Study on Skill Gaps, Employment Opportunities and Challenges in the Dairy Sector

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ABSTRACT

The dairy sector plays a crucial role in the global economy, particularly in rural areas, by providing employment and contributing to nutritional security. However, this industry faces significant challenges due to a persistent skill gap that hinders its growth and efficiency. This research paper aims to analyse the current skill gaps within the dairy sector and explore the employment opportunities available. By examining industry trends, educational and vocational training programs, and workforce requirements, we identify the key skills needed for various roles within the dairy industry. Additionally, this paper investigates the barriers to acquiring these skills and proposes strategic initiatives to bridge the gap. Through a comprehensive literature review, stakeholder interviews, and case studies, we highlight the importance of targeted training programs, policy interventions, and technological advancements in addressing the skill gap. The findings suggest that a multi-faceted approach involving collaboration between government, educational institutions, and industry players is essential for developing a skilled workforce, enhancing productivity, and unlocking the full potential of the dairy sector.

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Introduction

The dairy sector is a pivotal component of the agricultural economy, especially in developing countries where it serves as a vital source of livelihood for millions of rural households. It not only contributes to economic stability but also plays a significant role in nutritional security by providing essential dairy products. Despite its importance, the dairy sector faces substantial challenges, primarily due to a pronounced skill gap within its workforce. This gap hampers productivity, innovation, and the overall growth potential of the industry. Addressing the skill gap in the dairy sector is imperative for several reasons. First, the demand for dairy products is on the rise globally, driven by increasing population and changing dietary preferences. To meet this demand sustainably, the industry requires a workforce equipped with modern skills and knowledge. Second, advancements in dairy farming techniques, processing technologies, and quality control measures necessitate continuous upskilling and reskilling of workers. Finally, bridging the skill gap can significantly enhance employment opportunities, particularly for youth and women in rural areas, contributing to broader socio-economic development. This research paper aims to provide a comprehensive analysis of the skill gap in the dairy sector and explore the employment opportunities it presents. By identifying the specific skills that are currently lacking and the barriers to acquiring these skills, this study seeks to offer actionable insights and recommendations for stakeholders. The paper will explore into the existing educational and vocational training programs, industry requirements, and the role of technological advancements in shaping the future of the dairy workforce [1-5].

Overview of Indian Food Processing Industry

The food processing ecosystem in India plays a pivotal role in the nation's economic growth, with the country ranking as the second-largest food producer globally. This sector encompasses a vast and intricate network of stakeholders, including over 2,450 Agricultural Produce Market Committees (APMCs) and more than 4,800 submarket yards. It supports a substantial workforce, with 40,162 registered food processing units employing 1.933 million workers and an unregistered sector providing jobs for an additional 5.111 million workers. This industry's importance is underscored by its steady growth, marked by a Compound Annual Growth Rate (CAGR) of 11.62% from 2014 to 2019, significantly contributing to GDP, employment, and investment. The Indian government has introduced key initiatives such as the Pradhan Mantri Kisan Sampada Yojana and the Production Linked Incentive Scheme to bolster infrastructure, minimize wastage, and create employment opportunities. The sector's growth is driven by factors such as shifting demographics, rising disposable incomes, urbanization, and increasing health consciousness among consumers. Strategic support measures, including 100% Foreign Direct Investment (FDI), lower Goods and Services Tax (GST) rates, and various tax incentives, further fuel the sector's expansion. Looking ahead, the food processing industry is poised for continued growth through technological advancements, the expansion of organized retail, and a supportive ecosystem for start-ups. This evolving landscape necessitates ongoing upskilling of the workforce and the development of new skills to meet the growing demand for high-quality, branded, and innovative food products [6-8].

Dairy Sub-Sector

India is the largest milk producer globally, contributing 18.5% to world production. The dairy sector includes both organized

(cooperatives and private dairies) and unorganized segments (milkmen, vendors, and self-consumption). About 70% of milk is consumed directly, while the rest is processed into products like ghee, butter, and cheese. The liquid milk market holds a 58% share of the dairy market. Currently, the organized sector represents 38% of the market, with expectations to reach 50% by FY'30. The COVID-19 pandemic adversely affected milk product demand, especially in the hospitality sector, leading to a decline in sales and exports. However, there is a growing shift towards value-added products like cheese and yoghurt, sold entirely through the organized market, indicating significant growth potential. The dairy industry's market is expected to grow from 40,835 thousand metric tons to 102,000 by FY'30, with an employment increase from 202,240 to 475,811 [9-13].

