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An overview of recent dairy schemes revolutionising socio-economic landscape of India

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Abstract

The dairy industry in India has witnessed substantial growth, positioning the country as the world's leading milk producer. From 2020 to 2023, India experienced significant advancements in milk production, with 2022-23 output reaching 230.58 million tonnes, indicating a 3.83% increase from the previous year. This surge in milk production has not only exceeded global averages but also led to per capita milk availability of 459 grams/day, well surpassing the global average of approximately 322 grams/day. Such achievements underscore the pivotal role of dairying in socio-economic development, offering employment opportunities, income generation, and nutritional security, particularly in rural areas. With a substantial portion of the population engaged in agriculture and livestock rearing, dairy farming emerges as a vital source of livelihood, especially for small-scale farmers and landless labourers. Furthermore, the involvement of women in dairy farming contributes significantly to inclusive development. This review focuses on the role of recent Indian dairy schemes in driving socio-economic development. It highlights the transformative impact of various government initiatives aimed at bolstering milk production, enhancing dairy infrastructure, and empowering rural communities. Through an examination of key programmes such as Operation Flood, the Rashtriya Gokul Mission, and the National Programme for Dairy Development. It further elucidates how these schemes contribute to job creation, income generation, and poverty alleviation, particularly in rural areas. By leveraging technological advancements, strengthening institutional frameworks, and fostering collaboration among stakeholders, Indian dairy schemes play a pivotal role in promoting inclusive growth and improving the well-being of millions of people across the country.

Keywords: Milk, dairy farming, dairy schemes, milk cooperatives

Introduction

India has rich livestock and poultry resources, which significantly contribute to improving the socio-economic circumstances of rural populations. According to the 20th Livestock Census, there are around 303.76 million bovines (including cattle, buffalo, mithun, and yak), 74.26 million sheep, 148.88 million goats, 9.06 million pigs, and roughly 851.81 million fowl in the nation (DAHD, 2022) [5]. Livestock production and agriculture are inherently interconnected, with one relying on the other, and both playing a vital role in ensuring food and nutritional security at large. The livestock sector plays a crucial role as a subsector of the Indian economy's agricultural industry. It serves as a crucial source of income for the majority of farmers, providing essential resources for agriculture, contributing to the well-being and nourishment of the household, supplementing incomes, creating job opportunities, and acting as a reliable asset in times of necessity. It serves as an additional and supportive business. India is the foremost global producer of milk. The Government has implemented several initiatives to enhance animal productivity, leading to a substantial rise in milk

output. The FAO indicated a 1.34% rise in global milk output, from 912.6 million tonnes in 2020 to an estimated 924.8 million tonnes in 2021 (Food Outlook, 2022) [11]. The significance of dairying extends beyond milk production, as it has the potential to induce substantial transformations in the socio-economic framework of rural economies. The function of job creation is well acknowledged. It has offered additional employment and a consistent income to many small-scale farmers and agricultural workers. As an industry, it employs more than 80 million rural households, with the majority being small and marginal farmers as well as the landless. The cooperative societies have not only made the farmers self-sufficient but have also broken the shackles of gender, caste, religion, and community (Press Information Bureau, 2022) [17]. The cooperatives have played a vital role in stimulating dairying, which has proven to be a crucial source of development (Sutar *et al.*, 2023; Tiwari, 2023) [23, 24]. The Indian economy is mostly agricultural, with over 75 percent of the population residing in rural areas and relying on agriculture and related sectors, including dairy farming. In India, it is projected that animal products would account for 21 percent of the whole

