processes. **Tharani, Mishra (2018)**. This paper compares an off-grid solar photovoltaic (SPV) system and a biogas system for a dairy farm containing 100 cows in India and gives a technical and economic assessment for the same. These technologies can sufficiently provide energy for dairy farms that cannot be connected to the grid due to financial reasons or geographical concern. The comparative analysis for the two different renewable energy systems is based on efficiency, reliability, space requirements, gas emissions and economic viability for both the systems. Based on the findings and estimations of economic cost, efficiencies and other factors of the two systems, a recommendation is to use the biogas system as it is more reliable and cost-effective method for electrifying a standalone 100-cow dairy farm, based in India. Keywords: Dairy farming, solar photovoltaic system, biogas system, anaerobic digestion, off-grid. Cite this Article: Kusum Tharani, Smriti Mishra. Techno-Economic Comparison of an Off-Grid PV System and Biogas System for Dairy Farming. **Idrus, Ahmar, Abdussakir (2018)**. The objective of this research is to reveal the effect of organisational learning on market orientation, job satisfaction on market orientation, organisational learning on business achievement, job satisfaction on business achievement and market orientation on business achievement. The research is designed to use quantitative approach. The causal relationship between research variables is examined with Partial Least Squares Structural Equation Modelling (PLS-SEM). Research is conducted at dairy cattle milk cooperatives in East Java with a sample of 46 cooperatives. Data are collected with a questionnaire, and the items within it are made with Smart PLS. Research has given several findings, such as: a higher level of organisational learning and job satisfaction will produce a higher level of market orientation; organisational learning can increase business achievement; job satisfaction is helpful to increase business achievement, but it is not statistically significant; and market orientation may reduce the business achievement of dairy cattle milk cooperatives in East Java. **(Kumar et al., 2014; Birthal et al., 2017)** Existing literature reveals a strong linkage between demographic transitions and the dynamics of milk production, particularly in developing economies such as India, where population growth, urbanisation, and rising incomes have reshaped consumption patterns. Studies consistently note that increasing population density and income elasticity of demand have led to a steady rise in per capita milk consumption, thereby intensifying pressure on the dairy sector to enhance productivity.

3. Research Objectives

1. To examine the trends in milk production, national share, and per capita availability in Uttar Pradesh over the past decades.
2. To analyse the species-wise output share and livestock demographic shifts in Uttar Pradesh across inter-censal periods.

4. Research Methodology

This research employs a descriptive and analytical research design based on secondary data obtained from the 18th, 19th and 20th Livestock Censuses, Basic Animal Husbandry Statistics (BAHS) 2025 and the National Dairy Development Board (NDDB). The analysis examines structural changes in livestock demography from 2007 to 2019, trends in milk production and per capita milk availability from 2009–10 to 2023–24, and species-wise milk production from 2018–19 to 2024–25. The major indicators considered in the study include total milk production, the share of Uttar Pradesh in India's total milk production, per capita milk availability, livestock population and the contribution of different livestock species to total milk output. To assess the changes over the study periods, percentage change, percentage share, year-wise trend analysis and comparative analysis are employed. These measures help identify variations in livestock populations, changes in milk production and shifts in the relative contribution of different species. The analysis also facilitates comparison between Uttar Pradesh and the national level, thereby providing a broader understanding of the state's position and changing structure within India's dairy sector. The findings are presented through tables and descriptive interpretation to highlight the major patterns and structural changes observed during the study period.

5. Data Analysis and Interpretations

5.1 Trends in Milk Production and National Share

Milk production is an important indicator of the performance and changing significance of the dairy sector in Uttar Pradesh. Examining changes in production over time helps to understand the state's contribution to India's overall milk economy and its position among major milk-producing states. The period from 2009–10 to 2023–24 provides an

