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Agriculture Skill Council of India

Skill Gap Analysis in

Indian Dairy Sector

"Sowing Skills...
...Harvesting Opportunities"

AGRICULTURE SKILL COUNCIL OF INDIA (ASCI)

GURUGRAM, HARYANA

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ASCI is contributing to nation building through Skill Development in Agriculture especially at the times when country's agriculture is experiencing stagnant growth, exodus of quality manpower to other sectors, changing climate with increased variability in production parameters and transformations in international agriculture markets that are especially too much subsidized challenging the competitiveness of Indian Agriculture.

ASCI has taken upon itself the responsibility of transforming Indian Agriculture through developing the skills of country's manpower in emerging areas of agriculture. With the development of 176 Qualification Packs, ASCI is covering following segments:

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- Poultry Farm Management
- Post Harvest Supply Chain Management
- Forestry & Agro Forestry
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- Amenity Horticulture & Landscaping
- Production Horticulture
- Seeds Industry A Soll Health Management
- Commodity Management
- Agri Entrepreneurship & Rural Enterprises Farm Mechanization and Precision Farming
- Agri-Information Management and other Allied

OBJECTIVES

- Determining skills/competency standards and qualifications and development of National
- Occupational Standards (NOS).
- Preparation and maintenance of skill inventory to facilitate individual choices.
- Development of sector specific skill development plans. A Standardization of affiliation and accreditation process.
- Affiliation, accreditation, assessment and certification of Vocational Institutes/Programmes. A Plan and execute Training of Trainers (TOT).
- Promotion of academics of excellence.
- Establishment of a well-structured, sector specific, Labour Market information System (LMS) to assist planning and delivery of training.
- Adoption of global best practices

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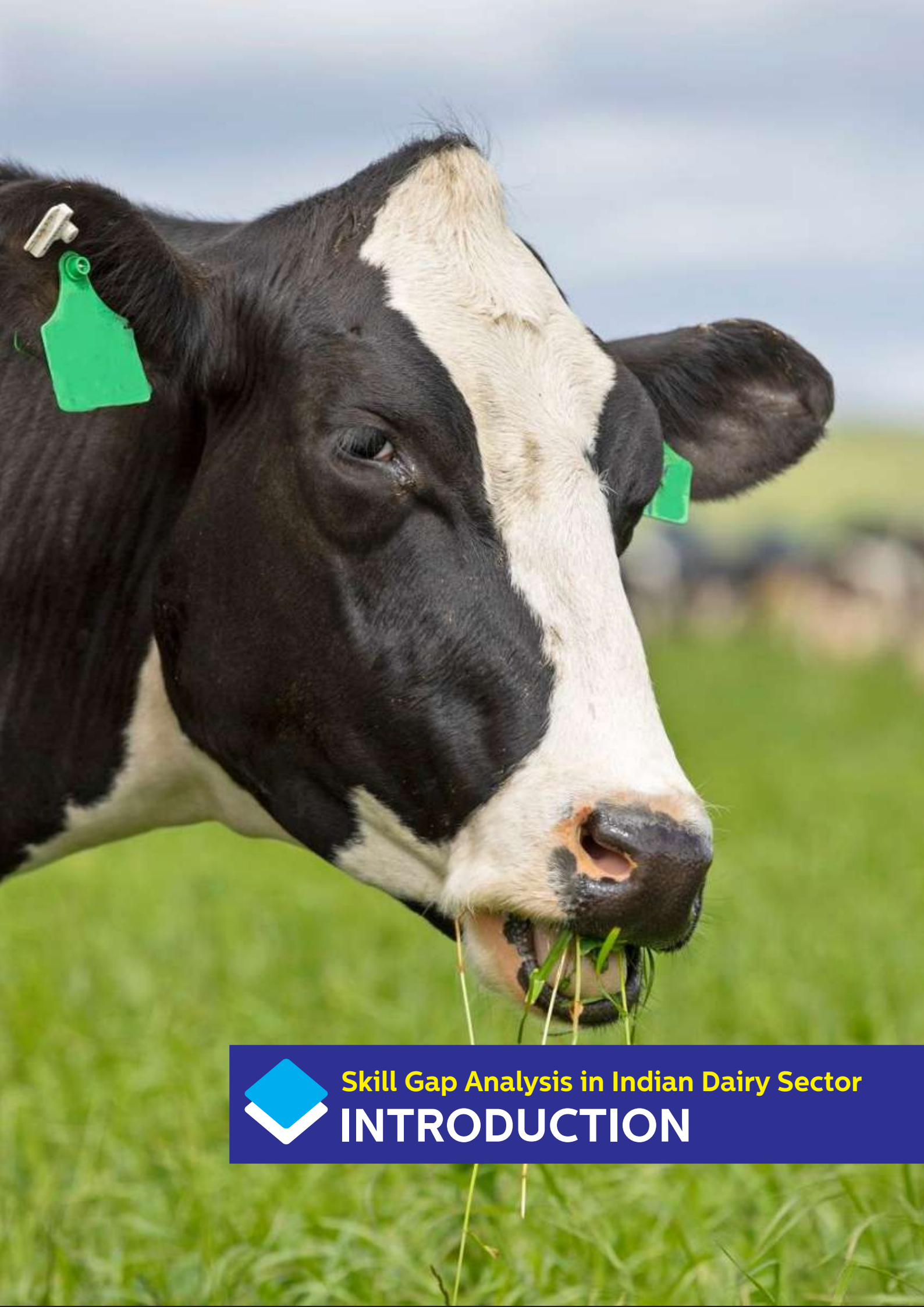


Skill Gap Analysis in Indian Dairy Sector

INTRODUCTION

1. Introduction

Status of Dairy in India

The importance of dairy in a country like India hardly needs emphasizing. Population growth, urbanization, income growth, high-income elasticity of demand and changes in food habits have fueled the increase in consumption of milk and milk products in the country. Milk and other dairy products account for about two-thirds of the output value of the Indian livestock sector while supports the livelihoods of nearly half of the rural households. India is the largest producer of milk in the world. Further, dairy is the single largest agricultural commodity, contributing significantly to the national economy with a production of 230.58 million tonnes in 2022-23 (BAHS-23), providing employment to millions of rural households directly. At the policy level, there has been an increased thrust on animal husbandry and dairying right from operation flood to present day government initiations on infrastructure development fund, national dairy plan, breed improvement and animal health to provide an assured source of employment and income especially for small and marginal farmers.

Milk is the most important source of essential nutrients such as calcium, protein and vitamins. The consumption of milk is increasing over the years along with diversity in product consumption. India has assumed self-sufficiency in Milk production. The USDA-FAS, 2023 report indicated that the fluid milk consumption in India in 2023 was 87 MMT which is up by 2.5 percent from previous year. The per capita availability of milk has increased many folds from 17 gm per day in 1950-51 to 390 gm per day in 2018-19, and 459 gm per day in 2022-23 (BAHS-DAHD, 2023). The country's current milk production exceeds its demand and is expected to continue further. According to the 2018 NITI Aayog working group report, milk production in India will increase to around 330 million tonnes in 2032-33, with milk supply exceeding milk demand. The DAHD national action plan 2022 also estimates the national demand for milk consumption at 341 million tonnes by 2033-34. The export of Dairy products from India was 63,738.5 MT to the world with a worth Rs. 2261 Cr/ 272.64 million USD during the year 2023-24 with major destination countries United Arab Emirates, Saudi Arab, USA, Singapore and Bhutan (APEDA website).

