

## Transforming India's dairy landscape: The rise of startups and pathways to sustainable growth

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### Abstract

India's dairy sector has evolved significantly from a predominantly unorganized industry to a rapidly growing space that now includes diverse startups catering to changing consumer demands. This review examines the journey of India's dairy industry from pre-1970 to the present, highlighting the pivotal moments that have shaped the sector. The emergence of dairy startups in recent years has introduced innovation in supply chain management, product variety, and digital consumer engagement, aligning with global trends such as sustainability and technological integration. The study also discusses the growing importance of organic, A2 milk, and value-added dairy products as consumer preferences shift towards healthier options. However, dairy startups face numerous challenges, including infrastructure deficits, regulatory barriers, and market access limitations. Key drivers for this sector's growth - such as increased government support, advances in IoT, and the rise of direct-to-consumer (D2C) models - indicate significant potential for future expansion. By analysing these dynamics and the existing challenges, this article aims to provide a comprehensive understanding of India's dairy startup ecosystem, identifying pathways for sustainable growth and suggesting areas for strategic intervention.

**Keywords:** Dairy industry, Dairy startups, Direct-to-consumer (D2C), Government policy, Innovation

### Highlights

- Dairy startups are redefining value chains from farm to consumer.
- Tech integration is enhancing productivity, safety, and transparency.
- Consumer-centric models are reshaping urban dairy consumption.
- Supportive policies are catalyzing entrepreneurial growth in dairying.
- Premiumization and health trends are reshaping dairy market dynamics.

### INTRODUCTION

India, the world's largest milk producer, contributes approximately 25% to global milk production, reaching 239.30 million tonnes in 2023-24 - a 58% increase since 2014-15, with a compound annual growth rate (CAGR) of 6% over the past decade (Press Information Bureau [PIB], 2025). The leading milk-producing states, namely Rajasthan (15.05%), Uttar Pradesh (14.93%), Madhya Pradesh (8.6%), Gujarat (7.56%), and Andhra Pradesh (6.97%), collectively contribute 53.11% of the nation's total milk output. In 2023-24, India exported 63,738.47 MT of dairy products, valued at INR 2,288.21 crore (Sharma & Sharma, 2021). Dairy production plays a pivotal role in India's rural economy, providing critical support for resource-poor farmers through diverse income sources including milk sales, insurance against drought, emergency cash, household nutrition, and inputs like fuel, manure, and draught power. The dairy sector's growth necessitates substantial investment in infrastructure, spanning processing,

chilling, logistics, and cattle feed. Additionally, significant potential lies in areas like value-added dairy products, organic/farm-fresh milk, and exports. Both the federal and state governments have implemented incentives to encourage investment in this crucial area in order to strengthen infrastructure. The sector's significance extends beyond production, encompassing broader contributions to livelihoods, nutrition, and economic stability. Traditionally dominated by small-scale producers, the Indian dairy industry has undergone a marked transformation with the rise of dairy startups in the past decade. These startups respond to evolving consumer preferences, heightened demand for quality products, and the adoption of technology to optimize supply chains and boost productivity. Dairy startups have the potential to be significant economic drivers in India's goal of reaching a USD 5 trillion economy by 2047 (Shukla et al., 2024). The emergence of dairy startups presents unique opportunities to address critical challenges related to food security, rural livelihoods,

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and environmental sustainability. However, the Indian dairy startup landscape faces several barriers to growth and scalability, including infrastructure deficits, regulatory hurdles, and financial constraints. This article provides a comprehensive overview of the current status, emerging trends, and growth potential of the dairy startup sector in India. It examines the pivotal role of government initiatives, such as the Dairy Processing & Infrastructure Development Fund (DIDF), Animal Husbandry Infrastructure Development Fund (AHIDF), and Rashtriya Gokul Mission (RGM), in promoting innovation and entrepreneurship within the dairy sector. This study examines crucial aspects such as the demand for dairy startups, current growth trends, major industry players, challenges, and future opportunities. It provides valuable insights for policymakers and stakeholders seeking to design focused interventions. This study identifies growth opportunities and effectively addresses key challenges in the dairy startup ecosystem by analyzing its dynamics.

### Evolution of India's dairy sector

The evolution of India's dairy sector has been transformative, from a traditionally unorganized industry to the world's largest milk producer, contributing significantly to the country's agricultural economy. Below is a timeline of key developments as shown in Fig. 1, supported by data.