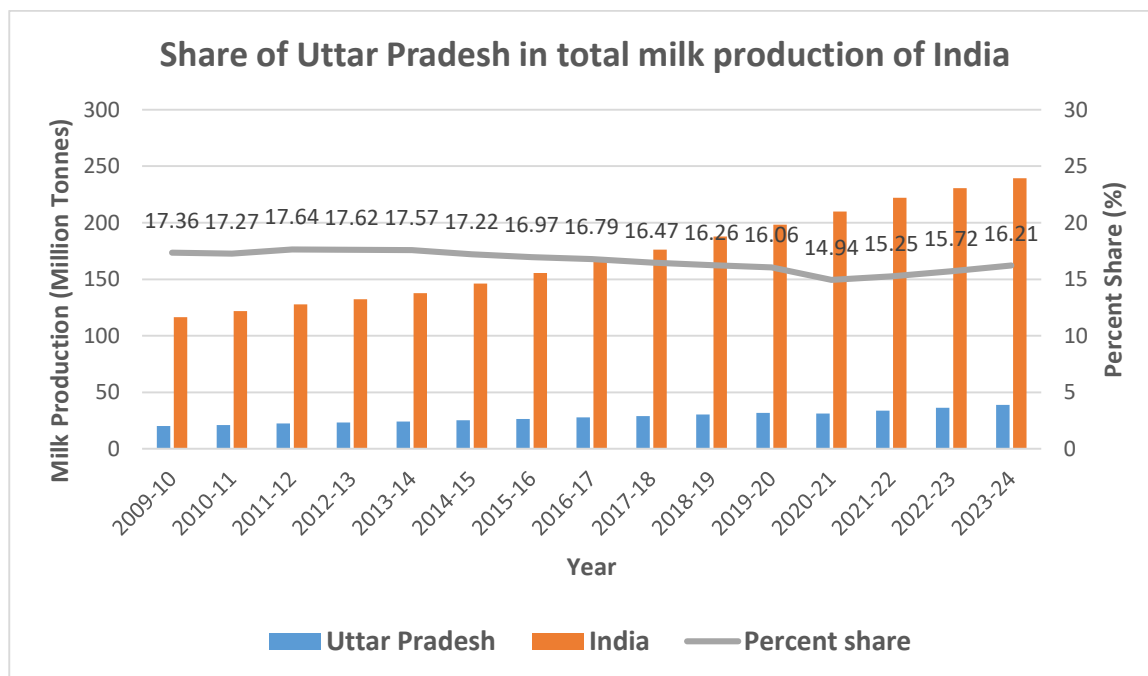
opportunity to assess the changes in milk production as well as the state's share in national output. Table 1 presents the trend in milk production in Uttar Pradesh along with its percentage contribution to India's total milk production during the study period.

YEAR	Milk production (in million tonnes)		Percent Share
	Uttar Pradesh	India	
2009-10	20.203	116.425	17.36
2010-11	21.031	121.848	17.27
2011-12	22.556	127.904	17.64
2012-13	23.330	132.431	17.62
2013-14	24.194	137.685	17.57
2014-15	25.198	146.314	17.22
2015-16	26.387	155.491	16.97
2016-17	27.770	165.404	16.79
2017-18	29.052	176.347	16.47
2018-19	30.519	187.749	16.26
2019-20	31.864	198.440	16.06
2020-21	31.359	209.960	14.94
2021-22	33.874	222.069	15.25
2022-23	36.242	230.577	15.72
2023-24	38.780	239.299	16.21

Table 1. Share of Uttar Pradesh in total milk production of India

Source: Computed from NDDB data

Figure 1: Share of Uttar Pradesh in total milk production of India



Source: Computed from Basic Animal Husbandry Statistics (BAHS), NDDB, and Official Reports/ Author's Own Creation

The state's milk output expanded consistently from 20.203 million tonnes in 2009–10 to 38.780 million tonnes in 2023–24, representing an absolute growth of nearly 92 per cent over the 15 years. While absolute production maintained an upward momentum (except for a marginal drop in 2020–21 to 31.359 million tonnes), the state's relative share in national production registered a gradual decline from 17.36 per cent in 2009–10 to a low of 14.94 per cent in 2020–21, before recovering to 16.21 per cent in 2023–24. This trend indicates that while total volume in Uttar Pradesh has

nearly doubled, national production grew at a slightly faster relative pace during the intermediate years due to rapid dairy expansion in other major states.