Inspite of such a spectacular growth with number one position in the world milk production, the dairy farming is in the hands of small and marginal farmers. Animal husbandry and dairy activities are not free from their own challenges. The major challenge faced by the dairy farmers is natural calamities in terms of frequent droughts in a few areas and frequent floods in a few areas affecting production and availability of feed and fodder.

The other challenges include shortage of dry fodder and feed, lower productivity of the dairy animals, decrease in the village common lands and grazing lands, improved irrigation leading to deceasing grazing lands, inadequate access to veterinary services and organized supply chain of milk is less than 50% of production. However, the most important challenge faced is the inadequate availability of skilled workforce with skills in scientific animal husbandry and sustainable dairy management practices.

The Sub-group of Chief Ministers on Skill Development constituted by NITI Aayog in 2015 noted that "most of the training received by the current workforce is "informal in traditionally transmitted or learned on the job" and there is a dire need of skill development through revision and re-orientation of skilling curriculum as per market needs and up-gradation of training infrastructure". Thus, the development of skilled human resources is necessary for reduction in costs, better management, higher productivity and profit maximization which would ultimately help in dragging millions of farmers out of poverty. Keeping in view of the constant high growth rate in milk production, rapidly changing technologies and upcoming innovations in dairy industry, it is necessary to upgrade the skills and meet the demand for skilled workforce. Therefore, this study on Skill Gap Analysis in the Indian Dairy Sector has been taken up to identify and estimate the skills requirement in dairy sector.

2. Objectives

Involvement of Women in Dairying

The main objectives of this dairy skill gap analysis study are as follows:

- To have an overview of the dairy sector, growth of workforce generation in different segments of the industry
- To analyse the availability of skilled labour across different occupations in the dairy value chain and the sectoral growth of labour force
- To overview the government policies and programmes to augment the supply of skilled manpower
- To analyse the existing status of skilling infrastructure in dairy sector and estimate the skill gap /requirement in dairy sector.

3. Methodology

The research methodology includes primary research through discussions and field visits to stakeholders who include government departments, agriculture/veterinary universities, ICAR institutes, industries, training institutes in dairy sector and farmers and secondary research through review of available literature and secondary data on various aspects of dairy, its value chain and markets, workforce and employment and skilling needs in various segments of dairying.

3.1. Primary Research

The primary research methods include mainly the field visits and discussions with the stakeholders across dairy ecosystem. Discussions were held with a wide range of stakeholders including Central and State Government Departments, universities, ICAR institutes related to dairying, industry/private farms, development institutes, training institutes and farmers. The primary research comprehensively covers the current landscape and ecosystem of dairy farming and its value chain, existing practices and current technological changes, skilling needs and gaps, key drivers of growth and challenges, role of the institutions in skill development, infrastructure available, key focus areas, emerging trends and upcoming developments. Overall, the interactions were held with 60 stakeholders across 9 different categories (Exhibit.1) including 30 skilled trainees by ASCI to estimate the effectiveness of skill programmes under dairying.

Livestock Specialist Advising Farmers

Exhibit 1. Broad Categories of Stakeholders Participated in Discussions

S.No.	Category	Number Participated In Discussion
1	Universities, KVK and colleges	7
2	Large dairies Cooperatives	4
3	Large Dairies Private	3
4	Dairy Development Agencies	3
5	Industry – Animal Health, Feed and Fodder and Farm machinery	5
6	Private Animal breeding	1
7	NGOs including ASCI training partners	4
8	Govt. - Food safety such as FSSAI	2
9	Data management and animal activity monitoring	1
10	Skilled trainees	30
	Total	**60**

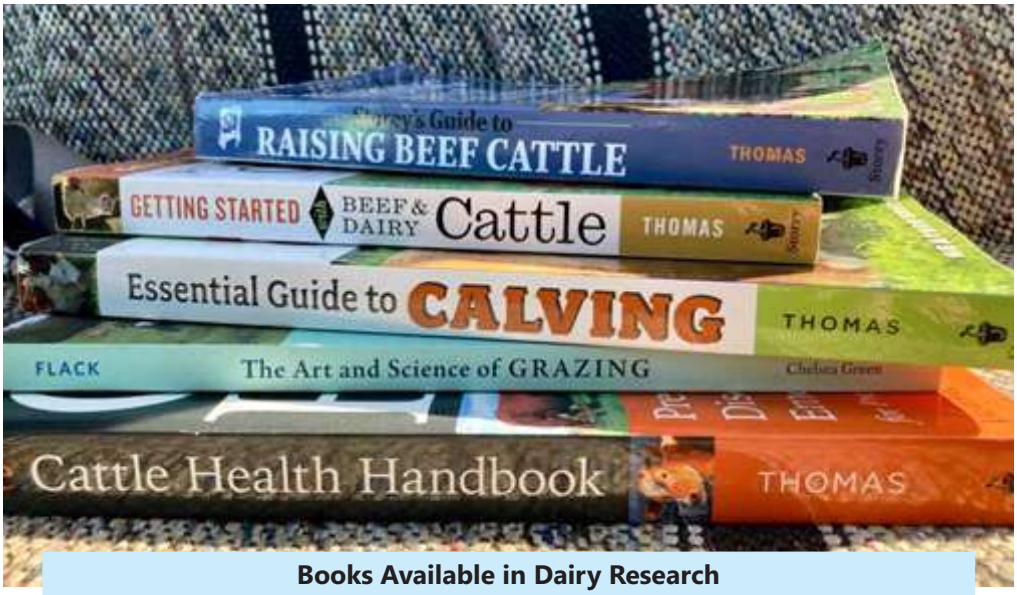
3.2 Secondary Research

Secondary research has been carried out through review of available information and literature on various dairy farming aspects, skill gaps and needs, workforce in dairying segment-wise, existing technologies, new emerging areas and technologies. The following important resources were referred and the data utilized for conducting the skill gap analysis on Indian dairy sector.

Annual Report, 2022-23, Department of Animal Husbandry and Dairying, Government of India (GoI)

- Basic Animal Husbandry Statistics (BAHS)- 2023, Department of Animal Husbandry and Dairying (DAHD), GoI, New Delhi
- Periodic labour force surveys (PLFS) and Annual survey of industries (ASI) of various years, MoSPI, GoI
- Annual Survey of Industries of various years, GoI
- Economic Survey 2024, Ministry of Finance, GoI
- NITI Aayog report Demand & Supply Projections towards 2033-Crops, Livestock, Fisheries and Agricultural Inputs -The working Group Report Feb 2018)
- Evaluation of Centrally Sponsored Schemes in Agriculture, Animal Husbandry and Fisheries Sector, Volume 2 – Agriculture, NITI Aayog and Development monitoring and evaluation Office, August 2020, Report 2020/UCSS01/2

- National Sectoral Paper on Animal Husbandry, NABARD, 2018.
- Dairy and Products Annual 2023, Foreign Agricultural Services, USDA, New Delhi
- Situation Assessment of Agricultural Households and Land and Livestock Holdings of Households in Rural India, 2019, NSS-77 th round.
- Doubling of Farmers' Income, GoI (DFI 2018)
- YES Bank (2015), Making Indian Dairy Farming Competitive- The Small Farmer Perspective. Food and Agribusiness Research Management (FARM), YES Bank, New Delhi and Gurgaon.