The Objectives of the Study are:
1. Assess the current and projected availability of human resources in the dairy products sub-sector.
2. Identify existing skill gaps within the sub-sector.
3. Determine the essential skills required for the dairy products sub-sector.
4. Recommend policy initiatives for the future development of the sub-sector.

Data Sources used for the Study
This study utilized several secondary data sources to gather comprehensive information on the dairy industry. The Annual Survey of Industries provided data on the number of units and employment figures. Various subject inputs were obtained from the MOFPI Annual Reports, while the FSSAI data contributed employment statistics and state-wise unit details. Macro-economic insights were sourced from the RBI Economic Overview. Additionally, economic inputs were gathered from the Ministry of Statistics and Program Implementation, including data from the Periodic Labour Force Survey (PLFS) and the National Sample Survey Office (NSSO). The list is available under Bibliography section at the end of this paper.

Dairy Products Market
India, the largest global milk producer, contributes 18.5% to world production, with an annual output of 199 million tonnes in FY20. The Indian dairy industry is divided into organized (co-operatives and private dairies) and unorganized (traditional milkmen, vendors, self-consumption) segments, with this study focusing on the organized segment. Approximately 70% of milk is consumed directly, while the rest is processed into products like ghee, butter, and cheese. The liquid milk market constitutes 58% of the dairy market's value. Despite the COVID-19 pandemic impacting demand from the hospitality sector and causing a decline in sales and exports, there is a notable shift towards value-added products like cheese and yoghurt, entirely sold through the organized market, indicating growth potential. The dairy industry employed 202,240 individuals in FY20, and employment is projected to rise to 475,811 by FY30. Key stakeholders include cattle farmers, dairy plants, distributors, and retail consumers, with top production states being Maharashtra, Telangana, and Karnataka. The market is expected to grow significantly, driven by increasing production and consumption trends.

In the fiscal year 2022-23, India's dairy sector showed robust growth despite challenges like adverse climatic conditions and sporadic diseases affecting cattle. Milk production reached 230 million tonnes with per capita availability at 455 grams per day. Dairy cooperatives played a crucial role by procuring an average

of 589 Lakh Kg per day and supporting farmers with essential services. The domestic market saw stable prices for commodities like Skimmed Milk Powder (SMP) and Butter, although international prices declined significantly. India remained a net exporter of dairy products, exporting commodities worth ` 3.36 thousand crores. Globally, milk production slightly increased, but international trade in milk products decreased by 4.5%, impacting prices adversely on the global market.

Figure 1 shows the Value chain of Dairy market in India. The key stakeholders in the dairy value chain include cattle feed suppliers, cattle farmers, and approximately 145,000 village dairy co-operative societies with 15 million primary members in India. The organized segment comprises co-operative and private dairy plants, serving institutional customers and retail consumers. Milk product manufacturers and distributors play crucial roles, with ingredient suppliers supporting the production process. Of the total milk production, 70% is consumed as liquid milk and UHT, while the remaining 30% is used for manufacturing various milk-based products. There are 1,065 dairy plants registered by state and central authorities, encompassing milk producers and village collection centres.
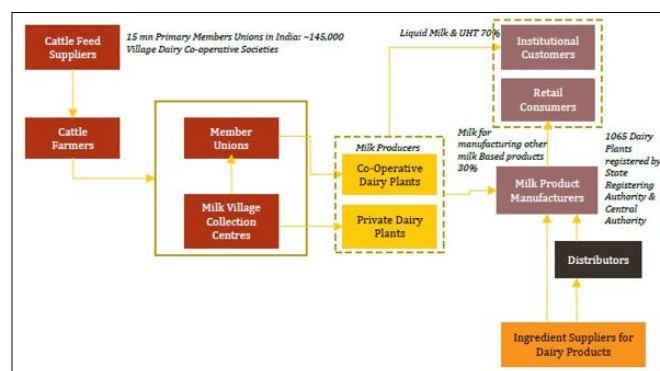