**Pre-1970:** Subsistence dairy farming prior to the 1970s, dairy farming in India was largely unorganized, with limited technological infrastructure. Milk production was low, catering mostly to local

consumption. The annual milk production in 1950-51 was just around 17 million tonnes (Sharma & Sharma, 2021).

**1970-1990:** Operation Flood (White Revolution) The launch of Operation Flood in 1970, led by Dr. Verghese Kurien and the National Dairy Development Board (NDDB), marked the beginning of India's dairy revolution. Operation Flood connected rural milk producers with urban markets, facilitated the establishment of milk cooperatives, and improved infrastructure. The amount of milk produced rose to 74 million tonnes by 1996 (Pashudhan Praharee, 2019). The creation of cooperative models like Amul played a pivotal role.

**1990-2010:** Post-Liberalization Expansion After India's economic liberalization in 1991, the dairy sector witnessed an influx of private investment in dairy processing and retail. Milk production continued to rise, reaching 127.9 million tonnes in 2011-12, as per the NDDB (Pashudhan Praharee, 2019). The growth was accompanied by technological advancements in milk processing and the emergence of value-added products such as yogurt, cheese, and butter.

**Post-2010:** Since 2010, India's dairy sector has grown significantly, with production rising from 121 million metric tons in 2010 to 222 million metric tons by 2022, a CAGR of 5.6% (Fortune Business Insights, 2022). This growth has been driven by government initiatives, increased investments, and technological advancements such as IoT-based cattle management, AI-driven production, and improved cold chain

logistics. The dairy startup ecosystem has seen a surge, focusing on value addition and digitalization. The COVID-19 pandemic further accelerated the shift towards organized retail and e-commerce, expanding consumer reach (Sharma & Sharma, 2021).

**Present:** India's dairy sector is a global leader, producing 231 million tonnes of milk in 2023-2024, accounting for 25% of global output, with a 6% annual growth rate over the past decade. Valued at Rs. 13 lakh crore in 2021, the sector is projected

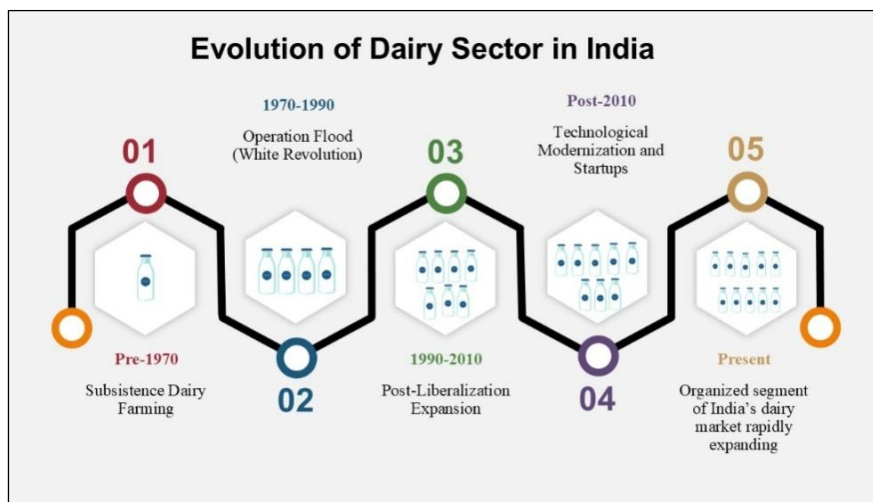


Fig. 1. Evolution of dairy sector in India

to reach Rs. 31 lakh crore by 2027, growing at a 15% CAGR. The organized segment, including cooperatives and private players, has expanded from 32% to 40% market share and is expected to reach 54% by 2026, driven by demand for branded and value-added dairy products like cheese, paneer, and flavoured milk, which are growing at 14% to 19% annually (Singh, 2024).

### What is a Startup?

The startup is a new business in its initial stage of operation built on technology and innovation where an idea manifests into a commercial undertaking. Luger & Koo (2005) defined the startup as a business that is new, active, and independent whereas, Carter et al. (1996) explained it as a newly born company with no previous history of operations.

### Startup definition by the Indian Government

“Definition of the startup as per G.S.R. (127E) notification of the Department for Promotion of Industry and Internal Trade (DPIIT) as released on 19th February 2019 (Startup India, 2025).

An entity is built up for a period of ten years from the date of incorporation/registration and is either a private limited company (as per Companies Act, 2013) or registered as a partnership firm (registered under section 59 of the Partnership Act, 1932) or a limited liability partnership (Under Limited Liability Partnership Act, 2008) in India.