agricultural industry. Dairy farming is a significant subsector of agriculture that has a crucial place in the economy. Dairy is the single largest agricultural commodity contributing 5 per cent of the national economy and employing more than 8 crore farmers directly. Although the proportion of agricultural production in relation to the entire GDP has been decreasing, the proportion of livestock output in relation to agriculture has been growing. The dairy industry alone makes a significant contribution of Rs. 5 trillion to the Gross National Product (GNP) of the nation with a 6.4% (CAGR) in the past 5 years (DAHD, 2023) [6]. Currently, India is considered the leading country in the global dairy sector. Entrepreneurs from across the globe have many chances to take advantage of one of the biggest and most rapidly expanding markets for milk and milk products. An abundance of valuable opportunities awaiting the multinational dairy processor in India. The Indian dairy sector is seeing fast growth as it strives to stay up with the quick development being made globally. The opening up of the Indian economy attracts both multinational corporations (MNCs) and international investors. The dairy business in India is projected to increase its output thrice over the next decade due to the growing opportunities for exporting to Europe and the Western countries (Bharatkumar *et al.*, 2023) [2]. Furthermore, since WTO standards are anticipated to be implemented in the near future, it is believed that all industrialised nations, who now serve as major exporters, would be required to cease their backing and financial aid to their domestic milk products industry (Hans, 2023) [13]. Several milk producers have already acquired quality standard certifications from the government (Narassima *et al.*, 2023; Singh, 2023) [14, 22]. This will facilitate their selling of processed goods in international nations. This review examines the significance of Indian dairy schemes in promoting socioeconomic development. It focuses on the transformational influence of several government efforts aimed at increasing milk output, improving dairy infrastructure, and empowering rural people. This review examines significant programmes such as Operation Flood, the Rashtriya Gokul Mission, and the National Programme for Dairy Development to determine how they contribute to job development, income production, and poverty reduction, especially in rural regions. Indeed, by utilising technical breakthroughs, building institutional frameworks, and encouraging stakeholder participation, Indian dairy schemes play a critical role in supporting equitable growth and increasing the well-being of millions of people throughout the nation.

Indian Dairy Farming

Currently, 65 percent of the nation's population resides in rural regions, while 47 percent of the population relies on agriculture for their means of living (Press Information Bureau, 2023). The practice of raising cattle is an extra means of generating cash for the people in our nation. Historical sources indicate that the domestication of cows and buffaloes occurred around 10,000 years ago (Chauhan *et al.*, 2022; Pérez-Pardal *et al.*, 2018) [3, 15]. Approximately 13% of the world's cattle population and 57% of the world's buffalo population are found in India (Rout & Behera, 2021) [21]. India holds the top position as the largest milk producer globally, accounting for 24.64% of the total global milk

output in the year 2021-22. India's milk output has had a significant 58% growth during the last nine years, namely between 2014-15 and 2022-23, reaching a total of 230.58 million tonnes in 2022-23 (Dervillé *et al.*, 2023; Gayathri *et al.*, 2023) [9, 12]. This may be mostly attributed to the effective execution of the operation flood project. Additionally, the contribution of livestock in total agriculture and allied sector Gross Value Added (GVA) has increased from 24.38 per cent (2014-15) to 30.19 per cent (2021-22). Livestock sector contributed 5.73 per cent of total GVA in 2021-22 (Press Information Bureau, 2023) [18]. Interestingly, the proportion of animal husbandry in GVA has been increasing over time, while the share of agriculture has been decreasing. This strongly supports the increasing significance of dairy farming in the Indian economy as dairy is the single largest agricultural commodity. In the period of 2015-16, the National Dairy Development Board has successfully developed a significant quantity of cooperative societies. The state of Maharashtra has the greatest number of dairy co-operative societies, with a total of 16,724. Uttar Pradesh comes next with 15,648, followed by Gujarat with 10,679, Karnataka with 8,516, Tamil Nadu with 8,369, Punjab with 6,823, Rajasthan with 5,900, Andhra Pradesh with 4,912, and Madhya Pradesh with 4,877 (Dervillé *et al.*, 2023) [9]. The Indian dairy sector's resilience is seen in its ability to achieve continuous and sustained development, while facing constraints in investment.

