**Milk Production Trends in Gujarat and India: A Comparative Analysis of the Last Two Decades**

**Abstract**

This research study conducts a comparative analysis of milk production, per capita availability, milch population, and dairy sector characteristics in Gujarat state vis-à-vis India over the past two decades (2001–2024). Using secondary data from sources like the National Dairy Development Board (NDDB), the Gujarat Government Animal Husbandry Department, and other reputable organizations, the study explores the growth rates, trends, and developments in milk production in both Gujarat and India.

Key findings reveal that Gujarat has consistently outperformed the national average in milk production growth, with a 212% increase in production from 5.86 million tonnes in 2001–02 to 18.31 million tonnes in 2023–24, compared to India’s 183% growth. Additionally, Gujarat’s share of national milk production rose from 6.95% in 2001–02 to 7.65% in 2023–24. The per capita availability of milk in Gujarat also surpassed the national average, increasing from 418 grams per day in 2009–10 to 700 grams per day in 2023–24, whereas India’s per capita availability increased from 273 grams per day in 2009–10 to 471 grams per day in 2023–24.

The study also highlights the significant role of Gujarat’s cooperative dairy sector, particularly organizations like Amul, which have driven milk procurement growth, from 44.43 lakh litres per day in 2001–02 to 240.99 lakh litres per day in 2022–23. The shift in Gujarat's milch population composition, with an increasing reliance on buffaloes, is evident from data showing stable buffalo population growth despite a slight decrease in cattle numbers.

In conclusion, Gujarat has demonstrated exemplary growth in its dairy sector, primarily through the cooperative model, resulting in higher milk production, greater per capita milk availability, and a stronger contribution to India’s dairy economy. This study underscores Gujarat’s pivotal role in shaping the national dairy landscape and its sustainable growth model, balancing production, farmer empowerment, and market access.

**Keywords :**

Milk Production, Per Capita Availability, Gujarat Dairy Sector, Indian Dairy Sector, Milch Population, Cooperative Sector, Livestock Population, Dairy Development, India Dairy Landscape.

### Introduction

India’s milk production in year 2023-24 stood at a mammoth 239.30 million metric tonnes which is around 23% of world milk production. The leading milk producing states are – Uttar Pradesh, Andhra Pradesh, Madhya Pradesh, Rajasthan and Gujarat. The NDDB has already implemented the National Dairy Plan (NDP-I), Dairy Entrepreneurship Development Schemes, Dairy Infrastructure Development scheme (DIDF), AHIDF etc (Gurjar M. D. et. al., 2023). In India, there is a significant contribution of milk production by Cattle, Buffalo and Goat. The data available for year 2022 23 shows that nearly 45% of the milk production is contributed by Indigenous/Non-Descript Buffaloes followed by 32% by crossbred/Exotic cattle. The Indigenous/Non-descript cattle contribute 20% of the total milk production in the country. Goat milk shares a contribution of 3% in the total milk production across the Country (DAHD, 2024).

Gujarat, one of India's leading agricultural states, has a long-standing tradition of dairy farming, playing a significant role in the national milk production landscape. The state's diverse climate, vast rural landscape, and robust agricultural infrastructure support the thriving dairy industry. In 2022-23, Gujarat's milk production stood at a mammoth 18.31 million metric tonnes, contributing substantially to the country’s overall milk output. Gujarat's dairy sector is characterized by a blend of **crossbred cows, indigenous cows, buffaloes,** and **goats,** each contributing to the state's total milk production in distinct proportions. With major districts like **Banaskantha, Sabarkantha, Dahod,** and **Kachchh** leading the way, understanding the specific contributions of each district helps to identify regional strengths, challenges, and opportunities within the dairy industry.

Milk production plays a critical role in India's agricultural economy, and both **Gujarat** and **All India** (total production across the country) have seen significant changes in their milk production levels over the last two decades. Gujarat, a leading milk-producing state, benefits from a robust cooperative dairy sector, spearheaded by organizations such as **Amul.** In contrast**, India’s** milk production represents the national output, reflecting the dairy farming practices, government policies, and technological advancements across all states.

This research report provides a detailed comparative analysis of milk production (in thousand tonnes) between Gujarat and All India from **2001-02 to 2022-23**. It explores growth trends, key drivers, and statistical relationships to provide insights into the overall progress of the dairy sector in Gujarat vis-à-vis the entire country.

### Literature Review

Gurjar M.D. , Modi Zeel, and Patel B.K. (2024) carried out a detailed district-wise analysis of milk production in Gujarat for the year 2022-23, focusing on cow, buffalo, and goat milk.Thier key findings were - Major districts such as Banaskantha, Sabarkantha, Mehsana, Anand, and Kheda were identified as key contributors. Banaskantha emerged as the leading district, particularly for crossbred cow and buffalo milk. Crossbred cows were the primary contributors to cow milk, while buffaloes played a major role in several districts, especially in Banaskantha and Kheda. Goat milk production, although less significant, was concentrated in districts like Dahod and Kachchh. The success of these regions can be attributed to favorable climatic conditions, robust cooperative networks, and efficient animal husbandry practices. As Gujarat continues to be a central player in India’s dairy sector, further strengthening of infrastructure, veterinary services, and sustainable practices will be crucial for maintaining and enhancing milk production capacity across the state.