Figure 1: Value Chain of Dairy Market in India

Present Employment Scenario & Analysis
The current employment scenario in India's dairy industry reveals a diverse landscape of companies categorized by revenue: micro enterprises (below Rs 5 Cr), small enterprises (Rs 5.1-50 Cr), medium enterprises (Rs 50.1-250 Cr), and large enterprises (above Rs 250 Cr). Employment has grown at a CAGR of 9.8% over the past five years, with a significant portion of jobs in micro and small enterprises, particularly in the northern, southern, and western regions. In FY20, the industry employed 202,240 individuals, with 73% in contractual roles and 27% in permanent positions. Key job roles include veterinary supervisors, machine operators, and technicians. Despite recent declines in manpower, 36% of companies reported marginal growth, and future plans indicate investments in IoT, automation, new equipment, and production capacity enhancements, particularly among medium and large enterprises. The sector anticipates substantial employment growth, with significant expansions planned in production and exports.

The data in Figure 2 suggests a significant shift in the composition of the dairy sector's workforce by 2030. Currently, the majority of employees (73%) fall under the contractual category, indicating a prevalence of temporary or seasonal workers. However, the future projection shows a potential decrease in this category (to 65%) with a corresponding increase in permanent positions (from 27% to 35%). This implies a trend towards a more stable and skilled workforce in the dairy industry. The figure illustrates a shift in the

employment distribution within the dairy sector, with the share of permanent employees expected to increase from 27% to 35% by 2030, while contractual employees are projected to decrease from 73% to 65%. This trend towards greater job stability indicates companies' increasing investment in long-term employment and professional development. Factors driving this shift may include technological advancements requiring skilled permanent staff, regulatory changes encouraging permanent employment, strategic growth in production and exports necessitating a stable workforce, and efforts to improve employee retention. Overall, the move towards a higher proportion of permanent positions reflects a positive trend towards workforce stability, enhancing the sector's productivity and sustainability.
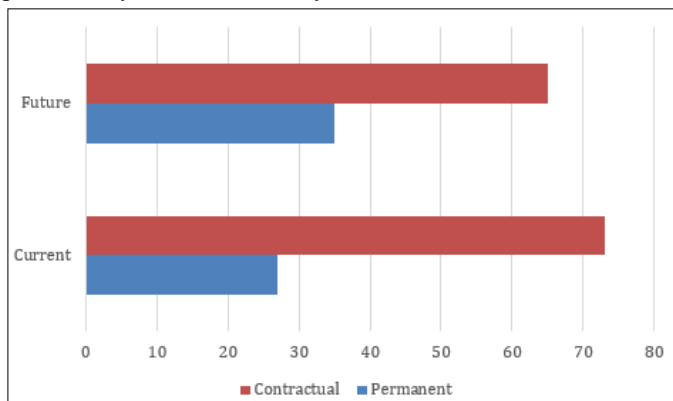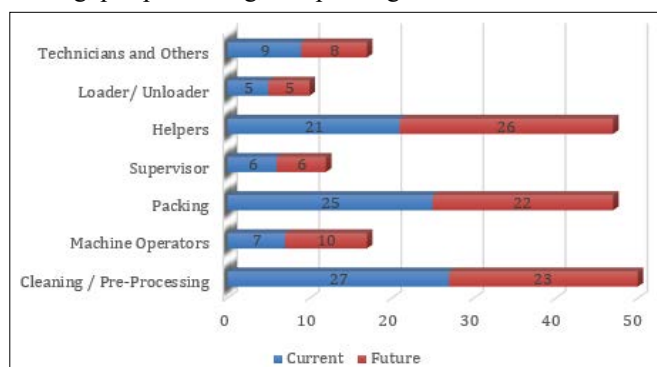

Figure 2: Share of Current Employees and Employment Generation Potential by 2030 in percentage under Permanent and Contractual Category