Achievements in the Dairy Development Sector during 2020-2023

Globally, India is the highest milk producer, accounting for 24.64 percent of global milk output. The comparative development of the dairy industry between the years 2020-21, 2021-22 and 2022-23 is as follows: In the year 2022-23, milk production reached a provisional total of 230.58 million tonnes, compared to 221.06 million tonnes in 2021-22 and 209.9 million tonnes in 2020-21. The average per capita availability of milk in the world was approximately 322 grams per day in 2022-23, while in India it was 459 grams per day (provisional), representing a 38.63% increase (Press Information Bureau, 2023). 228 dairy cooperative milk unions have included around 172.63 lakh farmers under the scope of 1.96 Lakh village-level dairy cooperative organisations. The Cooperative Milk Unions have obtained an average of 461.96 lakh Kg per day of milk for the year 2022-23 till November 2022, compared to 464.86 lakh Kg per day during the same time in the previous year, resulting in a decline of about 0.62%. The Cooperative Dairies sold around 411.53 lakh litres of liquid milk per day over the period of November 2021 to November 2022, which is a 5.49% increase compared to the same time previous year when they sold about 373.09 lakh litres per day. In November 2022, the milk procurement increased by around 5.45% compared to November 2021, while the sale of liquid milk increased by about 8.37%. (DAHD, 2023) [6].

Government schemes for cattle and dairy development in 2022-23

1. Authorised Representative for Health and Expansion of Livestock Production (A-HELP): On September 1st, 2021, the Department of Rural Development (DoRD) lined up to use Self-Help Groups

- (SHGs) as a platform to promote rural economic development, supposed to be accomplished via the collaboration of the Department of Animal Husbandry and Dairying (DAHD) and the National Rural Livelihoods Mission (NRLM) (Press Information Bureau, 2021). Under this agreement, the chosen SHG members function as Livestock Resource Persons and Primary Service Providers under a model known as "A-HELP" (certified Agent for Health and Extension of Livestock Production). An A-HELP worker is the focal point of contact for any livestock-related health problems in a particular community, especially for individuals who do not have easy access to veterinary health care. The National Dairy Development Board (NDDDB) functions as the principal institution in charge of developing capacity for A-HELP (DAHD, 2023)^[6].
2. **Mobile Veterinary Units (MVUs):** Under the Livestock Health & Disease Control Programme (LH & DCP), funds have been allocated to States/UTs to set up Mobile Veterinary Units (MVUs) aimed at improving access to veterinary services for farmers. Each MVU is designed to cater to approximately one lakh livestock. These units are equipped with facilities for diagnosis, therapy, minor surgeries, audio-visual assistance, and other basic animal treatment needs. The main objective is to bring veterinary services right to the doorsteps of farmers based on requests received through a Call Centre. MVUs are strategically positioned to minimise travel time and ensure timely service delivery. As of January 2023, a total of Rs. 682.37 crore has been allocated to 34 States/UTs for acquiring 4340 MVUs (DAHD,2023)^[6].
 3. **Animal Health Support System for One Health (AHSSOH):** On January 16, 2023, the Ministry of Finance approved the Animal Health Support System for One Health (AHSSOH) project in five Indian states of Assam, Karnataka, Madhya Pradesh, Maharashtra, and Odisha. This project, supported by the World Bank and funded under the Livestock Health and Disease Control Programme (LHDCP), has a total budget of Rs. 1228.7 crore for the five-year period from 2022-23 to 2026-27. The aim of this initiative is to enhance laboratory, veterinary hospital, and dispensary facilities, and to improve illness monitoring and reporting using a One Health approach. The project seeks to promote responsible animal disease management, community engagement, and enhance veterinarian and diagnostic services across the states (DAHD, 2023)^[6].