5.2 Trends in Per Capita Availability of Milk

The availability of milk on a per capita basis reflects the combined effect of changes in milk production and population growth. It provides a useful measure for understanding the extent to which the expanding dairy sector has contributed to improving milk availability for the population.

Table. 2: Per capita availability of milk

Year	Per capita Availability of Milk (gm per day)	
	Uttar Pradesh	India
2009-10	283	273
2010-11	289	281
2011-12	310	290
2012-13	312	299
2013-14	318	307
2014-15	329	319
2015-16	339	333
2016-17	352	351
2017-18	363	370
2018-19	377	390
2019-20	387	406
2020-21	377	427
2021-22	402	446
2022-23	426	459
2023-24	450	471

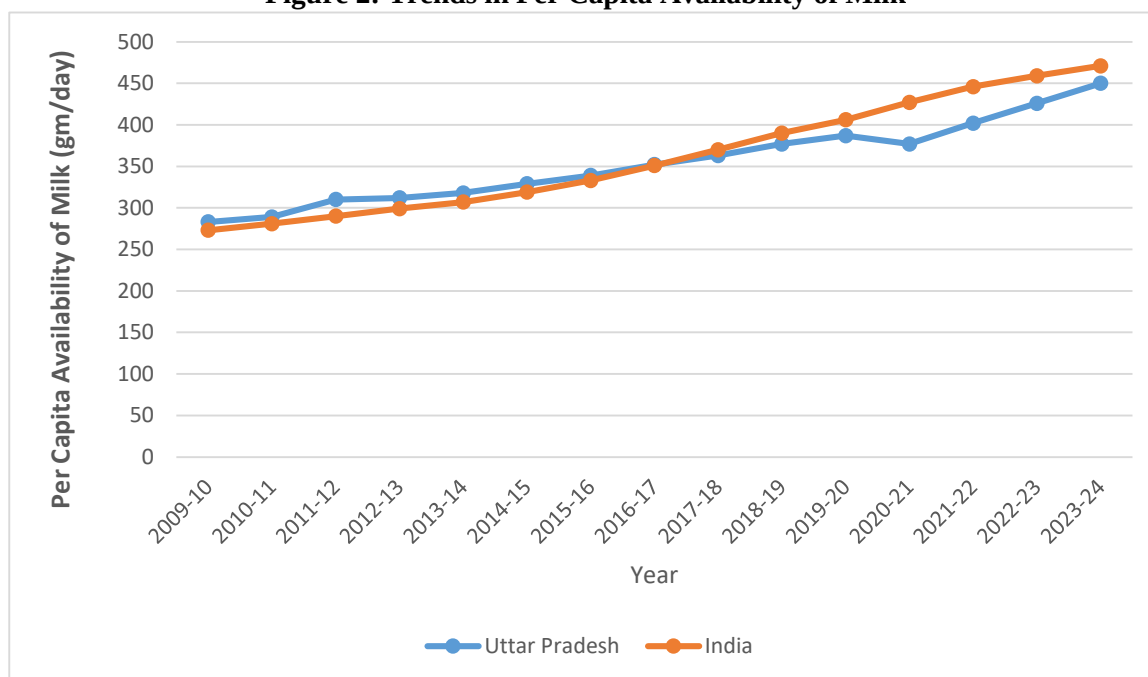
Source: Computed from Basic Animal Husbandry Statistics (BAHS), NDDB, and Official Reports/ Author's Own Creation

Metric	Uttar Pradesh	India
Mean ($\bar{X}$)	354.27	361.47
Std. Deviation (s)	49.31	68.05
CV (%)	13.92%	18.82%
CAGR (2009–24 %)	3.37%	3.97%