The entity turnover has not exceeded Rs 100 crore for any of the financial years since its incorporation/registration.

Innovation, development, improvement of products/processes/ services, employment creation, and wealth generation should be the main objectives of the Startup. The entity formed by splitting up or reconstruction of an existing business is not considered a Startup.”

### Scenario of startups and dairy startup in India

India, the world’s seventh-largest country by land and economy by GDP, is set to become the third-largest economy by 2030. Launched in 2016, the Startup India initiative aims to cultivate a thriving entrepreneurial ecosystem. With an estimated 50,000 startups, 31,945 recognized by the Department for Promotion of Industry and Internal Trade (DPIIT), India has emerged as the world’s third-largest startup hub, growing annually by 12-15%. Startups have generated 40,000 jobs over the past year, contributing to an estimated 1.6-1.7 lakh jobs within this ecosystem (Global Startup Ecosystem Report [GSER], 2019). The country also ranks among the

top 20 startup cities globally, with Bangalore as one of the five fastest-growing ecosystems (Forbes India, 2024).

India’s robust entrepreneurial growth is driven by economic expansion, venture capital availability, incubator development, and a skilled talent pool, fuelling the rise in startup activity from 5.3% in 2020 to 11.5% in 2022–2023 (Global Entrepreneurship Monitor, 2024). India ranks tenth in the Economist Intelligence Unit’s Business Environment Ranking and 63rd in the World Bank’s Ease of Doing Business Index (PIB, 2025). The Startup India initiative has recognized 131, 211 startups by November 2024, generating 0.89 million jobs and nurturing 107 unicorns with a combined valuation of \$350 billion, reflecting the startup ecosystem’s role in driving socioeconomic growth and the Atmanirbhar Bharat vision (Subrahmanya, 2015; Nuthalapati et al., 2020).

India’s dairy startup sector is witnessing rapid expansion through advancements in technology, supply chain enhancements, and evolving consumer preferences. Although India leads in global milk production, its dairy sector is highly fragmented, creating ample opportunities for innovation. Dairy startups are adopting direct-to-consumer (D2C) models, offering value-added products, and leveraging technology for farm management and supply chain optimization, addressing critical inefficiencies in the largely unorganized sector and meeting urban demand for fresh, diverse dairy options. These innovations position dairy startups as pivotal to modernizing India’s dairy industry and addressing longstanding challenges.

### Key factors driving dairy startups

The key factors driving dairy start-ups is given in Fig. 2 below

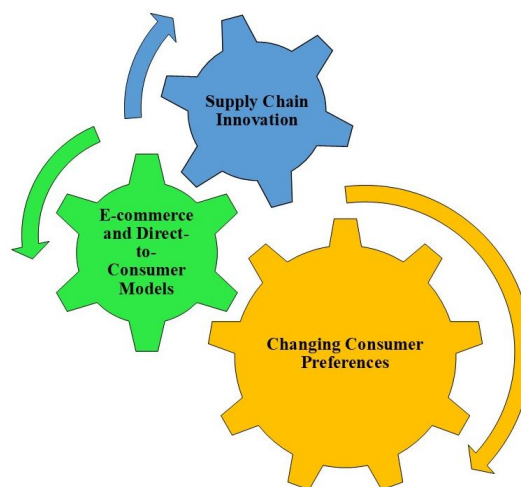


Fig. 2. Key factors driving dairy startups

**Changing consumer preferences:** The shift in consumer behaviour is a key driver of dairy startup growth in India, with health-conscious consumers increasingly seeking organic, natural, and minimally processed products that provide nutritional benefits without additives. Rising awareness of the risks associated with processed and adulterated foods has fuelled demand for pure, organic dairy, growing by approximately 20% annually (Food Safety and Standards Authority of India [FSSAI], 2017). Additionally, ethical concerns about animal welfare are prompting interest in startups that prioritize organic practices and humane treatment. India's expanding middle class and urbanization are also driving demand for premium dairy products, including lactose-free, plant-based, and functional beverages. These new categories allow startups to serve niche markets, setting them apart from traditional dairies. Fresh, convenient options like cold-pressed, raw milk delivery have gained significant traction in urban areas, aligning with the fast-paced, health-conscious urban lifestyle.