#### According to DAHD’s Annual Report (2024), the contribution of milk production by Cow, Buffalo and Goat. The analysis shows nearly 45% of the milk production is contributed by Indigenous/ Non-Descript Buffaloes followed by 30% by crossbred cows. The Indigenous/Non-descript cows contribute 20% of the total milk production in the country. Goat milk shares a contribution of 3% in the total milk production across the country. The contribution of exotic cows in total milk production is 2%.

#### According to Singh M.K. et al. (2023), India possesses vast caprine resources with 37 goat breeds distributed in different bio-climates with varied nutritive value, however, some goat breeds native to north and north-western region namely Beetal, Jamunapari, Jakhrana, Surti and Zalawadi are considered as Indian dairy breed with 150 to 500 litre milk yields. The reported milk yield of Indian dairy goat is far below their potential, since they are primarily raised for mutton and also due to energy-deficient diet. Around 70% of Goat farmers have trouble identifying pure breed animals due to a lack of information. A key barrier is the difficulty of obtaining high-quality breeding animals. The best animals (especially males) from traditional flocks are sold to traders/butchers for slaughter. As a result, good breeding animals have become scarce. This problem has been exacerbated by the lack of coordinated attempts to enhance goat breeds (Abhishek Pathak et al.,2022)

#### Manpreet Kaur and Naresh Singla (2018), in their study titled Growth and structural transformations in dairy sector of India, assert that Their study also shows that different states of India has responded differently to the structural changes such as rapid growth in contribution of milk by states like Andhra Pradesh, Gujarat and Rajasthan in national milk production, while traditionally green revolutionary states such as Punjab and Haryana along with Karnataka, Maharashtra, Tamil Nadu, Madhya Pradesh and West Bengal have registered a decline in milk contribution. At national level, the contribution of crossbred cows has continuously increased, whereas the share of indigenous/local cows and buffaloes has gone down. The study also reveals that around 57 per cent of growth of milk production is contributed by increase in livestock population, while another 31 per cent growth is due to rise in milk yield of the milch animals

#### According to Gurjar M. D et al. (2022), There are around 16.5 million dairy farmers registered with around 1,85,903 Village Dairy cooperatives in the country. Majority of the milk producers belong to small and marginal category with only 2 to 5 animal holding. The leading milk producing states are – Uttar Pradesh, Andhra Pradesh, Madhya Pradesh, Rajasthan and Gujarat. Further, As per the 2019 livestock census data, there were 192.5 million Catlle and 109.9 million Buffaloes in the country. In India, in 1999, the average milk productivity per cow was 1014 kg/year which was below the global average of 2017 kg/year. The milch animals in their daily biological routine and throughout their lifecycle create environmental pollution.

#### Debnarayan Sarker and Bikash Kumar Ghosh (2010). In their study titled ‘Constraints of Milk Production: A Study on Cooperative and Non-cooperative Dairy Farms in West Bengal’ The study has revealed that financial problem is the most significant constraint faced by the cooperative farms. Since most of the dairy cooperative societies themselves are faced with the problem of recovery of loan they had provided to their attached cooperative farms, they are not able to provide loan facility to the latter; consequently, the latter face financial problems for all types of constraints. Among infrastructural constraints, unavailability and infrequent visit of veterinary medical practitioners is the main constraint. In the absence of a registered veterinary medical practitioner, the main employee of cooperative society, who does not have any degree or diploma in veterinary medicine, acts as a veterinary physician. Among marketing constraints, the lack of exercising proper management practices by cooperative societies in favour of their attached farms is the major constraint. Due to this they fail to provide precise and detailed information on marketing facilities (milk collection, processing and distribution) to their attached farms in time. For technical constraints, lack of technical guidance is severe for members of cooperative farms, because cooperative societies, in particular, are not aware of many of these hurdles. As regards the sociopsychological constraints, the lack of time due to busy in domestic / agricultural work and lack of cooperation and coordination among members are major constraints

#### Lalgoulen Khongsai (2020). study investigates the growth and development of the dairy industry in India. It studies the status of milk production and consumption of the country. Descriptive statistics, forecasting, and correlation analysis were used during the study to bring out the relationship between production, consumption, and distribution of milk products. It was found that with the current production trend in the country, India will be able to produce about 217 million tonnes of milk by 2025. The per capita milk availability of the country stands at 351 gms in 2016-17, which exceeds the global milk per capita availability of 229 gms per day. Correlation analyses were used to determine if there is a relationship between import and export of milk products with that of the amount of milk produced. The findings indicated that the production of milk has a positive impact on the export of milk products (r = 0.220, p = 0.601), whereas it has a negative effect on the imports (r = 0.228, p = 0.588). The study found that there is ample room for promotion, production, and distribution of liquid milk and its products, which policymakers and dairy industry can use it in their favour.