The Figure 3 depicts the distribution of current and future employment across different managerial categories in the dairy sector. The proportion of top management remains stable at 5%, while middle management is expected to increase from 8% to 10%. Lower management/supervisory roles are projected to decrease from 13% to 10%. The share of operator-level employees is anticipated to remain relatively constant, increasing slightly from 74% to 75%. This shift suggests an emphasis on strengthening middle management to support organizational growth and enhance operational efficiency, while a slight reduction in lower management roles indicates a possible restructuring or consolidation of supervisory positions. The consistent proportion of operator-level employees underscores the ongoing need for skilled labour at the operational level to maintain and enhance production capabilities.
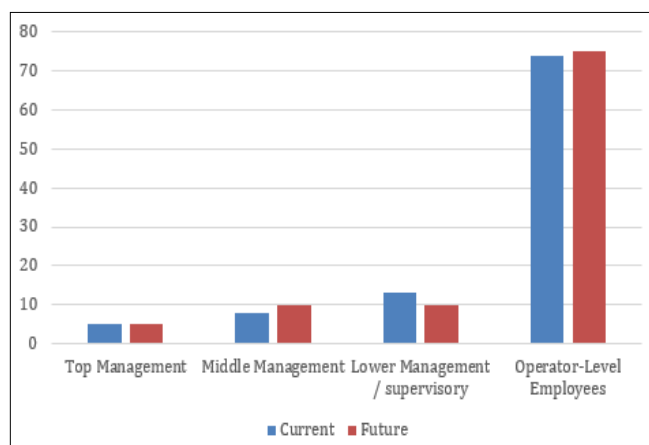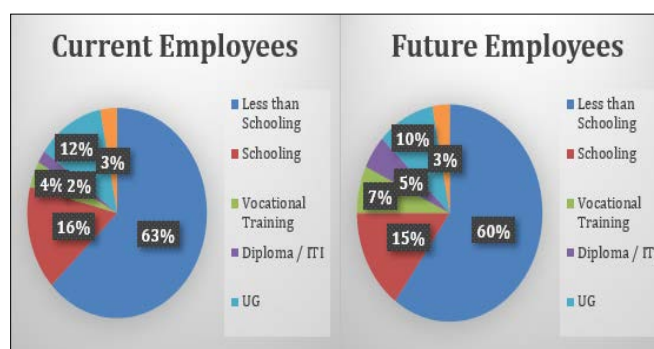

Figure 3: Share of Current Employees and Employment Generation Potential in percentage by Different Managerial Category

The Figure 4 highlights the distribution of current and future employment percentages among different categories of operator-level employees in the dairy sector. The share of employees in cleaning/pre-processing is expected to decrease from 27% to 23%, while machine operators' share is anticipated to increase from 7% to 10%. The proportion of employees in packing is projected to decline from 25% to 22%. The share of supervisors remains stable at 6%, and helpers are expected to see an increase from 21% to 26%. The proportion of loaders/unloaders remains constant at 5%, while technicians and other roles are expected to decrease slightly from 9% to 8%. This distribution suggests a shift towards a higher reliance on machine operators and helpers, possibly indicating a trend towards increased mechanization and the need for support roles, while reducing the emphasis on manual cleaning, pre-processing, and packing tasks.
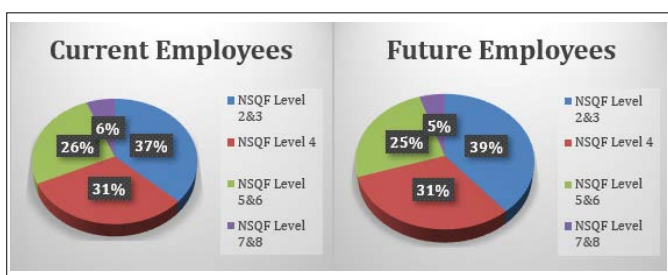

Figure 4: Percent Share of Current Employees and Employment Generation Potential in percentage by Different Operator Level Employees Category

The Figure 5 shows the distribution of current and projected future employment percentages by educational category in the dairy sector. Currently, 63% of employees have less than schooling, which is expected to decrease to 60% by 2030. Employees with schooling education are projected to decrease from 16% to 15%. Vocational training and diploma/ITI categories are expected to see increases from 4% to 7% and 2% to 5%, respectively. The share of employees with undergraduate (UG) education is anticipated to decrease from 12% to 10%, while the proportion of employees with postgraduate (PG) education remains constant at 3%. These trends indicate a potential shift towards a more skilled workforce, with a greater emphasis on vocational training and technical qualifications, while the share of employees with minimal education slightly declines.