**E-commerce and direct-to-consumer models:** The rise of e-commerce in India has greatly benefited dairy startups by enabling direct-to-consumer (D2C) models that bypass traditional intermediaries. This approach allows startups to deliver fresh products directly from farms to consumers, ensuring quality control, pricing flexibility, and enhanced customer engagement. The ability to provide fresh dairy within short delivery windows has been crucial for urban consumers who prioritize convenience. E-commerce also helps startups overcome barriers like high retail space costs by leveraging subscription models and mobile apps to optimize supply chains and ensure timely deliveries. Furthermore, online platforms and social media allow startups to educate consumers, promote their products, and build brand loyalty. With India's online food and grocery market projected to reach \$18.2 billion by 2024, e-commerce offers substantial growth potential for dairy startups (India Brand Equity Foundation [IBEF], 2021).

**Supply chain innovation:** Supply chain innovation is crucial for dairy startups to ensure efficiency and competitiveness, particularly in managing the perishability of products like milk. Innovations such as real-time tracking, temperature-controlled logistics, and instant chilling at the farm level help maintain product freshness and reduce spoilage, leading to cost savings. Immediate chilling after milking, for instance, inhibits bacterial growth, enhancing milk's shelf life.

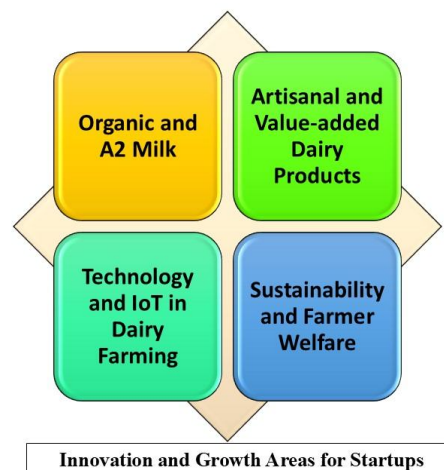
Additionally, blockchain technology is being utilized to boost traceability and transparency, offering consumers insights into product origin, animal welfare, and farming practices. This builds consumer trust, aids regulatory compliance, and reduces fraud risks. Such supply chain advancements, including blockchain, have the potential to cut operational costs by up to 15% (NITI Aayog).

### Growth of dairy startups in India

In general, the potential in the Indian dairy industry is high. Forecasts indicating that the Indian dairy sector will develop at a compound annual growth rate (CAGR) of 13% from 2023 to 2032, amounting to an opportunity worth INR 49.95 Lakh crore (Inc42, 2024). The growth of dairy startups in India has been significant over the past decade, driven by various factors such as increased consumer demand for high-quality dairy products, technological advancements, and government initiatives.

### Innovation and growth areas for startups

The key factors driving dairy start-ups are given in Fig. 3, below.



**Fig. 3. Innovation and growth areas for startups**

### Organic and A2 milk

The demand for organic and A2 milk has risen due to increased consumer awareness about health and sustainability. Organic milk production avoids synthetic fertilizers and pesticides, promoting better soil health and animal welfare. A2 milk, produced by cows with A2 beta-casein, is considered easier to digest and is gaining popularity as a healthier alternative to A1 milk (Srichakra, 2024). Startups focusing on organic and A2 milk serve a growing health-conscious market, implementing strict quality control and certification

standards. This segment offers promising growth opportunities as awareness of its benefits increases.

**Artisanal and Value-added dairy products**

The Indian dairy industry is seeing a rise in demand for artisanal and value-added products like probiotic yogurts, flavoured cheeses, and fortified milk beverages (Dollon’s, 2024; Modi et al., 2025). Startups are leveraging this trend by offering specialized products with enhanced production techniques, such as fermentation and fortification, to meet the health-conscious urban market. These products align with the global shift towards personalized nutrition, helping startups differentiate and attract new consumers. Additionally, value-added dairy products offer higher profit margins, driving further investment in this segment.

**Technology and IoT in dairy farming**

The integration of IoT technology is transforming dairy farming by enhancing productivity, animal health monitoring, and farm management. IoT devices, such as sensors and wearables, provide real-time data on health, milk yield, and feed quality, enabling data-driven decisions to improve efficiency. Automated milking systems, health tracking, and predictive analytics help reduce labour costs and improve animal welfare (Akbar et al., 2020). Startups investing in these technologies are modernizing India’s dairy sector, making advanced farm management accessible to small-scale farmers and increasing milk production efficiency.

**Sustainability and farmer welfare**

Dairy startups are increasingly focusing on sustainability and farmer welfare, balancing profitability with environmental and social responsibility. They implement practices like reducing water and energy use, eco-friendly packaging, and better waste management. Many startups also enhance farmer welfare through fair pricing, financial support, and skill development (TraceX, 2024). These initiatives not only boost productivity but also create a more resilient supply chain, promoting income stability and resource conservation while contributing to long-term sustainability and rural socio-economic development.