Source: Author's Creations

Table 2 indicates a steady overall improvement in per capita milk availability in both Uttar Pradesh and India during 2009–10 to 2023–24. In Uttar Pradesh, availability increased from 283 gm/day to 450 gm/day, while the national average increased from 273 gm/day to 471 gm/day. During this period, per capita milk availability in Uttar Pradesh recorded a CAGR of 3.37%, with a mean of 354.27 gm/day and a CV of 13.92%, whereas the All-India average grew at a comparatively higher CAGR of 3.97%, with a mean of 361.47 gm/day and a CV of 18.82%. Uttar Pradesh remained above the national average up to 2016–17, but the faster national growth resulted in India overtaking Uttar Pradesh from 2017–18 onwards. The lower CV for Uttar Pradesh indicates relatively greater stability in milk availability compared with the national level. Overall, although Uttar Pradesh has made considerable progress, its comparatively slower growth highlights the need for further improvements in milk productivity, breeding, animal healthcare, feed and fodder management, and dairy infrastructure.

Figure 2: Trends in Per Capita Availability of Milk



Source: Basic Animal Husbandry Statistics (BAHS), NDDB, Ministry of Fisheries, Animal Husbandry & Dairying/ Author's Own Creation.

This line graph illustrates the growth of per capita milk availability (in gm/day) from 2009–10 to 2023–24, comparing Uttar Pradesh with the national average of India. From 2009–10 to 2015–16, Uttar Pradesh maintained a higher availability than the national average, starting at roughly 284 gm/day compared to India's 273 gm/day. The two trends converged around 2016–17 at approximately 350 gm/day, after which the national average surpassed Uttar Pradesh, maintaining a steeper growth trajectory through 2023–24 to reach about 470 gm/day versus UP's 450 gm/day. While India showed consistent upward movement throughout the decade, Uttar Pradesh experienced a brief dip around 2020–21 before strongly resuming its upward trend.

5.3 Species-Wise Share in Total Milk Production

The composition of milk production across different livestock species provides an important indication of the changing structure of Uttar Pradesh's dairy sector. Table 3 presents the percentage contribution of major milk-producing species in Uttar Pradesh from 2018–19 to 2024–25, highlighting changes in their relative importance to the state's total milk output.

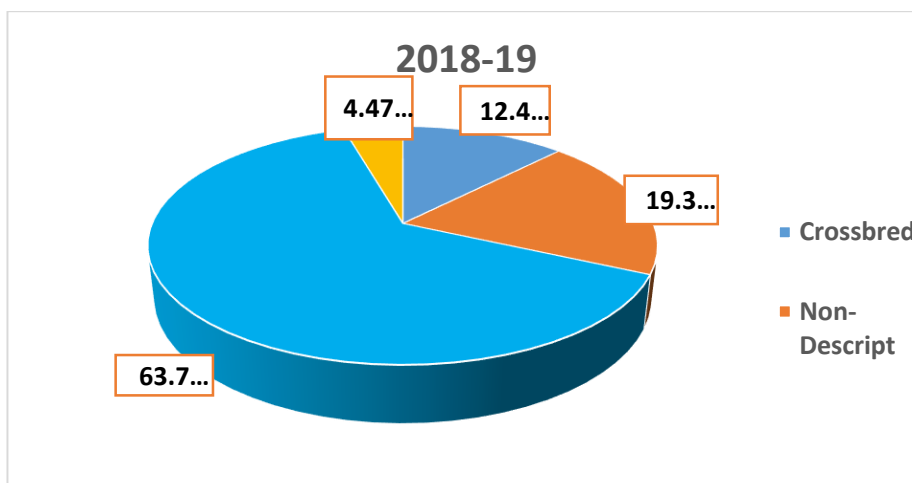
Table 3: Share of cow, buffalo and goat milk

Year	Per Cent Share in Total Milk Production			
	Exotic/Crossbred	Non-Descript/Indigenous	Buffaloes	Goat
2018-19	12.41	19.35	63.77	4.47
2019-20	12.36	19.44	63.76	4.44
2020-21	15.39	17.64	62.76	4.21
2021-22	15.42	20.08	60.69	3.82
2022-23	13.96	18.98	63.43	3.62
2023-24	13.86	19.93	62.79	3.41
2024-25	14.73	19.30	62.47	3.49
Mean	14.02	19.25	62.81	3.92
Std. Deviation	1.27	0.80	1.07	0.45
CV (%)	9.08%	4.17%	1.70%	11.41%

Source: Author's calculations based on secondary data compiled from Basic Animal Husbandry Statistics (BAHS), Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India.