Books Available in Dairy Research

The primary data and inputs are received from sectoral experts, industry, scientists and others during the discussion. The analysis carried-out on the availability of skilled labour in different segments of the dairy industry, skill gaps the dairy workers, trends in employment creation and labour absorption, employment scenario and availability of skilled labour, projections for labour requirements in the new and emerging areas of the dairy sector. Inputs and insights received from the stakeholders during discussion and experts in the field of dairy constitute an important part of the analysis, especially to understand the skill requirements and employment potential in emerging areas of the dairy sector and the associated new job roles.

The secondary data has been used to estimate employment generation and skilled labour availability in broad sectors of the dairy. Secondary data, published in different reports are useful in getting an overview and aggregate picture of the trends and patterns of the labour market indicators. The availability of skilled labour is given both in absolute terms as well as a proportion of total labour engaged in the industry. The major activities considered in the dairy industry are ranging from raising of cattle and buffaloes, production of milk and its processing, and retail and wholesale activities. In dairy, as well as in other sectors of agriculture, a large section of the workforce acquires skills and knowledge through traditional and informal ways- hereditary, self-learning and learning on the job. A separate data on the labour skilled in different methods, both formal and informal, are provided.

To get a more disaggregated picture, more detailed data of labour absorption in different occupations and sub-sectors in the dairy sector was analyzed. The dairy sector, like any other sub-sectors of agriculture, has witnessed some transformational changes in the use of technology, organisation of production and man-power, composition and relative importance of different segments in the total output of the sector which have a far-reaching impact on the employment and livelihood potential of the dairy sector. The secondary data for this study has been collected from the Livestock Census, Basic Animal Husbandry Statistics-2023, Employment and Unemployment Survey (EUS 2011-12)/ Annual Period Labour Force Survey (PLFS) and Annual Survey of Industries (ASI) of various years. **The brief details of Data sources used to for analysis in this report are as under:**

A. All India Livestock Censuses (LC):

Rearing of Cow, Goat, Sheep Etc.

This study used data from the All-India Livestock Censuses (LC) carried out by the Department of Animal Husbandry and Dairying under the Ministry of Fisheries, Animal Husbandry, and Dairying (previously under the Ministry of Agriculture and Cooperation). The latest Livestock Census was undertaken in 2018 (19th Livestock Census) and the same is used for the estimation of the required workforce as compared to the livestock population in the country.

B. Basic Animal Husbandry Statistics:

Basic Animal Husbandry Statistics (BAHS) is an annual publication of the Department of Animal Husbandry and Dairying. Among the many other information, BAHS collects data on output from the dairy sector. The data on milk production and availability from this survey is used for future projections and the associated demand for skilled labour in the dairy sector.

Rearing of Livestock

C. Situation Assessment of Agricultural Households and Land and Livestock Holdings of Households in Rural India, 2019 (NSS 77th Round):

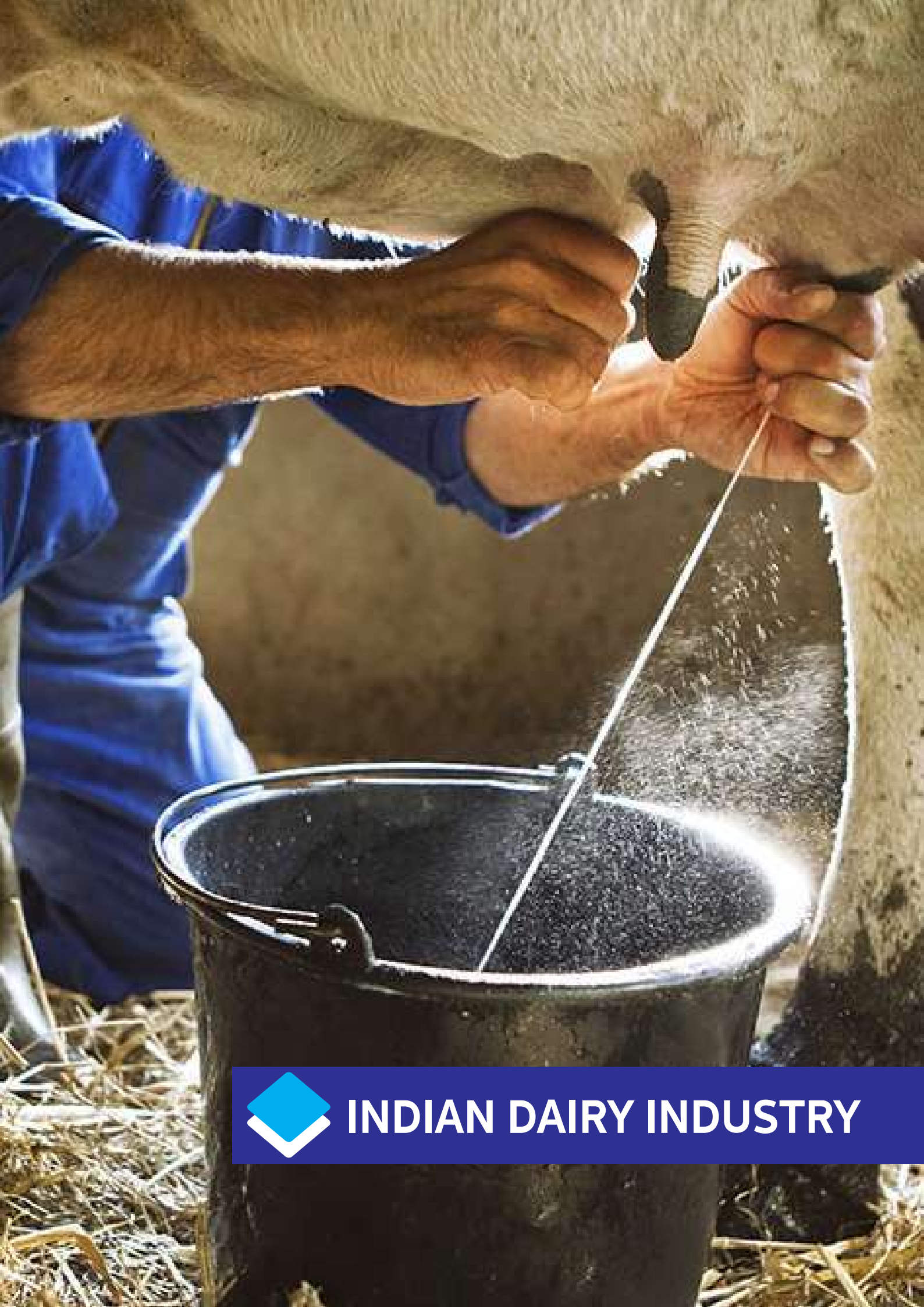
Situation Assessment of Agricultural Households and Land and Livestock Holdings of Households in Rural India, 2019 (NSS 77th Round) of Ministry of Statistics and Programme Implementation is used to collect data on the source of technical advice by farmers and adoption of technical advice took by farmers. The data from this survey is used to study the distribution of livestock across land classes, and pattern of use of the land devoted to animal husbandry.