#### Geetha M. Rajaram (2011) , her study titled “Production Pattern of Milk: A Study At KMF” analysed the data of ‘Milk production and per capita availability of milk in India 2000-01 to 2006-07’ . The author also made a comparative study of India with that of Karnataka state and their findings show that during the period of their study, Karnataka contributes to about 4.08 million-tonne of milk. Punjab achieved a high degree of per capita milk availability with 898 grams per day, while Mizoram is cursed at the bottom with per capita milk availability of only 44 grams per day. The per capita availability of milk in Karnataka decreased from 233 grams per day in 2000- 2001 to 197 grams per day in 2006-07. Milk production in Karnataka has been declining after the Operation Flood programme ended in 1997 till 2003-04. Hassan Milk Union (6.71%) witnessed the maximum growth rate in terms of milk procurement. Three milk unions, Bangalore, Dakshina Kannada and Mandya accounted for about 54.3 percent of total milk sales in 2006-07.

Animal husbandry and milk production also has an effect on environment. According to Gurjar, M.D. et. al. (2022), the Dairy sector affects the environment in terms of Animal husbandry activity mostly by production of methane, Dairy Processing operations, large Effluents, huge use of Electricity and fuel energy for Heating and Cooling Operations, Large use of Water in dairy operations, and so on and some of the solutions are - – Plantation, Rural Sanitation, Bio-CNG production, Use of Solar Energy, Innovations in the Energy efficient equipment and processes,

Apart from Milk and Milk Products, the commercialization and economic interests related to other animal husbandry outputs such as – dung and colostrum are also increasing nowadays, According to NDDB (2023), To propagate household level biogas plants at a large scale, NDDB Mrida Limited in collaboration with “Sistema.bio”, a manufacturer of biogas plants, introduced “Gobar se Samriddhi” Biogas. The programme involves large-scale installations of domestic biogas plants in clusters, through dairy cooperatives and farmer-focussed institutions. The Varanasi Milk Union also gained the distinction of having setup the country’s first dung based biogas plant to meet the steam and electricity requirement of its dairy plant. The biogas plant, while creating an additional source of income for dairy farmers through sale of dung is also helping the union to contribute towards reducing carbon footprint by replacing traditional fuels. Very recently one more sustainability issue linked to bovine colostrum has been highlighted. Bovine colostrum is a natural secretion from the mammary gland and the first milk produced after the birth of a calf. Large-scale milk production produces considerable volumes of colostrum, typically collected at farms, chilled, and transported to central processing facilities. At the processing facility, it undergoes pasteurization, cream separation, and lactose removal before drying. The required proteins and bioactive compounds are extracted from the bovine colostrum. However, during centrifugal separation, 28% of immunoglobulins are obtained in the lipid fraction. The colostrum cream obtained as a by-product is high in fat, containing 40–45% fat and concentrated further to 70–80% fat. Currently, this cream is not effectively utilized and is often disposed of, resulting in sustainability concerns and economic problems (Modi, Zeel 2025). According to Sunanda Maharana & Somanath Sahoo (2023), Colostrum milk is providing the passive immunity to the neonates. Colostrum has high affinity for the body cell repair, regeneration, some biologically active molecules for renewal and repair of various special and general cell of muscle, cartilage and all. They suggest that there is opportunity in this field also for example -The colostrum-based products are colostrum gummies, colostrum powder, Nutra up mass gainer with colostrum, bovine colostrum powder shelf life of 6 months, colostrum powder shelf life of 24 months, colostrum capsule, cow colostrum tablet, immune strong B-colostrum powder, colchicine powder api shelf life:18 months. All these colostrum products are manufacturing in different companies like- Lexicare Pharma Pvt. Ltd. Ankleswar, HerboNutra Extract Pvt. Ltd. Noida, Nutralike Health Care, Mitushi Biopharma Ahmedabad to name a few.

According to Deshmuk (2014), Among various states, Uttar Pradesh ranks first in terms of number and capacity of milk plants operating under central registered authorities followed by Gujarat and Maharashtra. But Maharashtra rank first in terms of number and capacity of milk plants operating under state registered authorities followed by Uttar Pradesh and Punjab. Several brands have been created by co-operatives like Amul (GCMMF), Vijaya (AP), Verka (Punjab), Saras (Rajasthan), Nandini (Karnataka), Milma (Kerala) and Gokul (Kolhapur).

At International level, the National Dairy Development Board (NDDB) is Spreading spirit of cooperation beyond India for example - Taking into consideration past collaboration with NDDB, the Government of Sri Lanka sought assistance from India to help Sri Lanka achieve its nutritional requirements and improve the livelihoods of smallholder dairy farmers across the country. By undertaking field visits and meetings with various stakeholders, NDDB along with Gujarat Cooperative Milk Marketing Federation is formulating a large scale dairy development plan for Transforming Sri Lankan Dairy Sector from deficiency and import dependency to self-sufficiency. Similarly, NDDB is assisting the Government of Kenya in strengthening their dairy sector through cooperatives by putting in place a long-term dairy development plan (NDDB, 2024)

**3. Research Objective**

* To study and carry out the comparative analysis of milk production, per capita availability, milch population and other dairy sector characteristics of Gujarat vis a-vis India.