 4. **The Rashtriya Gokul Mission:** Launched in December 2014, the Rashtriya Gokul Mission aims to promote the scientific and holistic development and protection of indigenous cattle breeds. This initiative holds significant importance for rural communities, particularly small and marginal farmers and landless laborers, who own over 80% of low-yielding indigenous livestock. As a result of government initiatives, milk production witnessed an annual growth rate of 6.38% from 2014-15 to 2021-22. Animal productivity, encompassing various cattle breeds, buffaloes, and crossbred cattle, saw a growth of 16.74% during the same period (DAHD, 2023)^[6].
 5. **Animal Husbandry Start-up Grand Challenge-2.0:** On November 26, 2021, the Minister of Fisheries, Animal Husbandry, and Dairying, launched the Start-up Grand Challenge 2.0. This initiative aims to foster innovative solutions for challenges in animal husbandry and the dairy industry. Under the Animal Husbandry Start-up Grand Challenge 2.0, winners receive financial rewards. The top participants in each problem area receive INR 10 Lakh for the champion and INR 7 Lakh for the runner-up. Additionally, 14 winners receive incubation support for up to three months to facilitate virtual growth. The incubator also facilitates mentor-mentee matching, provide access to laboratory resources, organize seminars, and monitor business progress for nine months after the program ends. Invest India selects the incubator through a Request for Proposal (RFP) process. Furthermore, the challenge includes seven virtual masterclasses, each dedicated to addressing one of the problem areas. These masterclasses serve as mentorship sessions for all participating businesses and innovators (DAHD, 2023)^[6].
 6. **Central Cattle Breeding Farms (CCBFs):** The government established Central Cattle Breeding Farms (CCBFs) in various agro-climatic zones between 1968 and 1976. These farms aim to provide high-quality germplasm of indigenous and foreign cattle breeds like Holstein Friesian and Jersey to support the dairy sector. The CCBFs have played a crucial role in supplying disease-free high genetic merit (HGM) bulls and frozen semen doses for breeding purposes. There are seven CCBFs located in Alamadhi (Tamil Nadu), Andeshnagar (Uttar Pradesh), Chiplima & Sunabeda (Odisha), Dhamrod (Gujarat), Hessarghatta (Karnataka), and Suratgarh (Rajasthan). These farms focus on breeding cattle and buffaloes to produce high-quality bulls for genetic improvement programs. They also conduct awareness programs to educate farmers and breeders. Moreover, CCBFs produce high-quality bull calves of indigenous, exotic, and valuable buffalo breeds for distribution to state governments, breeding agencies, NGOs, and cooperatives (DAHD, 2023)^[6].
 7. **The Central Herd Registration Scheme (CHRS):** The implementation of the Central Herd Registration Scheme (CHRS) as referred by DAHD was carried out to register superior cows and buffaloes and offer incentives for breeding superior cows and male calves. The primary objective was to identify and promote superior germplasm of native breeds by recording field performance and facilitating breeding with high genetic merit bulls. This initiative is crucial for the development and preservation of indigenous breeds. The plan included setting up of four CHRS units located in Rohtak, Ahmedabad, Ajmer, and Englefield. Field performance recording is conducted by 96 milk recording centres using FPR technology. The initiative covers 14 indigenous cattle and buffalo breeds across nine states. Each animal is identified using a 12-digit Animal Unique Identification (AUID) number in the INAPA database, following the guidelines of the International Committee on Animal Recording. The Rohtak CHRS unit, established in 1963, operates 33