D. Employment Data from NSSO and PLFS:

The employment and unemployment surveys undertaken by the National Sample Survey Office (NSSO) are the primary source of statistics on the sectoral distribution of the labour force. This had been conducted at regular intervals up to 2011-12 (NSS 68th round). However, since 2017-18, NSSO has replaced employment and unemployment surveys with the Periodic Labour Force Survey (PLFS). The PLFS follows a rotational survey design to collect information about the involvement of labour force in different activities including the dairy sector. The data from this survey is used to analyse trends related to the labour force and availability of skilled labour (workers who have received vocational education and training (VET).

E. Annual Survey of Industries:

Annual Survey of Industries is an annual publication of the Central Statistical Organisation (CSO) which surveys registered manufacturing units across India. It collects data on operational aspects of the units including employment of manpower. The datasets have been used to study employment trends in the milk processing sector in registered manufacturing units.



INDIAN DAIRY INDUSTRY

4. Indian Dairy Industry

4.1. The Great Journey of Indian Dairy Sector

Collection and Processing of Milk at Milk Industry

Indian dairy sector has undergone significant transformation starting its journey with milk deficient country to milk self-sufficient country over the years. The Operation Flood period between 1970 to 1996 is a game changer for Indian dairy sector which has tripled the milk production and doubled the per capita availability. Milk production has grown consistently above 4% since the white revolution (BAHS, 2023), making India the world's largest producer of milk with 24.64% share in global milk production (USDA-FAS, 2023). However, Indian dairy exports are at 0.25% of the expansive world dairy trade (Indian dairy association website) exports due to the huge domestic demand for milk. The domestic demand has absorbed the majority of the milk production. The great journey of dairy industry is as under at Exhibit.2:

Exhibit 2. Key Milestones of Indian Dairy Sector

1946	Kaira District Cooperative Milk Producers Union Ltd. (now AMUL Dairy) began with just two village dairy co-operative societies (DCS) and 247 litres of milk /day
1955	Imperial Dairy Institute renamed as National Dairy Research Institute (NDRI) and shifted to Karnal
1965	National Dairy Development Board (NDDB) founded with the basic objective of replicating AMUL model cooperative system throughout the country.
1970	Operation Flood (OP) known as White revolution launched. The main objectives are "Increase milk production ("a flood of milk"), Augment rural incomes and Reasonable prices for consumers". Operation Flood was implemented in 3 phases i.e Phase I - 1970-1980, Phase II - 1981-85 and Phase III - 1985-1996. Milk production at start of OP was 23 million MTs and at the end was 69 million MT with per capita milk availability at 110 and 210 grams/day, respectively.

1991	Deregulation began with de-licensing of the dairy industry from the Industries (Development and Regulation) Act, 1951 leading to establishment of dairy processing infrastructure by private players.
1997	Indian milk production surpassed USA's and became the largest global milk producer
2000	India become net exporter of dairy products especially milk powder and butter
2010	India allowed 100% foreign direct investment (FDI) in food processing, including dairy products. Top global dairy players such as Lactalis, Fonterra entered the Indian market
2012	National Dairy Plan (NDP-I) was launched with an objective of enhancing productivity of milch animals and providing market access to milk produces
2014	National Program for Dairy Development (2021-22 to 2025-26) was launched to enhance quality of milk and milk products and increase share of organized milk procurement.
2017	Dairy Processing & Infrastructure Development Fund (DIDF) setup and it focuses on building an efficient milk procurement system by setting up of processing and chilling infrastructure & installation of electronic milk adulteration testing equipment at village level.
2020	The AMUL became the first Indian dairy firm to make a place in the top 20 global list released by Rabobank achieving an annual turnover of $ 5.5 billion.
2020	Animal Husbandry Infrastructure Development Fund (AHIDF) worth INR 15,000 crore was announced to support exclusively private sector for expanding dairy and processing infrastructure in the country
2021	"Supporting Dairy Cooperatives and Farmer Producer Organizations engaged in dairy activities(SDCFPO)" launched to provide working capital loan to State Cooperatives and Federations to provide stable market access
2024	AIDHF has introduced in 2020 and realigned in 2024 for promotion of dairy and meat processing infrastructure and feed plants.

Sources: *Website of NDDB and DAHD*

4.2. Current Status of Indian Dairy Sector

Status of Indian Dairy Sector

India is the largest producer of milk in the world and accounts for approximately 24.64 percent of the world's milk production (USDA-FAS, 2023). India also has the largest dairy animal population. Further, Dairy is the contributing to 67% of livestock GVA (NAS 2023) and providing employment to 83% of livestock-workforce (PLFS 2022-23). Milk production in the country is 230.58 million tonnes in 2022-23 as against 146.31 million tonnes in 2014-15 with an annual growth rate of above 5.6% till 2021-22.

However, the growth rate reduced to 3.83% in 2022-23 due to irregular rainfall, drought conditions and diseases like lumpyskin (DAHD AR 2022-23). The size of Indian dairy market stood at Rs. 13.17 trillion in 2021 and it is expected to reach Rs. 30 trillion by 2027 (DAHD annual report 2022-23). The growth would come from increase in production of milk and other dairy products as well as value appreciation (Size of Indian diary market, Business standard dated 13th Sep 2022). The snapshot of present status of Indian dairy sector is as under (Fig.1):

Fig.1 Present Status of Indian Dairy Sector

4.2.1. Bovine Population

India has total bovine population of 302.3 million with cattle and buffaloes contributing to 64% and 36%, respectively (Livestock census 2019). The overall share of cattle and buffalo population in total bovine population has changed over the years i.e cattle population was 21.8% in 1951, 24.35% in 1972, 31.1% in 1997 and 36.28 in 2012 as shown in Fig.2. Total milch animals (both in milk and dry) in India are 125.75 million in 2019 which is an increase of 6 percent over the previous Livestock Census in 2012. There is an increase in the number of exotic/ crossbred cattle by 29.3 percent between the last two census. On the other hand, the number of indigenous/ non-descript cattle has declined by 6 percent during the same period. As per the data available from the Food and Agriculture Organisation, India has the highest stock of buffalos and the second highest stack of cattle after Brazil.