1. **Methodology**

The present research is based on secondary data. The data for the study was obtained from various websites and Annual reports of various organizations such as NDDB, Gujarat Government Animal Husbandry Department, DAHD, etc. Secondary data was also obtained from various research articles from reputed journals. The data of milk production was taken for a period of 23 years starting from year 2001-02 to year 2023-24 from the website of National Dairy Development Board (NDDB). The milk production data was then analysed mainly in terms of Growth parameters namely ‘absolute percentage growth’ over the entire period. Also, for each year the Percentage contribution of Gujarat towards the overall milk production of the country was calculated to study the growth, pattern and magnitude of the contribution. The data of ‘per capita availability of milk’ was available for a period of 13 years starting from year 2009-10 to year 2023-24. The data was systematically analysed to find out the growth rate, trends, etc. and a comparative analysis was done. The descriptive statistical tools were used to study growth rates, trends, and contribution. Further, to gain deep understanding of underlying industry structure prevailing in Gujarat, the data of ‘Milk Procurement by Cooperative dairies in Gujarat’ was also anlayzed for 22 years starting from year 2001-10 to year 2022-23. Hence, the study covers a sufficiently long period for comparative analysis so as to give a clear picture of the comparative aspects.

### Results and Discussion

* 1. Milk Production over last two decades in India and Gujarat **:** The following table summarizes the milk production data (in million tonnes) for Gujarat and India from 2001-02 to 2022-23:

**Table no. 1 Milk Production of Gujarat and India ( in Million Tonnes)**

|  |  |  |
| --- | --- | --- |
| **Year** | **Gujarat** | **All India** |
| 2001-02 | 84.41 | 5.86 |
| 2002-03 | 86.16 | 6.09 |
| 2003-04 | 88.08 | 6.42 |
| 2004-05 | 92.48 | 6.75 |
| 2005-06 | 97.07 | 6.96 |
| 2006-07 | 102.58 | 7.53 |
| 2007-08 | 107.93 | 7.91 |
| 2008-09 | 112.18 | 8.39 |
| 2009-10 | 116.43 | 8.84 |
| 2010-11 | 121.85 | 9.32 |
| 2011-12 | 127.90 | 9.82 |
| 2012-13 | 132.43 | 10.32 |
| 2013-14 | 137.69 | 11.11 |
| 2014-15 | 146.31 | 11.69 |
| 2015-16 | 155.49 | 12.26 |
| 2016-17 | 165.40 | 12.78 |
| 2017-18 | 176.35 | 13.57 |
| 2018-19 | 187.75 | 14.49 |
| 2019-20 | 198.44 | 15.29 |
| 2020-21 | 209.96 | 15.85 |
| 2021-22 | 222.07 | 16.72 |
| 2022-23 | 230.58 | 17.28 |
| 2023-24 | 239.30 | 18.31 |

#### Source: NDDB

##### **Comparative Analysis of Milk Production**

##### **From the above table and graph it can be seen that:-**

1. **Growth Rate**: Over the 23-year period, milk production in India grew from 84.4 million tonnes in 2001-02 to 239.3 million tonnes in 2023-24, marking an increase of approximately 183%. In Gujarat, milk production grew from 5.86 million tonnes in 2001-02 to 18.31 million tonnes in 2023-24, representing an increase of approximately 212%.
2. **Percentage Contribution of Gujarat to All India Milk Production**: Gujarat's contribution to total milk production in India has consistently increased over time. In 2001-02, Gujarat contributed about 6.95% to India's total milk production. By 2023-24, Gujarat’s contribution rose to around 7.65%.

**Year-wise Growth**: Both India and Gujarat show steady growth, but Gujarat's milk production has been growing at a faster rate compared to the national average. This could be attributed to various factors including the development of dairy farming infrastructure, better management practices, and the success of the "White Revolution" led by cooperative dairy societies like Amul. According to Gurjar M.D (2016) “Gujarat’s dairy cooperatives have been a frontrunner in propagating the benefits of “Amul Pattern’ Dairy cooperatives in the state as well the entire country. The contribution of Gujarat dairy cooperatives in the Indian dairy sector is immense and it is quite evident if one looks at the origin and spread of ‘Amul Pattern,’ tremendous growth and development of the cooperatives under GCMMF.GCMMF’s brand “Amul” is the “Largest Fully Integrated Food Brand” of the country. Its turnover has grown remarkably at a cumulative average growth rate(CAGR) of 21% during the last five years. In the current year, 2014-15, it has touched a whopping Rs 20,733 crore, a 14% increase from previous year’s turnover of Rs 18,143 crore.”

**5.1.2 Comparative Trends in milk production Gujarat and India**

##### a) **National Trend**

1. The growth in milk production across India has been consistent. The production has grown significantly from 84.4 million tonnes in 2001-02 to over 230 million tonnes in 2023-24. This reflects the success of dairy farming and milk production technologies, as well as growing domestic demand for milk.
2. India’s milk production growth rate has been slower than that of Gujarat, which shows that other states are growing more slowly or are facing challenges in increasing production.