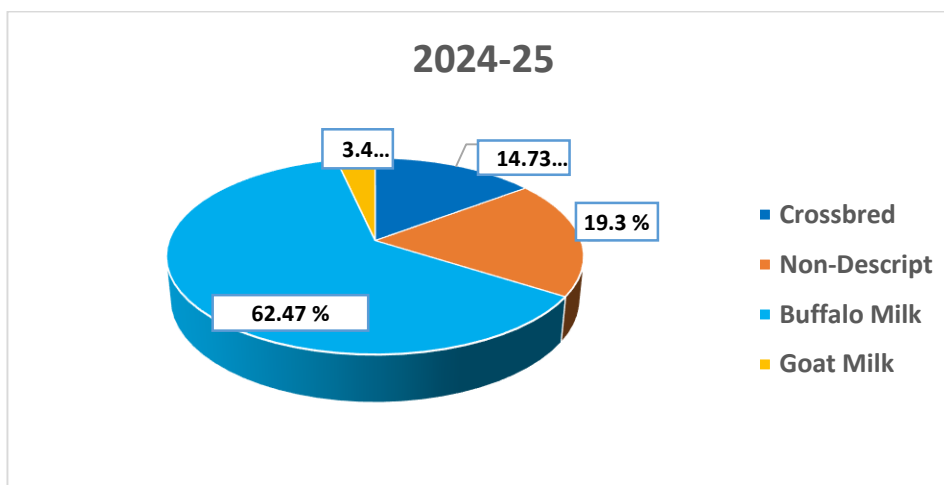
Table 3 indicates that buffaloes remained the dominant source of milk production in Uttar Pradesh, contributing an average of 62.81% during 2018–19 to 2024–25, with a stable share of 62.47% in 2024–25. Indigenous/non-descript cattle contributed around 19.25%, while the share of exotic/crossbred cattle increased from 12.41% to 14.73%, indicating a gradual shift towards improved breeds. In contrast, goat milk declined from 4.47% to 3.49%. Overall, the findings reflect a buffalo-dominated dairy structure with a gradual rise in crossbred cattle.

Figure 3: Per Cent Share in Total Milk Production (2018-19)



Source: Author's Own Creation based on secondary data compiled from Basic Animal Husbandry Statistics (BAHS 2025), Ministry of Fisheries, Animal Husbandry and Dairying, Government of India.

Figure 4: Per Cent Share in Total Milk Production (2024-25)



Source: Author's Own Creation based on secondary data compiled from Basic Animal Husbandry Statistics (BAHS 2025), Ministry of Fisheries, Animal Husbandry and Dairying, Government of India.

Buffaloes continue to occupy the largest share of milk production in Uttar Pradesh, contributing more than 60% of the state's total milk output throughout the period under study. Their share stood at 62.47% in 2024–25, confirming their continued importance to the state's dairy economy. Non-descript and indigenous cattle remained the second-largest contributors, with their share generally ranging between 18% and 20% and reaching 19.30% in 2024–25. The contribution of exotic and crossbred cattle increased gradually, rising from 12.41% in 2018–19 to 14.73% in 2024–25, although the highest share of 15.42% was recorded in 2021–22. In contrast, goat milk's contribution declined steadily, falling from 4.47% in 2018–19 to 3.49% in 2024–25. Overall, the pattern indicates the sustained importance of buffaloes in Uttar Pradesh's milk production, accompanied by a gradual increase in the contribution of crossbred cattle and a reduction in the relative contribution of goat milk.

5.4 Structural Changes in Livestock Demographics

The composition of the livestock population in Uttar Pradesh has changed noticeably across successive census periods. Table 4 compares the changes recorded during 2007–12 and 2012–19 for major livestock categories, including

different cattle groups, buffaloes and goats. The inter-censal figures indicate the direction and magnitude of change in the state's livestock base and help explain broader structural shifts in its dairy economy.