Present Bovine Population of India

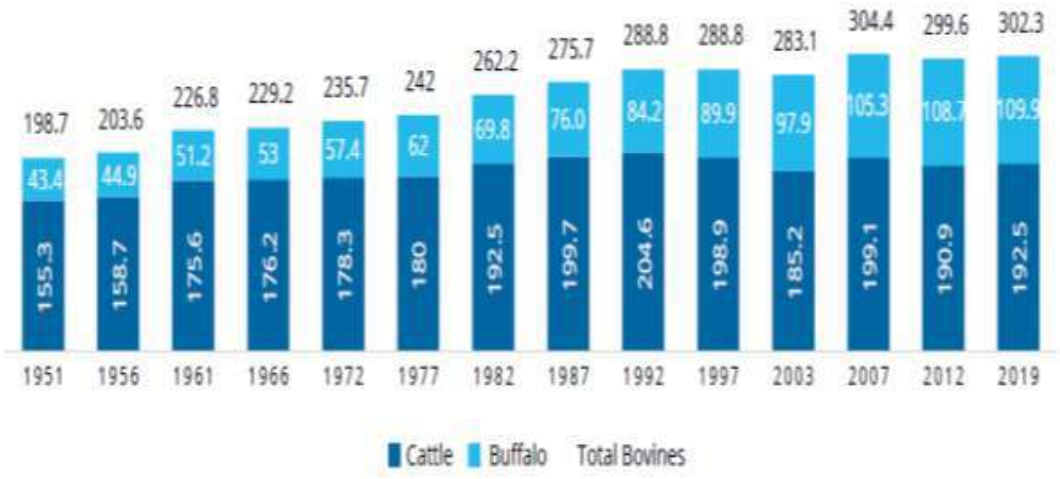


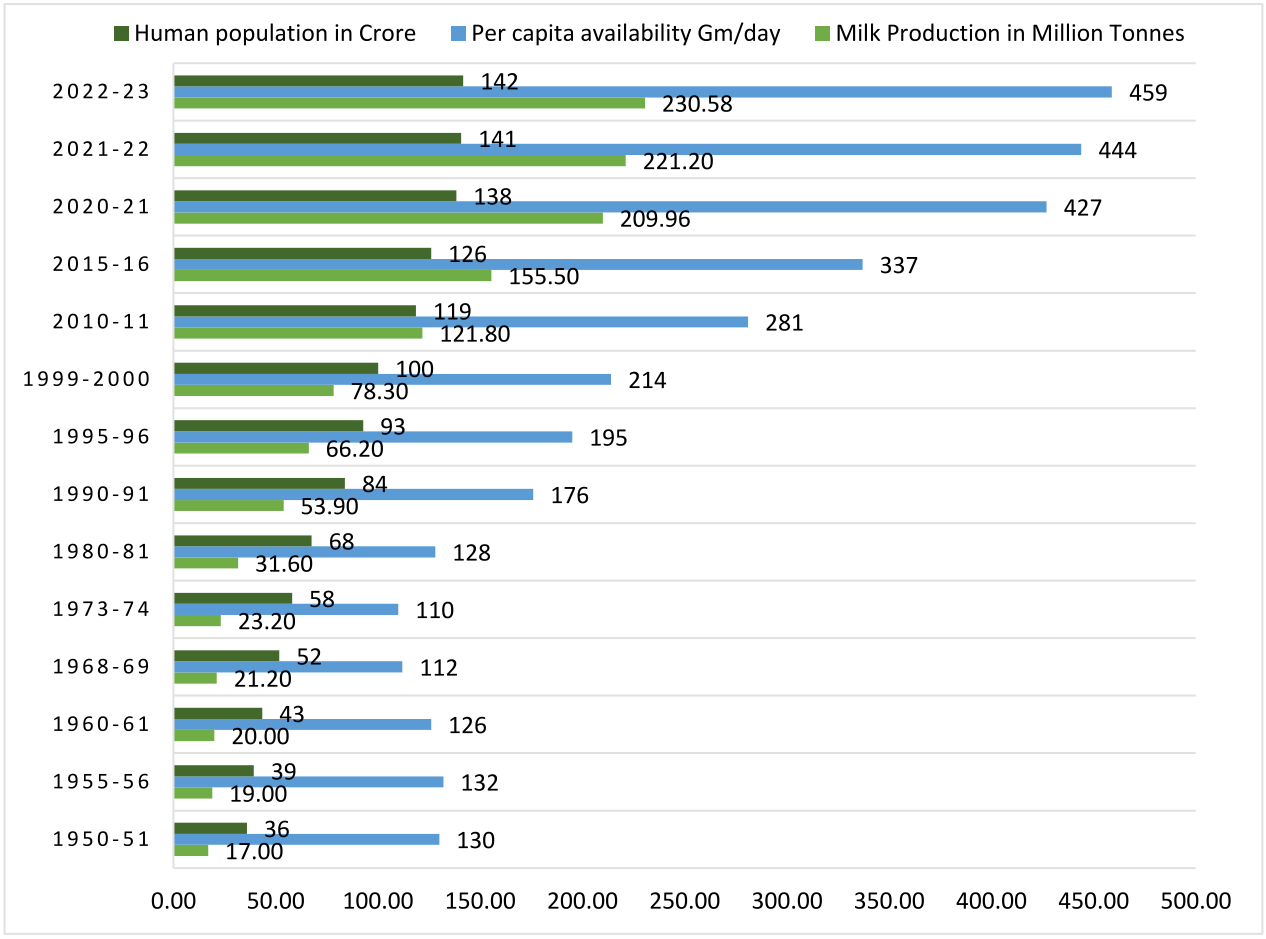
Fig.2 Cattle and Bovine Population Trends in India

Source: *BAHS, 2023, DAHD, GoI and analysis by ASCI*

4.2.2. Milk Production, Productivity and Per Capita Availability

The consumption of milk is increasing over the years along with diversity in product consumption in India as the milk is the most important source of animal protein and other nutrients. The country has assumed self-sufficiency in milk production in 2018-19. The USDA-FAS, 2023 report indicated that the fluid milk consumption in India in 2023 was 87 MMT which is up by 2.5 percent from previous year 2022 (85 MMT). The milk production in 2022-23 stood at 230.58 MT per annum with growth rate about 6% in last 5 years (BAHS, 2023). The crucial period in enhancing the milk production was between the years 1970 to 1996. The per capita availability of milk (Fig.3) has increased many folds from 110 gm per day in the year 1973-74 to 195 in the year 1995-96, 394 gm per day in 2018-19, and 459 gm per day in 2022-23 despite having regional disparities i.e. 55 gm/day in Mizoram to 1283 gms/day in Punjab (BAHS, 2023). The country's current milk production exceeds its demand and is expected to continue further.