**Leading dairy startups in India**

India’s dairy sector is undergoing transformation, driven by startups leveraging technological innovation, direct-to-consumer models, and sustainability (Dahiya, 2021). These startups tackle challenges like supply chain inefficiencies and cold chain logistics while addressing the demand for organic and premium dairy products. By using IoT, AI, and big data, they optimize milk production and enhance quality (Sangode, 2024). Many also support small-scale farmers and adopt sustainable practices (Engelberts et al., 2021). The growing urban market and consumer preference for fresh, organic products offer significant potential, with some startups creating direct-to-consumer platforms for better margins and improved product quality (World Economic Forum, 2023).

There are many Dairy startups in India, but the leading Dairy startups in India are given in Table 1.

**Table 1. Major dairy startup in India**

Name of Startup & Establishment Year	Major Focus Area	Unique Points	Geographical Area of Operations
Stellapps (2011)	Dairy supply chain digitization	<ul style="list-style-type: none"> <li>- India’s first end-to-end dairy technology solutions company.</li> <li>- Uses IoT, AI, and big data to optimize the dairy supply chain.</li> <li>- SmartMoo platform connects farmers to processors.</li> <li>- Helps farmers improve milk yield and quality through data-driven insights.</li> </ul>	Operates across multiple Indian states; partnerships with cooperatives and private dairies at the national level.
Country Delight (2015)	Fresh and pure milk delivery	<ul style="list-style-type: none"> <li>- Direct-to-consumer (D2C) model delivering farm-fresh milk within 24–36 hours of milking.</li> <li>- Conducts over 26 quality tests for adulteration.</li> </ul>	Operates in Delhi-NCR, Bengaluru, Mumbai, Pune, and Chennai (urban and peri-urban regions).
Whyte Farms (2015)	Organic milk production and	<ul style="list-style-type: none"> <li>- Offers chemical-free, organic A2 cow milk.</li> <li>- Promotes a</li> </ul>	Primarily in Delhi-NCR region.

Cont. Table 1.

Table 1., Cont. ...

Name of Startup & Establishment Year	Major Focus Area	Unique Points	Geographical Area of Operations
	delivery	transparent and traceable supply chain.	
Pride of Cows (2012, Parag Milk Foods)	Premium milk for urban consumers	- Delivers fresh milk from automated farms directly to households. - "Farm-to-home" model with minimal human interference in processing.	Operations in Mumbai, Pune, Delhi-NCR, Bengaluru, and select urban centers.
Milk Mantra (2009)	Ethical sourcing and value-added products	- India's first venture capital-backed dairy startup. - Known for preservative-free milk in innovative tetra packs. - Promotes ethical sourcing from smallholder farmers.	Based in Odisha, with expanding markets in eastern and southern India.
Farmery (2017)	Fresh milk and dairy products	- Emphasizes sustainable, chemical-free, and hormone-free practices. - Subscription-based delivery through mobile app.	Focused on Delhi-NCR and adjoining regions.
Osam Dairy (2012)	Dairy production in rural India	- Operates in Jharkhand and Bihar, ensuring hygienic, high-quality milk. - Strong presence in Tier-2 and Tier-3 cities.	Regional-level operations across Jharkhand and Bihar.
Dvara E-Dairy (2019)	Digital solutions for dairy farmers	- AI-based platform connecting dairy farmers with financial services. - Provides cattle management and insurance solutions.	Expanding operations across southern and western India.
Milkbasket (2015)	Subscription-based micro-delivery service	- India's first micro-delivery service for milk and daily essentials. - Integrates dairy with broader grocery delivery services.	Active in Gurugram, Noida, Bengaluru, and Hyderabad (urban and peri-urban markets).
Matratva Dairy (2018)	Reviving traditional foods & organic farming	- Focuses on organic certified snacks, A2 ghee, and traditional dairy foods. - Operates eco-friendly production units.	Headquartered in Rajasthan, with operations across northern India.

### Schemes related to dairy in India

India has launched several schemes over the years to support the growth of the dairy industry, including initiatives aimed at dairy startups. These schemes have focused on increasing milk production, improving infrastructure, promoting technological innovation, and ensuring fair prices for both producers and consumers. Here's a chronological list of key schemes related to dairy in India as given in Table 2.