Figure 5: Share of Current Employees and Employment Generation potential (2030) in percentage by Different Education Category

The Figure 6 depicts the distribution of current and projected future employees in the dairy sector by NSQF levels. Presently, 37% of employees are at NSQF Levels 2 and 3, which is expected to increase slightly to 39% by 2030. The share of employees at NSQF Level 4 remains constant at 31%. Employees at NSQF Levels 5 and 6 are anticipated to decrease marginally from 26% to 25%. The proportion of employees at the highest levels, NSQF Levels 7 and 8, is expected to decrease from 6% to 5%. These trends suggest a slight increase in the share of employees with basic to intermediate skill levels, while the proportion of those with higher skill levels remains relatively stable or decreases slightly.

Figure 6: Share of Current and Future Employees (2030) in percentage by NSQF levels

The Figure 7 highlights the distribution of current and projected future employees in the dairy industry across various states in India. Gujarat currently employs 32,303 individuals, with this number expected to rise to 46,547 by 2030. Maharashtra follows closely with 30,131 current employees, projected to grow to 41,725. Tamil Nadu employs 28,820 people, anticipated to increase to 39,039. Uttar Pradesh's workforce is set to grow from 14,995 to 20,452, while Karnataka's is expected to increase from 13,354 to 18,111. Other states like Andhra Pradesh, Punjab, and Haryana also show significant growth, with current numbers at 12,684, 10,117, and 8,522, respectively, projected to rise to 13,786, 12,777, and 11,963. States like Madhya Pradesh, Telangana, Rajasthan, Kerala, Bihar, Uttarakhand, and West Bengal also show notable increases. The 'Others' category, comprising various smaller states, is projected to grow from 10,516 to 14,200 employees. Overall, there is a positive trend of employment growth across all states, indicating a robust expansion in the dairy industry.
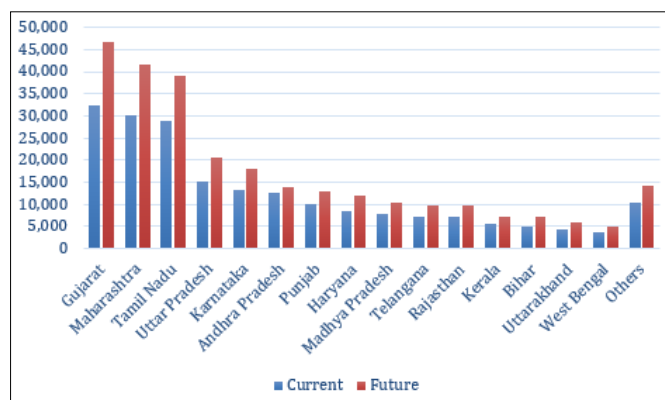
Figure 7: State wise Current Employees and Future Employees (2030) in the Industry

Recruitment & Training Practice
Recruitment in the dairy industry primarily relies on walk-ins, especially for operational and lower-level employees. Top and middle management typically come from formal education institutes offering food technology or food science programs, while lower-level management and operator-level employees often have secondary or higher secondary education or less. Around 30% of companies provide on-the-job training across various levels, focusing on raw milk handling, product handling, storage, supervision, operations management, plant maintenance, and cleaning. Training effectiveness varies, with micro and small enterprises less likely to offer training compared to medium and large enterprises. Future manpower is expected to grow by less than 1% in the next 3 years and by 1-2% in the next 5 years.

Challenges Related to Skill Availability Vs Skill Gaps
The dairy industry faces several challenges related to skill availability and gaps. Key concerns include the limited awareness of training programs and institutes among companies, with many processing companies unaware of where to source semi-skilled or skilled manpower despite the availability of specific qualifications developed by FICSI. Formal education in dairy science/technology is limited to about 15 institutes primarily in the western and northern regions, prompting a need for more regional institutes to support mid and top management. Additionally, medium, small, and micro companies often lack knowledge of emerging technologies such as automation. High attrition rates among operator-level employees, with around 45% leaving within 2-3 years, exacerbate the issue. Specific skill gaps exist across various job roles, including plant managers, production managers, quality control, inventory controllers, transportation managers, shift supervisors, maintenance officers, loading/unloading labourers, and helpers. These gaps include deficiencies in managerial skills, technical know-how, leadership, equipment operation, hygiene practices, quality control, inventory management, and material handling. Addressing these gaps is essential for improving efficiency and maintaining high standards in the dairy sector.