Figure 3. Milk Production, Per capita availability and Population in India



Source: *BAHS Statistics, DAHD and DAHD annual report, 2022-23*

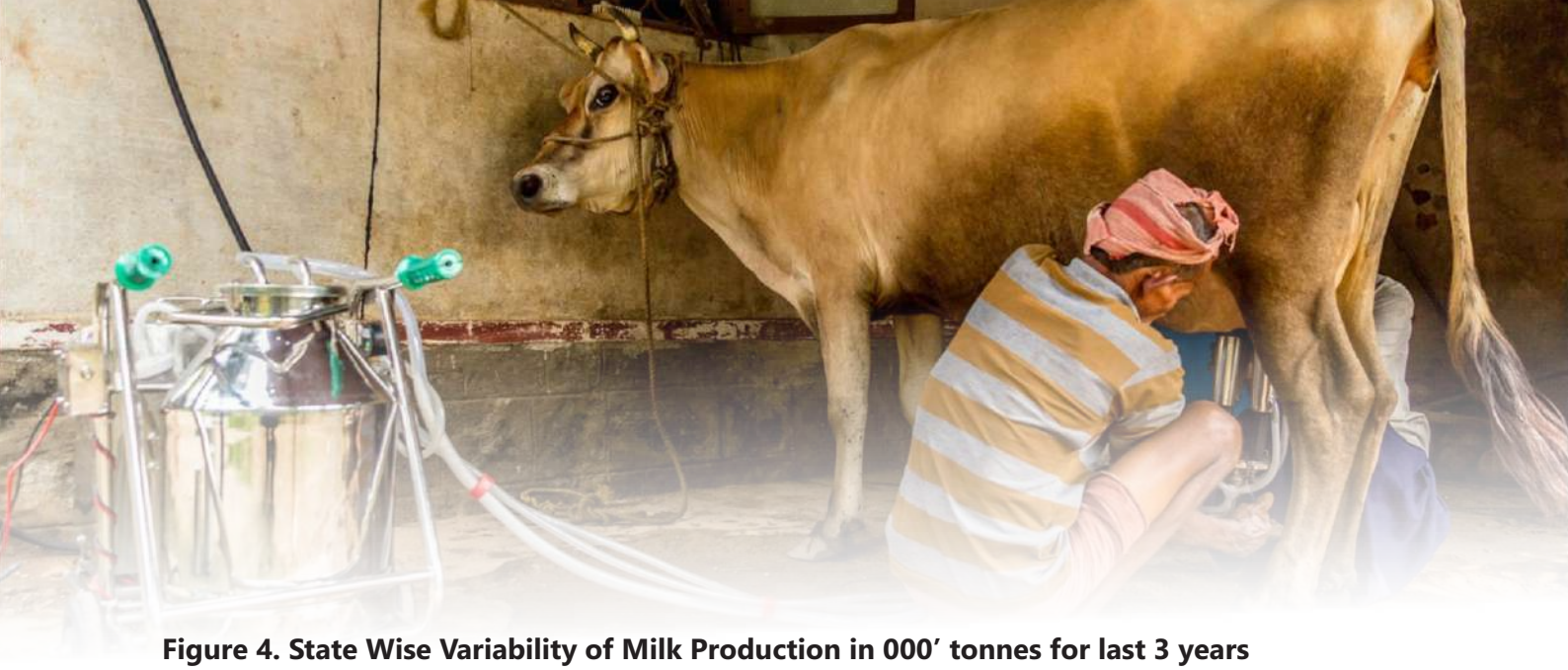
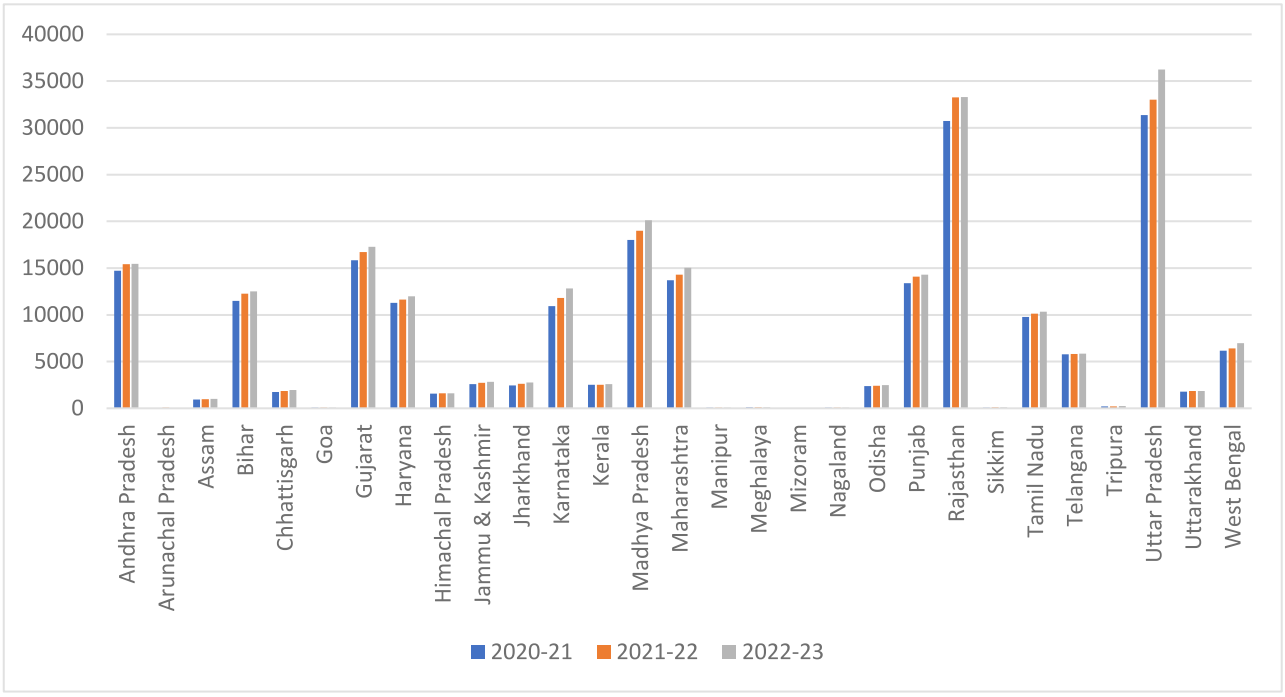


Figure 4. State Wise Variability of Milk Production in 000' tonnes for last 3 years



Source : *AHD-BAHS Statistics, 2023*

The top milk producing states (Fig. 4) are Uttar Pradesh (15.72%), Rajasthan (14.44%), Madhya Pradesh (8.73%), Gujarat (7.49%), Andhra Pradesh (6.70%) and They together contribute 53.08% of total Milk production in the country (BAHS 2023). The annual growth rate in milk production was above 6% between 2015 to 2019 and around 4.18 % in last three years. It is observed that the States of Karnataka, West Bengal, Uttar Pradesh, Tripura, Madhya Pradesh, Chhattisgarh, Jharkhand and Maharashtra have registered growth rate of more than the national average i.e 3.83% in 2022-23. With regard to productivity, the average milk yield per indigenous cow, crossbred cow and buffaloes in 2022-23 was 3.44, 8.55 and 6.06 kg/day, respectively (BAHS, 2023) as against 2.5, 6.78 and 5.62 kg/day in the year 2013-14, a decade back.

The per capita availability (grams/day) of milk is highest in Punjab (1283) followed by Rajasthan (1138), Haryana (1098), Andhra Pradesh (799), Gujarat (670), Madhya Pradesh (644), Himachal Pradesh (596), J&K (572), and Karnataka (523) and per capita availability in these states is above national average (459). The lowest milk producing states are North eastern States and union territories (BAHS, 2023).