- recording centres for field milk recording. The unit serves states like Haryana, Uttar Pradesh, Punjab, Uttarakhand, and Delhi, and includes indigenous breeds such as Hariana, Sahiwal, Red Sindhi, Gir, Murrah, and Nilli Ravi cow and buffalo varieties.
8. **e-GOPALA App:** On September 10, 2020, the Prime Minister introduced the e-GOPALA app (Generation of Wealth via Productive Livestock), a platform designed to help farmers improve their livestock management practices and access valuable information. The e-GOPALA app serves as a marketplace for breed improvement and provides essential guidance on livestock care. Through the app, farmers can easily buy and sell disease-free germplasm, access quality breeding services such as artificial insemination (AI), veterinary first aid, vaccination, and treatment. Additionally, the app offers guidance on animal nutrition and treatment using traditional ayurvedic and ethno- veterinary medicine practices. One of the key features of the app is its ability to alert farmers about important events such as vaccination schedules, pregnancy, calving, and government policies and campaigns relevant to their area. This helps farmers stay informed and take timely action to ensure the health and well-being of their livestock (DAHD, 2023)^[6].
 9. **Gopal Ratna Awards:** In 2022, the government introduced the Gopal Ratna Award, a prestigious national honour in the livestock and dairy sector. The aim of this award is to recognize and promote excellence among farmers, artificial insemination technicians, and dairy cooperative groups. The award is divided into three categories: "Best Dairy Farmer Raising Indigenous Cattle/Buffalo Breeds," "Best Artificial Insemination Technician," and "Best Dairy Cooperative." Winners in each category receive a Certificate of Merit, a memento, and a monetary prize. The prize money amounts to Rs. 5 lakhs for the 1st place, Rs. 3 lakhs for the 2nd place, and Rs. 2 lakhs for the 3rd place (DAHD, 2023)^[6].
 10. **National Programme for Dairy Development:** The Department of Animal Husbandry and Dairying (DAHD) initiated the implementation of the Central Sector Scheme "National Programme for Dairy Development (NPDD)" in February 2014. This scheme aimed at enhancing infrastructure for high-quality milk production, procurement, processing, and marketing, with the State Cooperative Dairy Federation acting as the State Implementing Agency (SIA). The scheme underwent restructuring in July 2021, with a redesigned plan projected to cost Rs. 1790 crore from 2021-22 to 2025-26. The redesigned NPDD Scheme comprises two components: Component 'A' focuses on developing and upgrading high-quality milk testing equipment and primary chilling facilities. It extends support to various entities such as State Cooperative Dairy Federations, District Cooperative Milk Producers' Unions, self-help dairy enterprises, milk producer corporations, and farmer producer associations. Over the course of the five-year initiative, spanning from 2021-22 to 2025-26, the goals include establishing robust milk infrastructure, providing training to dairy farmers on clean milk production, promoting awareness regarding milk quality, and supporting research and development. Component 'B' aims to foster dairying through cooperatives by enhancing market access for farmers, upgrading dairy processing facilities and marketing infrastructure, and strengthening the capacity of producer-owned institutions. This is intended to increase the sales of milk and dairy products, ultimately leading to higher returns for milk producers in the project area. As of December 31, 2022, a total of 178 projects in 28 states and 2 union territories have received approval, with a combined cost of Rs. 2783.69 crore (Central Share Rs. 2130.04 crore), covering the period from 2014-15 to 2022-23. An amount of Rs. 1634.99 crore has been disbursed for the execution of the newly authorized project under the plan till December 31, 2022. The programme includes the installation of 42,737 Automatic Milk Collection Units with Milk Analysers, 9978 Electronic Milk Adulteration Testing Machines, and 5038 bulk milk coolers with a capacity of 111.67 lakh litres, primarily under Component 'A' (DAHD, 2023)^[6].
 11. **Supporting Dairy Cooperatives and Farmer Producer Organizations engaged in dairy activities:** An initiative named "SDCFPO in dairy activities" was launched to provide working capital loans to State Cooperatives and Federations. Till December 2022, a total of Rs. 433 crores have been disbursed to the National Dairy Development Board for the implementation of this program. The primary objective of these programs is to assist State Dairy Cooperative Federations by offering them low-interest loans. As stated by DAHD, it aims to help them address financial challenges arising from unfavourable market conditions or natural disasters.
 12. **Dairy Processing & Infrastructure Development Fund (DIDF):** The Dairy Processing and Infrastructure Development Fund (DIDF) is aimed at enhancing milk processing, value addition, and chilling facilities. With a budget of Rs. 11,184 crore and borrowing of Rs. 8,004 crores, this project provides loans to Dairy Cooperatives, Multi State Dairy Cooperatives, Milk Producer Companies (MPC), NDDDB subsidiaries, Self Help Groups (SHGs), and Farmer Producer Organisations (FPOs) established under the State Cooperative and Companies Act. NABARD provides loans to the National Dairy Development Board (NDDDB) and National Cooperative Development Corporation (NCDC) using market money. NDDDB and NCDC, in turn, finance eligible entities. The Indian government offers a 2.5% interest subsidy to NABARD. This funding is available until March 2022-23, with a repayment term extending until 2030-31, and there's a potential extension into FY 2031-32 (DIDF, 2020)^[10].
 13. **National Dairy Plan-II scheme:** The 120th meeting of the Department of Economic Affairs Screening Committee took place on September 17, 2021, to discuss a proposal for financing from multilateral development banks and bilateral agencies. The project proposal, named National Dairy Plan, Phase-II, received approval to be submitted to the World Bank for assistance in the amount of USD 77.81 million (subject to finalization at the time of financing).