Future Projection – Sector & Employment
The future outlook for India's dairy processing industry projects significant growth, driven by a compound annual growth rate (CAGR) of milk production at 5.5% to 6.2% until FY'30, aiming to reach approximately 340 million metric tonnes. The sector anticipates substantial investments, with an estimated requirement of Rs. 1,66,500 crores for enhancing processing capacities to meet escalating demand. Employment in the industry is expected to rise significantly, reaching about 475,811 by FY'30, spurred by expansions in large, medium, small, and micro-enterprises. The sector's evolution towards automation and industry 4.0 is likely to enhance productivity and skill requirements across various levels of employment, supporting India's dairy processing ambitions.

Existing & Emerging Prominent Job Roles Which Requires Skilling
The dairy processing sub-sector in India is experiencing significant growth, driven by a range of existing and emerging job roles across various enterprises. From entry-level positions like Helper / Floor Cleaner / Loader & Unloader and Machine & Truck Cleaners, responsible for basic operational tasks and hygiene maintenance, to specialized roles such as Bulk Milk Cooler Operators, Milk Pasteurization Plant Operators, and Paneer Press Machine Operators, which require technical expertise in equipment operation and food safety standards. Higher-level positions like Dairy Products Processing Plant Supervisors, Data Analysts, and R&D Managers oversee operations, data analysis, and innovation, ensuring compliance with quality standards and driving product development. These roles collectively contribute to employment generation and skill development in micro, small, medium, and large enterprises within the dairy processing industry, reflecting its growing importance and potential for future expansion.

Expectations from the Industry Stakeholders

Industry stakeholders in India's dairy processing sector are advocating for the establishment of a professional council dedicated to promoting, regulating, and standardizing dairy education. Modelled after bodies like the Council of Architecture and Veterinary Council of India, this council would maintain a register of dairy technologists, ensuring competency and adherence to industry standards. There is also a call to modify FSSAI requirements for technical managers, emphasizing degrees specifically in dairy technology due to the sector's stringent hygienic and food safety standards outlined in FSSR 2011. Furthermore, there is a strong push for formal training institutes to enhance practical training and internships as integral components of dairy education. These institutes are urged to update curricula regularly to align with industry needs and collaborate with dairy plants and cooperative societies for hands-on experience. The need for specialized training institutes across states is emphasized to meet the growing demand for skilled manpower in the sector, with a focus on creating programs tailored to semi-skilled and unskilled employees. Data analytics is identified as a critical skill set in demand, essential for leveraging vast amounts of data in areas such as demand forecasting, supply chain optimization, and market analysis within dairy processing and other food sectors. To address industry staffing challenges, stakeholders propose creating a centralized portal listing trained manpower certified by industry-recognized qualification packs (QPs), facilitating easier recruitment and workforce planning for dairy companies.

Conclusion

The dairy sector in India faces both promising opportunities and significant challenges in bridging the skill gap. As the sector continues to expand, driven by increasing consumer demand and technological advancements, there is a clear need for a skilled workforce capable of meeting stringent hygiene, safety, and operational standards. The emergence of new job roles, from data analysts to specialized machine operators, underscores the sector's evolving nature and the demand for diverse skill sets. However, challenges such as limited awareness of vocational training institutes, uneven distribution of specialized programs across states, and the need for practical, hands-on training persist. Addressing these challenges requires collaborative efforts between industry stakeholders, educational institutions, and policymakers to align training curricula with industry requirements, expand vocational training opportunities, and ensure the availability of skilled manpower across all levels of the dairy value chain. Moreover, initiatives such as the establishment of a professional council for dairy education and the creation of a centralized portal for certified manpower can enhance transparency, standardization, and accessibility in hiring practices within the sector. By investing in skill development, promoting practical training, and leveraging data analytics capabilities, the dairy industry can not only meet current challenges but also capitalize on emerging opportunities for sustainable growth and competitiveness in the global market.

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