##### b) **Gujarat’s Performance**

* Gujarat has demonstrated robust growth in milk production. The state's dairy industry, particularly through the cooperative sector led by organizations like Amul, has been a driving force for this growth.
* Gujarat's contribution to India's total milk production has been increasing, and it continues to be a key player in India’s dairy sector.
* The state’s dairy farming model, which emphasizes cooperative societies, has proven successful in improving both production and the livelihood of farmers. As Gurjar M D. (2016) indicates “Gujarat has around 18,536 village level cooperative societies, which have33,65,442 dairy farmers. As per data available for year 2013-14, there were around 2,641 women dairy cooperative societies, around 4,233 societies had installed Bulk Milk Coolers (BMC), around 11,814 societies had Automated Milk Collection Systems (AMCS). These numbers indicate the trust and involvement of dairy farmers in the cooperative setup and are the reason for continuous improvement in the quality of raw milk and final products of the cooperatives.”

**5.2 Comparative Analysis Per Capita Availability of Milk (Grams per Day) in Gujarat vs. All India (2009-10 to 2023-24)**

Milk is an essential dietary component in India, contributing significantly to the nutritional needs of the population. The **per capita availability of milk** is an important indicator to assess the accessibility of this vital resource across different regions. This section focuses on the **per capita availability of milk** (measured in grams per day) in **Gujarat** and **All India** from **2009-10 to 2023-24.**

**5.2.1 Per Capita Availability of Milk in India and Gujarat** : The following table outlines the **per capita availability of milk** in **grams per day** for both **Gujarat** and **All India** over the period from **2009-10 to 2023-24**

Table no. 2:Per Capita Availability of Milk in India and Gujarat (in grams per day)

|  |  |  |
| --- | --- | --- |
| **Year** | **Gujarat** | **All India** |
| 2009-10 | 418 | 273 |
| 2010-11 | 435 | 281 |
| 2011-12 | 445 | 290 |
| 2012-13 | 476 | 299 |
| 2013-14 | 506 | 307 |
| 2014-15 | 506 | 319 |
| 2015-16 | 522 | 333 |
| 2016-17 | 538 | 351 |
| 2017-18 | 563 | 370 |
| 2018-19 | 593 | 390 |
| 2019-20 | 615 | 406 |
| 2020-21 | 631 | 427 |
| 2021-22 | 656 | 446 |
| 2022-23 | 670 | 459 |
| 2023-24 | 700 | 471 |

##### Milk consumption is an essential aspect of dietary patterns, especially in India, where dairy is a major part of the diet. The per capita availability of milk, measured in grams per day, serves as an indicator of how much milk is available for consumption per person in a given year. This section analyzes the per capita availability of milk in **Gujarat** and **All India** over the period from **2009-10 to 2023-24.**

##### Gujarat's Per Capita Milk Availability

Gujarat shows a steady increase in the per capita availability of milk, with a growth from 418 grams/day in 2009-10 to 700 grams/day in 2023-24. The standard deviation is relatively high, indicating some fluctuations, but overall, Gujarat’s per capita milk availability has shown consistent growth.

1. All India Per Capita Milk Availability

India’s per capita milk availability has also grown from 273 grams/day in 2009-10 to 471 grams/day in 2023-24. While the range is smaller than Gujarat’s, the CV is slightly higher, reflecting some level of variation in milk availability across the country, but still showing an upward trend.

#### **Growth of per capita availability of milk in Gujarat and India**

Though the growth rates of Gujarat and All India are both impressive, Gujarat's per capita milk availability was significantly higher than India’s average, and it has maintained a steady increase, albeit at a slightly lower percentage than the national growth. The **Comparison over two decades shows that - In year 2009-10,**  Gujarat’s per capita availability was **418 grams/day,** which was **145 grams/day** higher than the national average (273 grams/day) whereas after two decades , in y**ear 2023-24,** Gujarat's per capita availability reached **700 grams/day**, which is **229 grams/day** higher than India's **471 grams/day.**

Over the years, the gap between Gujarat and All India has increased, reflecting Gujarat's success in expanding milk production and distribution.

#### **Key Insights**

* **Higher Per Capita Availability in Gujarat:** Gujarat has a consistently higher per capita milk availability compared to India as a whole. This can be attributed to the state’s robust dairy infrastructure, largely driven by cooperative dairies like **Amul**.
* **Steady Growth in Both Regions:** Both Gujarat and All India have witnessed steady growth in per capita milk availability. However, Gujarat's growth trajectory has been slightly higher in absolute terms compared to India.
* **Increasing Demand for Dairy:** The consistent rise in milk availability across both Gujarat and India indicates the growing demand for dairy products, driven by population growth and rising consumption of milk and milk-based products.