Currently, the Detailed Project Report (DPR) for the "National Dairy Plan, Phase II (NDP II)" is under development. The project has a total cost of USD 176.45 million (Rs. 1429 crore), with a request for external support of USD 77.82 million (Rs. 630 crore) from the World Bank. The preparation of the DPR is being carried out jointly by the National Dairy Development Board (NDDB) and the World Bank (DAHD, 2022)^[5].

14. Quality Milk Programme: The Department of Animal Husbandry and Dairying (DAHD) launched the Quality Milk Programme on July 24, 2019, with the aim of meeting global standards for milk consumed domestically and increasing the share of milk exports worldwide. As part of this initiative, all cooperative dairy plants and dairy co-op societies are required to conduct both chemical and microbiological testing of milk. During the initial phase of the programme in 2019-20, approval was granted to strengthen 233 dairy plants under the "National Programme for Dairy Development" scheme. The objective is to equip these plants with the capability to detect adulterants in milk, such as urea, maltodextrin, ammonium sulphate, detergent, sugar, and neutralizer. Specifically, 143 dairy plants with a capacity of 30,000 litres and above will be equipped with FTIR technology-based milk analysers for accurate detection and estimation of milk composition and adulterants. Additionally, 90 dairy plants with a capacity below 30,000 litres will be provided with Electronic Milk Analysers along with adulteration testing equipment. Furthermore, a single State Central laboratory has been authorized to serve 18 states, with 15 states having consented to its formation. This central laboratory will conduct prompt chemical and microbiological testing of milk before it reaches customers to ensure its quality. The project had a total cost of Rs. 271.64 crore, of which Rs. 222.45 crore has been disbursed to the States as of December 31, 2022 (DAHD, 2023)^[6].

15. Delhi Milk Scheme (DMS): The Delhi Milk Scheme (DMS), operating under the Department of Animal Husbandry & Dairying, Ministry of Fisheries, Animal Husbandry & Dairy, was established in 1959. Its primary goals are: Delivering high-quality, nutritious milk and milk products that meet Food Safety Standards to customers in Delhi and the National Capital Region (NCR) at affordable prices. Ensuring consistent provision of superior products and excellent service to achieve customer satisfaction. Providing fair compensation to dairy farmers. DMS is involved in the production, packaging, and sale of Ghee, Table Butter, Yoghurt, Paneer, and Chhachh. Initially processing 255,000 litres of milk daily, DMS has expanded its procurement capacity to 5.00 lakh litres per day due to increased milk consumption in the city. However, due to insufficient upgrades to utility equipment, DMS currently operates at a usable capacity of 1.5 LLPD. DMS aims to become a quality-focused enterprise in the National Capital Region, offering safe and uncontaminated dairy products with prompt service. It prioritizes customer satisfaction by providing secure and high-grade milk and milk products, along with efficient service (DAHD, 2020)^[4].

Budgetary provision to boost the dairy industry

India, while being the top global milk producer, still has challenges in terms of poor productivity of dairy animals. Currently, significant efforts are being made to manage and contain foot and mouth disease by the current initiatives like Rashtriya Gokul Mission, National Livestock Mission, and Infrastructure Development Funds for dairy processing and animal husbandry. India's milk output had a 4% growth in the fiscal year 2022-23, reaching a total of 230.58 million tonnes. India has had a significant 58% increase in milk output during the previous nine years. Among the Indian states, Uttar Pradesh accounted for the largest proportion of milk production, with a share of 15.7%, followed by Rajasthan (14.44%), Madhya Pradesh (8.73%), Gujarat (7.49%), and Andhra Pradesh (6.70%). According to the data, Karnataka had the greatest yearly growth rate of 8.76%, followed by West Bengal with 8.65% and Uttar Pradesh with 6.99% (BAHS, 2023)^[1].