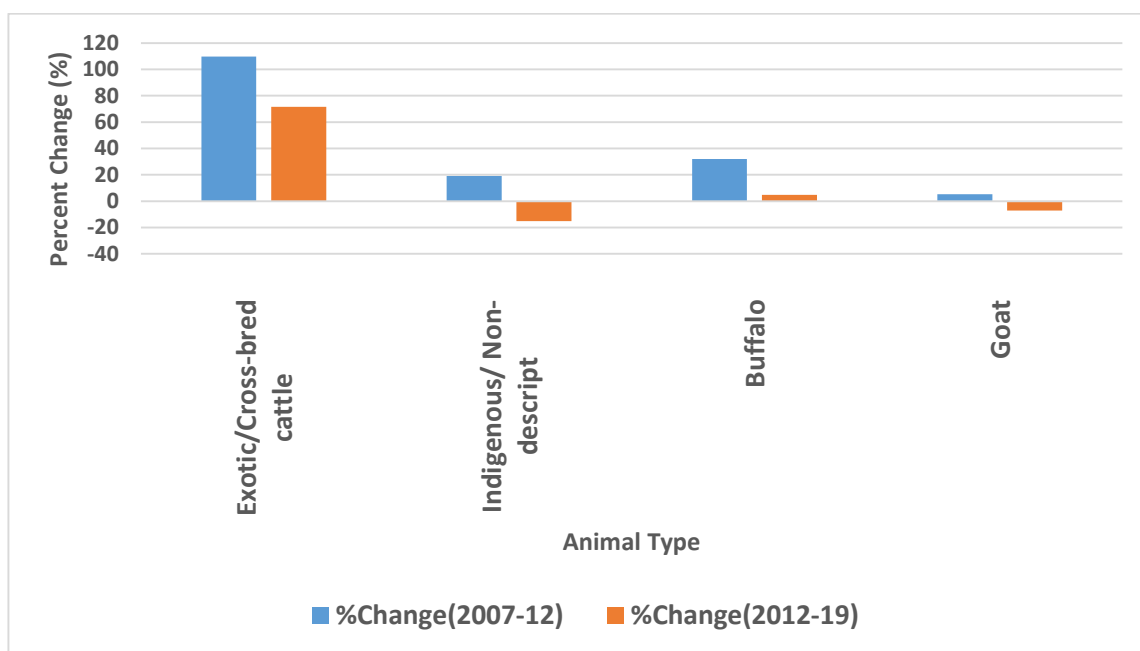
Table 4. Change in population of livestock during 2007-12 and 2012-19 (in thousands / '000)

Animal Type	Population during 2007-12 and 2012-19						
	2007	2012	%Change	2012	2019	%Change	CAGR % (2007–19)
Exotic/Cross-bred cattle	791.17	1660	109.79	1660	2848	71.58	11.24%
Indigenous/Non-descript	5537	6595	19.12	6595	5590	-15.25	0.08%
Buffalo	10565	13950	32.04	13950	14621	4.81	2.75%
Goat	14793	15586	5.36	15586	14480.03	-7.10	-0.18%

Source: Author's calculations based on data compiled from 18th (2007), 19th (2012), and 20th (2019) Livestock Censuses, Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India.

The table indicates significant structural changes in the livestock composition of Uttar Pradesh during 2007–2019. Exotic/crossbred cattle recorded the highest growth, increasing by 109.79% during 2007–12 and 71.58% during 2012–19, with a CAGR of 11.24%, indicating rapid adoption of improved breeds. Buffaloes also showed sustained growth, with their population increasing by 32.04% and 4.81%, respectively, and a CAGR of 2.75%. In contrast, indigenous/non-descript cattle increased by 19.12% during 2007–12 but declined by 15.25% during 2012–19, while goats declined by 7.10% in the latter period. Overall, the findings suggest a shift towards exotic/crossbred cattle and continued dominance of buffaloes, alongside a gradual decline in indigenous cattle and goat populations.