#### 5.3 Contribution of organized sector in Gujarat and Indian dairy sector

**5.3.1 Growth of organized dairy sector in India:**

According to DAHD (2024), In the cooperative sector, there are 22 Milk Federations/ Apex Bodies, 240 district cooperative milk unions, 28 marketing dairies, 24 Milk Producer Organizations covering about 2.3 lakh villages and 1.8 Crore dairy farmers as members. In India, about 37% of the milk produced is either consumed at the producer level or sold to non-producers in the rural area, the balance 63% of the milk is available for sale to organized and unorganized players. Organized sector comprises of government, producers’ owned institutions (milk cooperatives & producer companies) and private players which provides fair and transparent system of milk collection round the year at the village level. Unorganized/ informal sector involves local milkman, dudhias, contractors etc. Post 1991, when the era of reform in industrial licensing began, the private sector companies have made an impressive growth in building capacities for processing milk and milk derivatives. They made large investment in dairy sector creating capacities which surpassed the combined capacity of the dairy cooperatives and the government dairies in past 20 years. Some of these private players are now much larger than some cooperative dairies and they have large potential for growth. Since private sector functions purely on commercial lines with an aim to earn maximum profit, the social responsibility towards farmers’ development is largely affected. The private players prefer to procure milk through vendors affecting the farmers’ getting remunerative price. However, growth in private sector provides market access to large number of farmers. The total number of Private Dairies (Milk Processing Units)As Per FSSAI Licenses (Till May 2019) is 1944 Nos. with a Capacity of 901.6 Lakh Litres per day(LLPD).

#### 5.3.2. Growth of organized dairy sector in Gujarat:

Table no. 3:Growth inMilk Procurement by Cooperative dairies in Gujarat over last two decades

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Sr. no. | Year | Annual Production ('000 M.T) | Milk Production - Lakh Liter Per Day | Milk Procurement by Cooperative dairies of Gujarat (Lakh Litres per day) | Daily Milk Procurement In % To Total Production |
| 1 | 2001-02 | 5876.01 | 156.3 | 44.43 | 28.43 |
| 2 | 2002-03 | 6089.41 | 161.97 | 51.89 | 32.04 |
| 3 | 2003-04 | 6420.21 | 170.77 | 50.7 | 29.69 |
| 4 | 2004-05 | 6745.41 | 179.42 | 58.52 | 32.62 |
| 5 | 2005-06 | 6960 | 185.13 | 64.17 | 34.66 |
| 6 | 2006-07 | 7533.1 | 200.38 | 66.69 | 33.28 |
| 7 | 2007-08 | 7911.73 | 209.87 | 76.49 | 36.45 |
| 8 | 2008-09 | 8387.18 | 223.09 | 86.93 | 38.97 |
| 9 | 2009-10 | 8842.84 | 235.21 | 94.11 | 40.01 |
| 10 | 2010-11 | 9320.84 | 247.93 | 94.58 | 38.15 |
| 11 | 2011-12 | 9816.51 | 260.4 | 101.38 | 38.93 |
| 12 | 2012-13 | 10314.63 | 274.36 | 117.33 | 42.76 |
| 13 | 2013-14 | 11112.67 | 295.59 | 122.55 | 41.46 |
| 14 | 2014-15 | 11690.57 | 310.96 | 136.32 | 43.84 |
| 15 | 2015-16 | 12262.36 | 326.17 | 153.15 | 46.95 |
| 16 | 2016-17 | 12784.06 | 340.05 | 170.62 | 50.18 |
| 17 | 2017-18 | 13569.13 | 360.93 | 186.34 | 51.63 |
| 18 | 2018-19 | 14492.4 | 385.49 | 237.03 | 61.49 |
| 19 | 2019-20 | 15292.34 | 406.77 | 203.43 | 50.01 |
| 20 | 2020-21 | 15852.69 | 421.67 | 232.05 | 55.03 |
| 21 | 2021-22 | 16722.11 | 444.8 | 233.4 | 52.47 |
| 22 | 2022-23 | 17280.56 | 459.65 | 240.99 | 52.43 |

#### **From the above table it can be seen that :-**

1. **Steady Growth in Milk Production**:

Over the last two decades, Gujarat has shown consistent growth in milk production. From an annual milk production of **5876.01 thousand metric tonnes** in 2001-02, the state’s production increased to **17,280.56 thousand metric tonnes** in 2022-23. This represents an impressive growth rate of over **193%**.

1. **Rapid Growth in Milk Procurement**:

The growth in milk procurement by cooperative dairies in Gujarat has mirrored the increase in milk production. From **44.43 lakh litres per day** in 2001-02, procurement rose to **240.99 lakh litres per day** in 2022-23. This is a growth of more than **440%** over the period.

1. **Increase in the Share of Cooperative Milk Procurement**:

The percentage of total milk production procured by cooperative dairies has shown an increasing trend over the years, reflecting the growing strength of the cooperative model. For instance, the daily milk procurement as a percentage of total milk production increased from **28.43%** in 2001-02 to **52.43%** in 2022-23. This indicates a significant rise in the role of cooperatives in Gujarat's dairy industry.

1. **Record Highs in Milk Procurement**

The year **2018-19** saw a significant spike, with the cooperatives procuring **237.03 lakh litres per day**, which is about **61.49%** of the state's total milk production. This was a record peak, demonstrating the successful integration of cooperatives in the milk supply chain.

1. **Contribution to India’s Dairy Sector**

Gujarat's cooperative dairies play a pivotal role not only in the state's economy but also in the national dairy sector, particularly through **Amul**. The significant share of milk procurement by cooperatives has helped stabilize milk supply, improve farmer incomes, and contribute to the organized dairy sector.