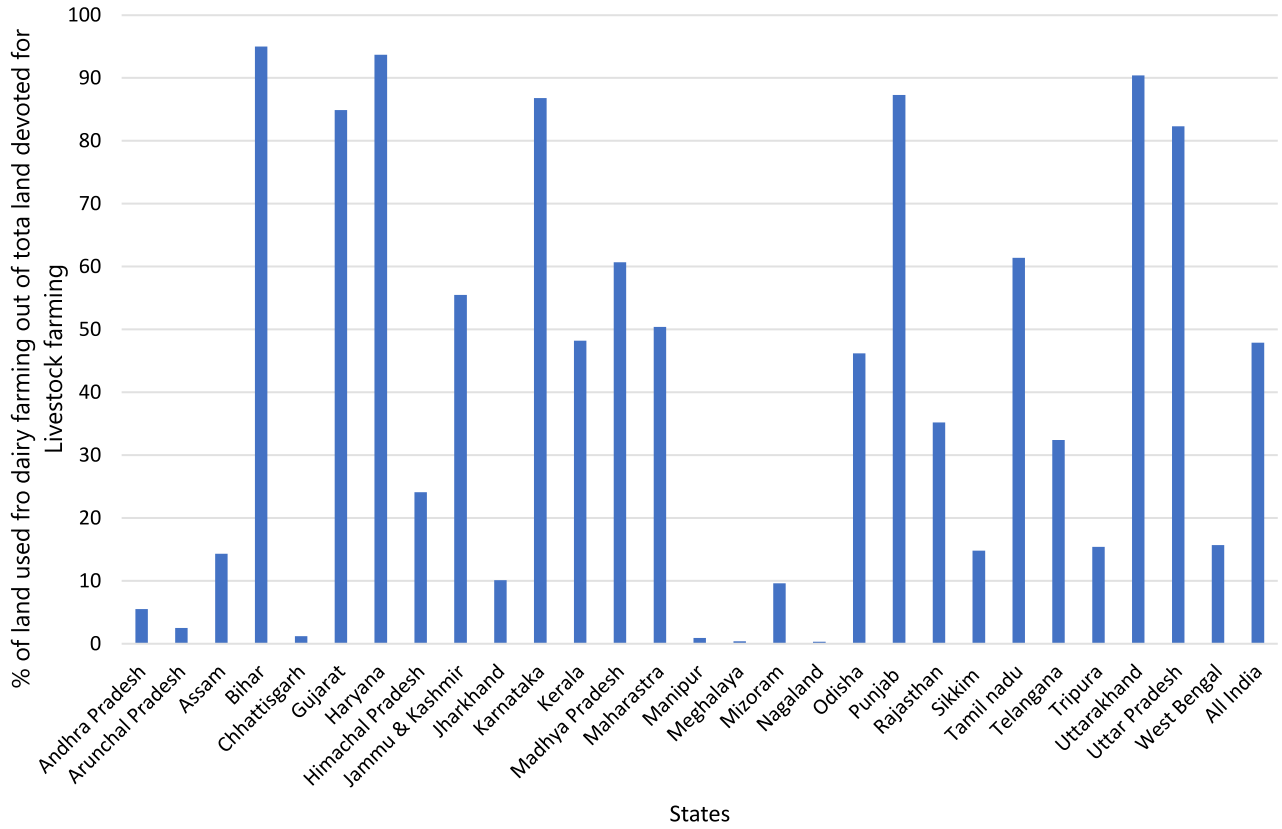
Of the total milk produced, 44.81% is from Buffaloes (31.94% -indigenous buffaloes and 12.87 %-Non-Descript buffaloes), 52% from cow (Cow-Exotic - 1.86 %, Cow crossbred – 29.81% and Cow-indigenous-10.73% and non-descript cows - 9.51%) and 3.3% from goats. The contribution from crossbred cows is increasing over the years gradually.

4.2.3. Land Usage for Dary Farming

Dairy farming the most important livestock activity pursued by households in rural areas. Out of the total land of 328.7 million ha, the 42.2% is net sown area, 3.2 % of the area under permanant pastures and 2.2% of the are under fodder cultivation. Due to increased irrigation, land fragmentation, farmers are not willing to allocate land to fodder cultivation (BAHS, 2023).

Usage of land while rearing goat

Figure 5. Proportion of Land Used for Dairy Farming out of Total Land Devoted to Animal Husbandry



Source: *Data from NSS Report No. 587: Situation Assessment of Agricultural Households and Land and Livestock Holdings of Households in Rural India, 2019 and analysis by ASCI*

As per the Land and livestock holdings report, 2019 the per cent of area of land operated/devoted for farming of animals is 6.12 million ha of the total land under agriculture (6.6%) and of this nearly 48% of the land under animal husbandry is used for dairy farming, thus emphasizing the importance of dairying. Except for a few North Eastern States and the States of Andhra Pradesh, Jharkhand and Chhattisgarh, most of the States have a sizeable share of land under livestock farming is devoted to dairy farming (Fig.5).

4.2.4. Indian Dairy Farming Dominated By "Small Holder Dairy Farming"

Dependence on livestock farming as a principal source of income (Exihibit.3) is much higher for the farmers with the lowest size class of holdings (marginal and small farmers) than the other land classes (Medium and large). Much of the farmwork in the lower landholding classes i.e small and marginal farmers is done using family labour.

Small Dairy Farmers

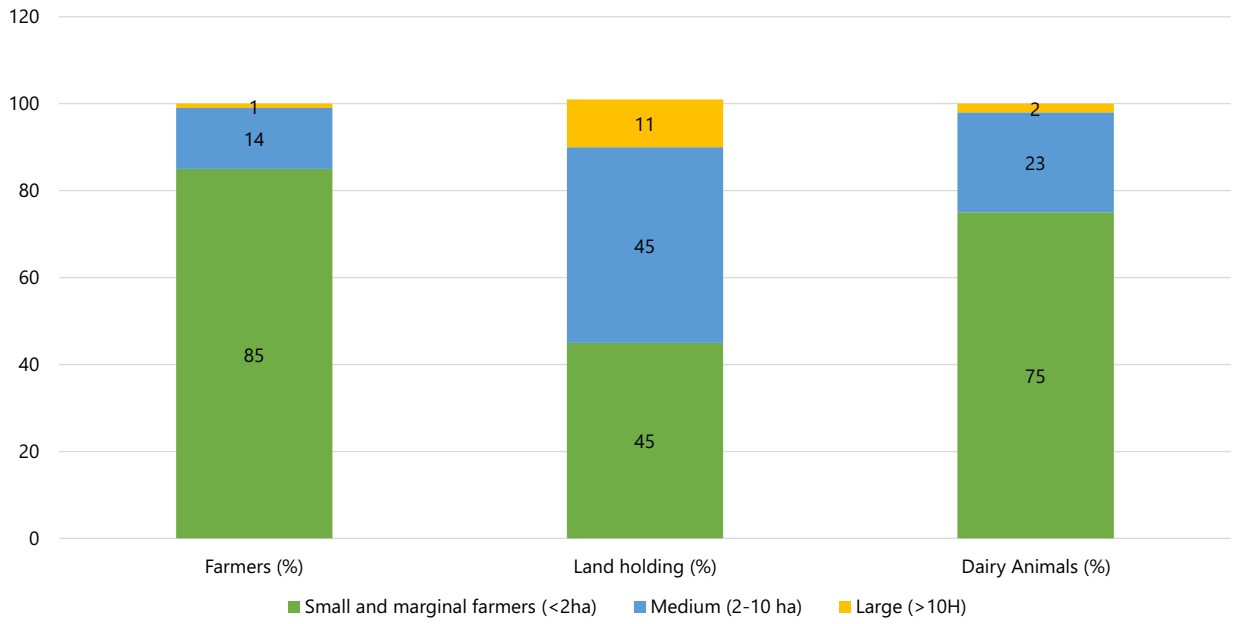
Exhibit. 3. Livestock's Share of Farm Income by Land Size (Rs./Month)