The Indian Government has introduced multiple initiatives to strengthen the dairy startup ecosystem,

emphasizing supply chain efficiency, infrastructure enhancement, and entrepreneurship (Pokharkar, 2024; Dairy Dimension, 2024). The Dairy Entrepreneurship Development Scheme (DEDS), which earlier provided financial support for establishing modern dairy farms and adopting advanced technologies, was discontinued from April 1, 2020. In its place, the government has aligned dairy development activities under the Atmanirbhar Bharat Abhiyan, aimed at building a self-reliant and resilient livestock sector. Under this framework, the Animal Husbandry

**Table 2. Major schemes related to dairy in India**

<b>Scheme Name</b>	<b>Ministry/Board</b>	<b>Key Focus</b>	<b>Impact on Startups</b>
Operation Flood (1970–1996)	National Dairy Development Board (NDDB)	Establishing a nationwide milk grid, building cooperative structures, strengthening milk procurement and processing infrastructure.	Laid the foundation for modern dairy production; indirectly supported future private dairy ventures.
Dairy Entrepreneurship Development Scheme (DEDS) 2010	Department of Animal Husbandry, Dairying, and Fisheries	Encouraging private investment in dairy processing, creating self-employment opportunities, establishing farms, cold chain infrastructure, and marketing networks.	Provides subsidies (25%-33.33%) for dairy farms, processing units, and cold chain facilities; supports farmers, self-help groups, and entrepreneurs.
National Dairy Plan - Phase I (2012–2019)	National Dairy Development Board (NDDB)	Improving dairy animal productivity, strengthening milk production infrastructure, enhancing institutional capacity for sector development.	Supported startups in animal husbandry, genetic breeding, and milk processing technologies.
Dairy Processing & Infrastructure Development Fund (DIDF) 2017	Department of Animal Husbandry, Dairying, and Fisheries	Modernizing dairy plants, expanding processing capacities, strengthening milk collection, chilling, and transportation infrastructure.	Provided credit for infrastructure modernization and improved supply chains for dairy startups.
National Livestock Mission 2014	Ministry of Agriculture and Farmers Welfare	Enhancing livestock productivity through better management and feed, promoting entrepreneurship, and encouraging sustainable practices.	Provided financial and technical support to startups focusing on livestock management and animal husbandry.
Rashtriya Gokul Mission 2014	National Program for Bovine Breeding and Dairy Development	Conservation and development of indigenous breeds, supporting breeding, dairy farming, and milk processing.	Encouraged startups to work with indigenous breeds and adopt sustainable dairy practices.
Supporting Dairy Cooperatives and Farmer Producer Organizations (SDC&FPO) 2018	Department of Animal Husbandry and Dairying	Creating an enabling environment for cooperatives, assisting with branding, packaging, marketing, and increasing farmers' incomes.	Supported startups working with FPOs and cooperatives, allowing them to scale operations and access new markets.
Animal Husbandry Infrastructure Development Fund (AHIDF) 2020	Atmanirbhar Bharat Abhiyan	Promoting private investment in dairy processing, feed production, and breeding infrastructure, offering interest subvention to eligible startups.	Provided affordable credit for infrastructure projects such as milk processing units and cold chain facilities.

Cont. Table 2.

Table 2., Cont. ...

Scheme Name	Ministry/Board	Key Focus	Impact on Startups
Pradhan Mantri Kisan Sampada Yojana (PMKSY) 2016	Ministry of Food Processing Industries	Creating infrastructure for food processing, including dairy, cold chains, processing parks, and agro-processing clusters.	Supported startups involved in processing dairy products like cheese, yogurt, and butter.
Startup India Initiative 2016	Department for Promotion of Industry and Internal Trade	Offering tax exemptions, compliance support, and capital access, fostering innovation in dairy tech and food processing.	Helped dairy startups with mentorship, incubation, and funding, boosting innovation in dairy farming and processing.
PM-FME (2020)	Ministry of Food Processing Industries	Promoting micro-level food processing units, including dairy, with credit-linked subsidies for infrastructure, cold chains, and technology.	Aimed at formalizing micro-enterprise dairy startups, enhancing productivity through modern technologies.