#### ****Factors Driving Growth in Milk Procurement by Cooperative Dairies****

**Cooperative Model Success**: The success of the cooperative sector in Gujarat, exemplified by organizations like **Amul**, has led to significant growth in milk procurement. The model has ensured fair prices for farmers, stable markets, and reliable milk collection systems. According to a crisil report cited by website agritimes.co.in - Gujarat in year 2019-20 , cooperative dairies procured milk on an average 225-227 LKPD (lakh kg per day) as compared to private dairies 12-14 LKPD. It shows the dominance, growth and contribution of cooperatives model in the state.

* **Infrastructural Development**: Over the years, Gujarat has built an extensive infrastructure for milk procurement, including chilling centers, transportation networks, and processing facilities, which has boosted procurement capacity.
* **Farmer Empowerment**: The cooperative model has played a critical role in empowering farmers, improving their livelihoods, and increasing milk yield through better management practices and access to quality feed and veterinary services.
* **Increased Demand for Dairy Products**: The rising demand for dairy products, both within Gujarat and across India, has incentivized higher milk production and procurement. The success of Amul products, including milk, butter, ghee, and ice cream, has contributed to the growth in procurement

#### 5.4 Comparison of Population of Milch Animals in India and Gujarat

#### 5.4.1 Livestock Census 2012- Gujarat Vs India

#### The Livestock Census 2012 provides essential data about the distribution of various livestock species across India and its states. Among the various categories of livestock, the milch animals—cattle and buffaloes—play a significant role in milk production, which is crucial for both the agricultural economy and food security. This report compares the milch animal populations of Gujarat with that of India in 2012, focusing on the two primary milk-producing animals: cattle and buffaloes.

Table no. 4:Livestock Census 2012 – Gujarat Vs India (data in million number)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sr. no. | Milch animal | Livestock  Census 2012- Gujarat | Livestock Census 2012- India | Percentage |
| 1 | Cattle | 9.984 | 190.9 | 5.23% |
| 2 | Buffaloes | 10.386 | 108.7 | 9.55% |

From the above table and figure it can be seen that, Despite having a relatively smaller share of the national cattle population, Gujarat's buffalo population surpasses its cattle population in numbers and percentage share. This suggests that buffaloes are more central to the state's dairy industry. While India’s overall milch animal population is vast, Gujarat's significant contribution to the buffalo population underlines its leading role in milk production, especially in the form of buffalo milk, which is highly valued for its fat content and used in products like ghee, butter, and paneer.

#### 5.4.2.Livestock Census 2019- Gujarat Vs India

Table no. 5:Livestock Census 2019 – Gujarat Vs India (data in million number)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sr. no. | Milch animal | Livestock Census 2019- Gujarat | Livestock Census 2019 - India | Percentage |
| 1 | Cattle | 9.634 | 193.463 | 4.98% |
| 2 | Buffaloes | 10.543 | 109.852 | 9.60% |

From the above table it can be seen that Gujarat's share of the cattle population decreased slightly over the seven years between 2012 and 2019. However, the buffalo population continued to grow, indicating that Gujarat's dairy industry is increasingly focused on buffaloes, which have better milk yields and fat content compared to cattle. Further, India’s total cattle population increased from 190.9 million in 2012 to 193.463 million in 2019, while the buffalo population also saw a slight increase from 108.7 million in 2012 to 109.852 million in 2019.Gujarat’s share of the national cattle population decreased, while its share of the buffalo population remained relatively stable, albeit with a slight increase.

#### 6. ****Conclusion****

The comparative study of milk production and the dairy sector in Gujarat vis-à-vis India over the past two decades highlights the significant progress and trends in milk production, per capita availability, and the milch population. The analysis reveals that Gujarat has consistently outpaced the national average in terms of milk production growth and has maintained a prominent role in India's dairy industry.

1. **Growth in Milk Production**: Gujarat's milk production has increased by **212%** over the last two decades, compared to India’s **183%** growth. This robust performance underscores the success of the state's dairy industry, particularly due to the cooperative sector led by organizations like **Amul**. Gujarat's milk production grew at a faster rate than the national average, resulting in a steady increase in its contribution to India's total milk production—from **6.95%** in 2001-02 to **7.65%** in 2023-24.
2. **Per Capita Availability of Milk**: The per capita availability of milk in Gujarat has been substantially higher than the national average. In 2023-24, Gujarat's per capita availability reached **700 grams per day**, compared to **471 grams per day** at the national level. This demonstrates that milk is more readily available to the population in Gujarat, which can be attributed to the higher milk production and better distribution mechanisms in the state.
3. **Milch Animal Population**: The Livestock Census data from 2012 and 2019 reveals a **shift in the composition of Gujarat’s milch animal population**. While the cattle population slightly decreased both in absolute terms and as a percentage of the national cattle population, the **buffalo population continued to grow**, maintaining Gujarat's position as a leading producer of buffalo milk. This aligns with the state's focus on **buffalo-based dairy farming**, which is highly profitable due to the higher fat content of buffalo milk.
4. **Contribution of the Cooperative Sector**: Gujarat's **cooperative dairy sector** has played a pivotal role in the state’s dairy success. The state's organized dairy sector, including cooperative societies like **Amul**, has seen consistent growth in milk procurement. The cooperative model has improved milk production efficiency, farmers' livelihoods, and market access. In contrast, while the private sector has grown substantially, its focus on profit-making has sometimes overshadowed the social responsibilities of supporting dairy farmers.
5. **Overall Performance**: Gujarat's performance in milk production, per capita availability, and its contribution to India’s dairy sector showcases a model of **sustainable growth**. The state has demonstrated a successful integration of cooperative systems, infrastructure development, and farmer empowerment, leading to higher milk yields and better market access for farmers. While the national dairy sector has also experienced growth, Gujarat’s continued leadership in milk production underscores its integral role in shaping India’s dairy landscape.
6. **Recommendations:** The state of Gujarat should make future efforts should continue to focus on innovation in dairy farming practices, enhancing the welfare of dairy farmers, and ensuring sustainable growth in the dairy sector, especially in the face of challenges like climate change and rising feed costs. Such efforts will strengthen the sustainability of Gujarat’s dairy sector and also help in contributing significantly towards achieving the United Nation’s sustainable development goals. In the wake of changing business environments stakeholders can make their own strategy by keeping in mind the new form of business organisations like \_ Milk Producer companies, Private companies, Climate change laws, schemes like AHIDF (Animal Husbandry Infrastructure development fund”, and other developments.