Significance of Indian dairy schemes and programmes for socio-economic development

The Indian dairy industry is crucial in socio-economic development via the implementation of different policies and programmes that focus on increasing milk output, building dairy infrastructure, providing assistance to farmers, and fostering rural lives. These programmes make a substantial contribution to generating money, reducing poverty, creating jobs, and improving nutrition across the nation. Operation Flood (OF), a prominent dairy development initiative in India, was initiated in 1970 by the National Dairy Development Board (NDDB). The objective was to mobilise milk farmers into cooperatives, improve milk procurement and processing facilities, and create a nationwide milk distribution network. OF played a crucial role in empowering rural communities, enhancing milk production, and promoting economic prosperity via the provision of equitable pricing to farmers and maintaining a consistent supply of high-quality milk to customers. The Quality Milk Programme, launched by the Department of Animal Husbandry and Dairying, aims to enhance the quality of milk, improve traceability, and boost India's worldwide milk exports. This initiative enhances the competitiveness of the dairy sector and promotes consumer health and confidence in dairy products by improving dairy facilities, using sophisticated testing technology, and assuring compliance with international standards. The Rashtriya Gokul Mission, initiated in 2014, seeks to save and advance native cattle breeds, therefore increasing their production and genetic variability. The mission's objective is to preserve traditional livelihoods, promote genetic resources, and increase rural incomes, especially among small and marginal farmers who mostly raise indigenous cattle, by supporting scientific breeding, breed improvement, and breed identification initiatives. The National Programme for Dairy Development (NPDD) is a government initiative led by the Department of Animal Husbandry and Dairying with primary objectives to enhance dairy infrastructure, increase milk output, and provide assistance to dairy cooperatives. NPDD enhances the dairy value chain, empowers dairy farmers, and promotes economic development in rural regions by offering financial aid for milk testing equipment, chilling facilities, and market connections. The e-GOPALA app, introduced in

2020, functions as a digital platform for the administration of livestock, enhancement of breeds, and provision of veterinary services. The software empowers farmers by providing them with easy access to high-quality breeding material, veterinary care, and market information. This, in turn, boosts productivity and encourages sustainable practices in livestock raising. Ultimately, the app contributes to the improvement of rural livelihoods and economic growth. The initiatives, including A-HELP, MVUs, and AHSSOH, have a crucial impact on promoting socio-economic progress in India, namely in rural regions. A-HELP enhances the capacity of rural communities by using Self-Help Groups (SHGs) to provide livestock management and health services, therefore fostering economic advancement and skill acquisition. Mobile Veterinary Units (MVUs) facilitate the provision of veterinary services by delivering healthcare directly to the doorsteps of farmers, hence improving efficiency and overcoming geographical obstacles. The primary emphasis of AHSSOH is to address disease control, promote community involvement, and enhance veterinary services. These efforts aim to have a positive impact on public health, agricultural production, and the overall socio-economic well-being in rural India. The primary objective of the Animal Husbandry Start-up

Grand Challenge 2.0 is to promote innovation and entrepreneurship in the animal husbandry and dairy sector which provides winners with monetary incentives, guidance from mentors, and access to valuable resources. This programme fosters the emergence of innovative and financially sustainable solutions, so promoting the creation of employment opportunities, technological progress, and overall expansion of the sector, consequently bolstering socio-economic development. Central Cattle Breeding Farms (CCBFs) are essential for the dairy business as they provide superior genetic material of both local and exotic cattle breeds. These farms support genetic improvement programmes and provide training to farmers, leading to increased livestock production, revenue creation, and agricultural sustainability. The Central Herd Registration Scheme (CHRS) plays a crucial role in fostering socio-economic progress by prioritising the registration and breeding of high-quality cows and buffaloes which helps in improving livestock output and genetic quality by discovering and spreading superior germplasm of native breeds. Consequently, this results in enhanced revenue prospects for farmers involved in animal husbandry, thereby enhancing their socio-economic standing.