Infrastructure Development Fund (AHIDF) provides credit-linked incentives to individual entrepreneurs, dairy cooperatives, and FPOs for setting up milk processing, value addition, and cold chain facilities. Additionally, the Dairy Processing and Infrastructure Development Fund (DIDF), with an investment of Rs. 11,184 crores, continues to support modernization of dairy infrastructure and logistics to reduce post-harvest losses (Dairy Dimension, 2024). The National Livestock Mission (NLM) complements these efforts by promoting sustainable livestock practices and the conservation of indigenous breeds (Pokharkar, 2024). Collectively, these Atmanirbhar-driven initiatives foster a technology-enabled, sustainable, and self-reliant dairy sector capable of meeting the growing domestic and global demand. Additionally, various MSME and NSIC (National Small Industries Corporation) schemes further complement these efforts by empowering dairy startups and small-scale entrepreneurs. The MSME Innovation Scheme and Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE) facilitate easier access to collateral-free credit for dairy entrepreneurs. Likewise, NSIC's Single Point Registration Scheme (SPRS) and Raw Material Assistance Scheme help startups obtain government tenders and procure inputs at competitive prices. Capacity-building and incubation support offered under MSME Champions and NSIC Technical Services Centres strengthen managerial, technological, and marketing capabilities of emerging dairy enterprises. Together, these converging policy

frameworks under Atmanirbhar Bharat, MSME, and NSIC create an enabling ecosystem for a sustainable, technology-driven, and self-reliant dairy sector, capable of meeting rising domestic and export demand.

#### Problems faced by dairy startups in India

Dairy startups in India face several challenges due to the complex nature of the dairy industry and the evolving market dynamics. Here are some key problems faced by these startups, supported by research literature:

**Lack of infrastructure and technology:** Many dairy startups in rural areas struggle with inadequate infrastructure, particularly in cold storage, transportation, and processing facilities. Limited access to refrigeration leads to milk spoilage, reducing product quality and market value, and exacerbating food loss (Hammond et al., 2015; Sustainable Energy for All [SEforALL], 2022). The lack of such infrastructure significantly impacts livelihoods and supply chain efficiency, especially in regions with poor facilities, causing economic losses. Additionally, the absence of technological integration in milking, quality testing, and data management further hampers production and supply chain efficiency (Sangode, 2024).

**Inefficient supply chain:** The dairy supply chain in India faces significant challenges due to multiple intermediaries, driving up costs and extending delivery times. This fragmented sector makes it difficult

for startups to streamline operations. Perishability adds complexity to transportation logistics, hindering efficiency and product quality. These supply chain inefficiencies also lead to high post-production losses, impacting the profitability of dairy startups (Food and Agriculture Organization [FAO] & Global Dairy Platform Inc [GDP], 2018; Kazancoglu et al., 2018).

**High cost of compliance and regulatory barriers:** Dairy startups in India face significant regulatory challenges, including compliance with food safety, milk testing, animal welfare, and environmental standards. Meeting these requirements incurs substantial costs in terms of time and money, particularly for small-scale startups. These include obtaining licenses, meeting microbial and compositional standards, and ensuring proper milk handling and processing. While regulatory enforcement ensures product quality, it can hinder smaller enterprises trying to scale due to bureaucratic delays, changing policies, and high compliance costs. Additionally, varying regulations by state add to the complexity (Banerjee & Banerjee, 2023).

**Financial constraints:** Dairy startups in India struggle with securing funding due to high capital requirements for land, cattle, feed, and technology. Access to credit is particularly limited in rural areas, where financial institutions have minimal reach (Moahid & Maharjan, 2020; World Bank, 2022). While schemes like the Dairy Entrepreneurship Development Scheme (DEDS) exist, navigating them remains difficult, restricting investments in infrastructure and technology. This lack of affordable financing hampers growth and innovation, limiting startups' competitiveness (Angadi & Patil, 2021).

**Lack of skilled labor and knowledge gap:** Dairy startups in India face a skilled labour shortage, particularly in animal husbandry, fodder management, and disease control. This is exacerbated by limited vocational training programs in rural areas, where many dairy ventures operate, and a reliance on outdated practices. Additionally, the lack of formal skill development initiatives tailored to dairy operations further contributes to the problem of unskilled workers (Congressional Research Service, 2022; Hunt, 2024).

**Limited market access:** Small-scale dairy startups in India face significant challenges in accessing urban markets due to stiff competition from established companies with strong distribution networks and brand

recognition. Limited processing capabilities hinder their ability to meet demand for value-added products like cheese and yogurt. Additionally, startups struggle with branding, marketing expertise, and retail partnerships, further restricting their competitiveness (Chakravarty, 2021; Dairy Industry Report, 2024).