Figure 5: Change in population of livestock during 2007-12 and 2012-19



Source: Author's calculations based on data compiled from 18th (2007), 19th (2012), and 20th (2019) Livestock Censuses, Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India.

This chart compares the percentage population change across four livestock categories over two distinct timeframes: 2007–12 and 2012–19. Exotic and cross-bred cattle consistently recorded the highest growth rates, increasing by roughly 110% in the first period and around 70% in the second. In contrast, indigenous and non-descript cattle shifted from a moderate 20% growth in 2007–12 to a decline of roughly 15% in 2012–19. Buffaloes experienced strong initial growth of about 32%, but their expansion slowed dramatically to just around 5% in the subsequent period. Goat populations remained relatively stable throughout, showing a modest rise of about 5% initially before dropping by

nearly 8%. Overall, while exotic cross-bred cattle expanded significantly in both periods, traditional livestock types including native cattle, buffaloes, and goats saw their growth rates stagnate or turn negative between 2012 and 2019.

6. Findings

Uttar Pradesh continues to hold a leading position in India's dairy sector, with milk production reaching 38.780 million tonnes in 2023–24 and accounting for nearly 16.21% of the country's total milk output during the period under consideration. Alongside this sustained production performance, per capita milk availability in the state increased substantially from 283 grams per day in 2009–10 to 450 grams per day in 2023–24, indicating a considerable improvement in the availability of milk for the population. Buffaloes continue to play a major role in the state's dairy economy, contributing consistently more than 62% of total milk production. A notable change has also occurred in the composition of cattle, with the population of exotic and crossbred cattle increasing by 109.79% during 2007–12 and 71.58% during 2012–19. This increase indicates a gradual shift towards cattle breeds with greater milk-producing capacity. In contrast, the population of non-descript/indigenous cattle declined by 15.25%, while the goat population decreased by 7.10% between the 19th and 20th Livestock Censuses. These changes suggest a shift in the livestock structure of Uttar Pradesh, with greater emphasis being placed on productive dairy animals. Taken together, the trends in milk production, per capita availability and livestock composition indicate substantial changes in the state's dairy sector while reinforcing Uttar Pradesh's continued importance in India's milk economy.

7. Policy Suggestions

The future development of the dairy sector in Uttar Pradesh depends on improving milk productivity while also conserving the valuable characteristics of indigenous livestock. Greater attention should be given to the genetic improvement of native breeds such as Sahiwal and Gangatiri through systematic selection and breeding programmes, to increase their milk yield without compromising their ability to withstand local climatic conditions. The expansion of productive dairy animals also creates a greater requirement for adequate and affordable feed and fodder. Measures such as better management of grazing and pasture areas, promotion of community-based fodder cultivation, and wider access to preserved fodder can help farmers manage increasing feeding costs. Alongside production-related interventions, dairy infrastructure needs to be strengthened, particularly through improved milk collection centres, refrigerated storage and transportation facilities, and processing units in rural production areas. Special attention should also be given to small and marginal dairy farmers by improving their access to veterinary services, livestock breeding facilities and institutional credit. A coordinated approach covering livestock improvement, feed availability, infrastructure and farmer support would contribute to higher dairy productivity and help ensure that the expansion of the sector generates greater and more sustainable economic benefits for rural households.

8. Conclusions

The present paper made an analysis of long-term trends and changes in the demographic profile of the dairy sector of Uttar Pradesh based on the secondary data from 2007 to 2024-25. Based on empirical evidence, it is seen that although Uttar Pradesh keeps its primacy in national milk production (38.780 million tonnes in 2023-24) and accounts for nearly 16.21 % of the national output, its relative share experienced a moderate contraction before recovering in recent years. There have been significant improvements in per capita milk availability, which amounted to 450 gm/day in the state; however, this figure lags behind the rapidly growing national average since 2017-18. Analysis of the demographic profile shows the technological transformation of the dairy sector in the state, as there is a tendency of replacement of local and non-descriptive cows by exotic and crossbred animals (71.58 % increase from 2012-19). However, buffalo continues to be the structural base of the dairy sector, providing more than 62 % of the total milk production in the state.

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