Table 1: Summary of the Indian dairy schemes

Name of the scheme	Year of launch	Objectives
Delhi Milk Scheme (DMS)	1959	To deliver high-quality, nutritious milk and milk products that meet Food Safety Standards to customers in Delhi and the National Capital Region (NCR) at affordable prices.
The Central Herd Registration Scheme (CHRS)	1962-63	To create a sustainable system for identifying, breeding, and distributing top-quality cattle and buffalo germplasm, empowering breeders and ultimately improving livestock across the country.
Central Cattle Breeding Farms (CCBFs)	1968	To enhance milk production and animal diversity through advanced genetics, superior breeding stock, and tailored crossbreeding, while preserving native breeds
National Programme for Dairy Development	February, 2014	To enhance quality of milk and milk products and increase share of organized milk procurement.
The Rashtriya Gokul Mission	December, 2014	For development and conservation of indigenous bovine breeds
Mobile Veterinary Units (MVUs)	2017	To provide veterinary services at farmer's doorstep by mobile veterinary units.
Dairy Processing & Infrastructure Development Fund (DIDF)	September 12, 2017	To modernize the milk processing plants and machinery and to create additional infrastructure for processing more milk.
Supporting Dairy Cooperatives and Farmer Producer Organizations engaged in dairy activities	2017-2018	To financially support State Dairy Cooperative Federations through soft loans and market access initiatives, ensuring timely payments and remunerative milk prices for farmers, especially during challenging times.
Quality Milk Programme	July 24, 2019	For meeting global standards for milk consumed domestically and increasing the share of milk exports worldwide.
National Programme for Dairy Development	February, 2014	To enhance quality of milk and milk products and increase share of organized milk procurement.
Supporting Dairy Cooperatives and Farmer Producer Organizations engaged in dairy activities	2017-2018	To financially support State Dairy Cooperative Federations through soft loans and market access initiatives, ensuring timely payments and remunerative milk prices for farmers, especially during challenging times.
e- GOPALA App	September 10, 2020	To empower dairy farmers with information, resources, and market access to increase milk productivity, quality, and income, ultimately contributing to a more efficient and transparent dairy industry in India.
Authorised Representative for Health and Expansion of Livestock Production (A-HELP)	September 1, 2021	To bridge the gap between veterinary institutions and livestock owners by providing primary health services through Livestock Resource Persons and Primary Service Providers.
Animal Husbandry Start-up Grand Challenge-2.0	November 26, 2021	To uncover and support innovative ideas that can make a real difference to the profitability and sustainability of animal husbandry and dairy farming.
Gopal Ratna Awards	2022	To honour and incentivize practices that support sustainable and effective dairy production, such as raising native breeds, efficient AI techniques, and collaborative dairy models, ultimately leading to a stronger and more vibrant industry.
Animal Health Support System for One Health (AHSSOH)	January 16, 2023	To seek innovative solutions to strengthen India's preparedness and response against potential animal pandemics, aligning with the One Health approach
National Dairy Plan-II scheme	April, 2023	To support cooperative dairying in unexplored/less explored States dairy.

Conclusion

The majority of India's population lives in rural areas where the main occupation is agriculture. The dairy industry is a substantial sector that offers employment to about 80 million households. India possesses a significant population of cattle, which plays a crucial role in improving rural socioeconomic conditions. The dairying provides rural labourers with a reliable and steady source of income throughout the year and a strong economic incentive for marginalised and landless farmers, particularly women. The utilisation of technological breakthroughs, reinforcement of institutional systems, and cultivation of collaborations among stakeholders are vital in fostering socio-economic advancement and boosting the well-being of millions of people across India through dairy activities. The Indian dairy industry plays a vital role in the socio-economic development of the country through the execution of many policies and initiatives aimed at enhancing milk production, developing dairy infrastructure, supporting farmers, and improving rural livelihoods. Together, these measures promote fair and balanced economic growth, decrease poverty rates, and build sustainable practices in rural regions. These projects and programmes illustrate the government's commitment to promoting inclusive economic growth, empowering rural communities, and fostering sustainable development through the dairy industry.

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