**Animal health and feed issues:** The health of dairy animals is crucial for the success of dairy startups, but access to quality veterinary services and nutritious feed remains a challenge in many parts of India. Poor access to veterinary care and low-quality feed lead to higher animal mortality and reduced milk productivity. Limited availability and affordability of high-quality feed affect dairy animals' overall productivity, while traditional feeding practices often fail to meet scientific standards (Prabhakar et al., 2020). Although veterinary services are available, their accessibility in rural areas remains a concern, impacting animal health and the performance of dairy startups (Nguyen, 2023).

**Climate and environmental issues:** Climate change poses significant challenges for dairy startups in India, especially in regions affected by extreme temperatures and water scarcity. Rising temperatures cause heat stress in cattle, reducing milk yields and affecting animal health (FAO & GDP, 2018; Gauly & Ammer, 2020). Water shortages hinder fodder production, impacting the quality of feed necessary for dairy animals' well-being. Additionally, dairy farming contributes to methane emissions, primarily through enteric fermentation, exacerbating environmental concerns (Lei, 2024). As consumer demand rises, startups must adopt innovative technologies and sustainable practices to mitigate these environmental impacts, ensuring long-term sector resilience.

**Consumer awareness and trust:** Many dairy startups in India, especially those offering organic or ethically produced milk, face challenges in building awareness and convincing consumers to pay a premium. Price-sensitive consumers, accustomed to lower-priced conventional dairy, limit demand for premium products. Startups also lack the marketing resources needed to educate consumers about the benefits of organic dairy, such as improved animal welfare, reduced environmental impact, and higher nutritional content. This lack of trust and skepticism about product quality further hampers customer loyalty (Farmonaut, 2024). The challenge lies in overcoming these barriers, as startups struggle to invest in the necessary marketing efforts (Forbes India, 2020).

### Prospects for dairy startups in India

The outlook for dairy startups in India is promising, driven by rising milk demand, technological innovation, and supportive government policies. As the largest global milk producer, India is expected to see demand increase from 198.4 million tonnes in 2020 to 266.5 million tonnes by 2030, spurred by urbanization, population growth, and a growing middle class (Grand View Research, 2021). Dairy startups are capitalizing on this by implementing automation, IoT, and data analytics to optimize farm management, boost productivity, and meet consumer preferences for high-quality, health-focused products (Farmonaut, 2024; Singh, 2024). The direct-to-consumer (D2C) model is also gaining traction, enabling startups to bypass intermediaries and connect directly with customers. Companies like Stellapps and Prompt offer farm management tools that improve cattle health, enhance milk yields by up to 20%, and reduce operational costs, helping to address India's historically low dairy productivity. Additionally, the popularity of value-added products, such as organic milk and probiotics, is expanding, with the dairy market growing at a CAGR of 15%, opening new avenues for premium offerings (Pashudhan Praharee, 2019). Despite these opportunities, startups face challenges, including limited access to affordable capital, regulatory compliance issues, and logistical hurdles in the fragmented supply chain, especially given milk's perishability (Dairy News 7x7, 2023). Furthermore, building consumer awareness around organic and ethically produced dairy remains challenging, particularly as many Indian consumers remain price-sensitive. However, the combined effects of government support, consumer demand, and technology adoption continue to make the dairy sector a fertile ground for innovation and growth.

### Conclusion

India's dairy startup ecosystem represents a transformative phase for the country's dairy sector, combining traditional strengths with modern innovations. Despite challenges such as infrastructure gaps, financial constraints, and regulatory complexities, the sector has shown resilience and adaptability. Dairy entrepreneurs are still

comparatively few in number, even if the nation's startup ecosystem has grown overall. Nonetheless, the dairy business offers a profitable opportunity because milk accounts for a significant amount of rural households' income and the market is predicted to grow to INR 30,840 billion by 2027. Startups in this space are not only meeting the rising consumer demand for organic and value-added products but also contributing to rural development through farmer-centric initiatives and sustainable practices. The adoption of digital platforms and advancements in supply chain technology have further enabled startups to reach urban and rural markets alike. Startups in the dairy industry have the ability to boost economic growth, create direct and indirect jobs, and support rural development. Dairy entrepreneurs have the potential to significantly impact the sector and the economy at large by utilizing technology, embracing sustainable practices, and capitalizing on market demand. The prospects for dairy startups in India remain promising, with potential to drive substantial economic and social benefits. Moving forward, a collaborative approach involving government support, private investments, and technological innovation will be crucial for overcoming existing hurdles. By addressing critical challenges and leveraging key growth factors, India's dairy startup ecosystem can emerge as a global leader in sustainable and inclusive dairy production.

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