**Limitations of the study:** The focus is on quantitative data, qualitative factors such as such as policy changes, socio-economic conditions, market dynamics, consumer preferences, or the impact of technological advancements can also be explored in further study. Also, Regional variations within Gujarat and India could influence the findings.

**COMPETING INTERESTS DISCLAIMER:**

**Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.**

Disclaimer (Artificial intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

#### References

Abhishek Pathak et al. (2022). Goat Farming: Benefits and Challenges. Just Agriculture. Vol. 2 Issue-11, July 2022, (e-ISSN: 2582-8223), ARTICLE ID: 023

Department of Animal Husbandry and Dairying. (2024). Annual Report 2022-23. Ministry of Fisheries, Animal Husbandry and Dairying, Government of India.

Debnarayan Sarker and Bikash Kumar Ghosh (2010). In their study titled ‘Constraints of Milk Production: A Study on Cooperative and Non-cooperative Dairy Farms in West Bengal’ Agricultural Economics Research Review Vol. 23 July-December 2010 pp 303-314

Geetha M. Rajaram (2011) , her study titled “Production Pattern Of Milk: A Study At KMF” Adarsh Journal of Management Research , Vol 4 Issue 1 March 2011

GoG (2024). The 40th Survey Report on Estimates of Major Livestock Products For the year 2022-23. Directorate of Animal Husbandry Gujarat State. Gujarat from <https://doah.gujarat.gov.in/Publication>

Gurjar M.D (2016). Gujarat Dairy Cooperatives: A shining example of ‘Make in India’. Food and Beverages (F&B) magazine: (http://www.fnbnews.com/Top-News/gujarat-dairy-cooperatives-a-shining-example-of-make-in-india-38315)

Gurjar M.D. et al. (2023). Dairy entrepreneurship scenario in Gujarat state. The Pharma Innovation Journal 2023; 12(2): 1090-1094

Gurjar M.D., et. al. (2022). Environment and pollution management in dairy sector: A case study of dairy cooperatives of Gujarat. The Pharma Innovation Journal 2022; SP-11(9): 71-75

Gujar Mahendra D. and Modi Zeel (2024). Milk Production in Gujarat, India: A District-Wise Scenario of Contributions of Cow, Buffalo, and Goat Milk during 2022-23 Journal of Experimental Agriculture International. Volume 46, Issue 12, Page 553-564, 2024; Article no.JEAI.127781 ISSN: 2457-0591

Lalgoulen Khongsai (2020). Growth and Development of Dairy Industry in India International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-8 Issue-5, January 2020

Mahadeo S Deshmukh (2014). Growth and Performance of Dairy Sector In India. Voice of Research. Volume 3 Issue 2. ISSN No. 2277-7733

Manpreet Kaur and Naresh Singla (2018). Growth and structural transformations in dairy sector of India. Indian J Dairy Sci 71(4): 422-429

Modi, Z., Dubey, K., & Salunke, P. (2025). Characterization of Fatty Acids and Nutritional Health Indicators of Ghee (Butteroil) Manufactured from Bovine Colostrum and Sweet Cream. Dairy, 6(1), 2. <https://doi.org/10.3390/dairy6010002>

NDDB (2024). Annual Report, National Dairy Development Board, India.

Singh M.K.,& Singh M (2023). Exploring potential of goat based dairy farming in India and way forward. Indian Journal of Animal Sciences 93 (3): 243–250, March 2023/Review Article https://doi.org/10.56093/ijans.v93i3.114871

Sunanda Maharana & Somanath Sahoo (2023). Commercialization Of Colostrum Milk for The Benefit of Human Health in Gunupur City, Odisha. International Journal for Multidisciplinary Research (IJFMR). E-ISSN: 2582-2160. Volume 5, Issue 5, September-October 2023

https://agritimes.co.in/crisil-data-finds-milk-procurement-by-private-dairy-more-in-8-milk-producing-states

<https://www.nddb.coop/information/stats/milkprodstate>

<https://www.nddb.coop/information/stats/percapitavail>

<https://amul.com/>