Land Size Class (Hectares)	Net Receipts from Crop Production (1)	Net Receipts From Farming of Animals (2)	Total Farm Income (3)	% Of Income From Animals (2) As % of (3)
<0.01	1,660	2,084	3,774	55.66
0.01-0.40	977	1,162	2,139	54.32
0.41-1.00	2,683	1,335	4,018	33.23
1.01-2.00	5,269	1,845	7,114	25.93
2.01-4.00	9,432	2,551	11,983	21.29
4.01-10.00	19,645	3,451	23,096	14.94
10.00+	43,599	11,473	55,072	20.83
All sizes	**3,798**	**1,582**	**5,380**	**29.41**

Source: *Data from NSSO (77th Round) Situation Assessment of agricultural households, 2018-19, MoSPI and analysis by ASCI*

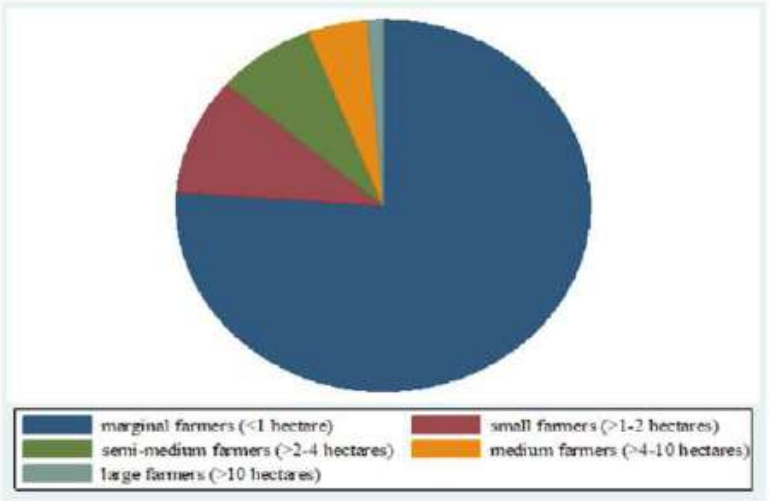
About 85% of the Indian farmers, who are marginal and small, own only 45% of farm land but 75% of bovines (Fig.6) and thus animal holding is found to be more equitable in comparison to land holding. Indian dairying sector mainly comprises of smallholder milk producers who are primarily small and marginal farmers including landless labourers.

Figure 6. Distribution of Landholdings (HHs), Operated Area and Dairy Animals



Source: *Data from NSSO (77th Round) Situation Assessment of agricultural households, 2018-19, MoSPI and analysis by ASCI*

Figure 7. Share of Different Size Classes of Farmers in the Value of Total Milk Sold in the Country (January-June 2013)



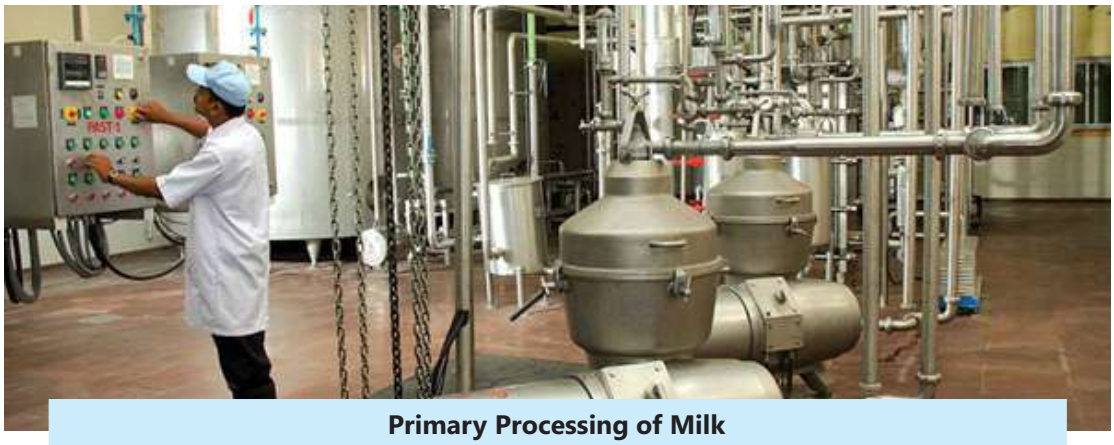
Source: *Situation Assessment Survey of Agricultural Households, NSS 70th round, 2013*

The dairying closely intertwined with small and marginal farmers with 1 to 5 animals, with production of milk ranging from 3.44 kg/day in indigenous/non-descript to 8.55 kg/day in crossbreds (BAHS, 2023, DAHD). Small dairy farmers favour buffalos as they are better adapted to Indian climatic conditions and produce milk with a higher fat content (7-8 percent) which fetch higher market price. Milk production in India is dominated by marginal and small farmers who possess very little amount of land. Data from the Situation Assessment Survey of Agricultural Households (2013) shows nearly 85 percent of all value of milk produced is contributed by marginal and small farmers (Fig.7) and similar situation continues now also i.e significant number of dairy animals are owned by the small and marginal farmers (fig.6).

Further, majority of the dairy farms falls under category of small dairy-farm size with < 10 animals (85%). The farms with farm size of more than 10 animals are around 15% of the total dairy farms (Dairy global) in the year 2016. The Dairy global reported that as per the IFCN, a dairy research network, the number of family farms with 10-50 cows is constantly growing in some regions by up to 30% each year in recent years. The commercial farms are coming up in a gradually specially in the states of Punjab, Maharashtra, Tamil Nadu and other states specially near big cities such as Bangalore, Hyderabad and NCR- Delhi.

Thus, high milk production in India is attributed to large dairy cattle population rather than high milk yields and big commercial farms. Accordingly, the future potential of Indian milk production is highly dependent on increasing milk yields through improved genetics, better animal health management and enhanced balanced feeding. At the policy level, there has been an increased thrust on animal husbandry and dairying right from operation flood to initiatives of present day government i.e national dairy plan, breed improvement, animal health and infrastructure to provide a source of employment and enhanced income especially for small and marginal farmers.

4.2.5. Marketable Surplus, Milk Procurement and Processing



Primary Processing of Milk

Presently, 46% of total milk produced is either consumed at the producer level or sold to non-producers in their vicinity in the rural area. The balance 54% of the milk is marketable surplus which is available for sale to consumers in peri-urban and urban centres. Of this 54%, about 41% of the milk sold is handled by the organised sector which include Dairy Cooperatives, Producer companies and Private Dairies (Annual Report, DAHD, 2022-23). The milk supply in rural areas is handled by the unorganized sector consisting of local milk venders/traders i.e small private dairy, milkmen, agents, and local producers. Among milk and dairy products, the market for liquid milk (60%) is highest followed by various value-added dairy products (30%) such as butter, UHT milk, cheese, ice crème, etc. and other products to an extent of 10% (NAP dairy, DAHD). Of the total liquid milk market, the share of organised sector has increased from 32 % to 41 % in last 3 years. It is estimated that the share of organised sector would reach to 54 % by 2026 (AR, DAHD, 2022-23).

Packaged liquid milk and products are mostly a mix of the two i.e cow milk as well as buffaloe milk, and only a few processors market pure cow milk. It is observed and policy makers also highlighted that, most of the private and cooperative dairies do not have separate collection systems for cow and buffalo milk. Milk procurement, from India's predominantly small-sized dairy farms and marketed by small vendors, is a great challenge, requiring high investment in infrastructure and procurement systems.

India's installed milk processing capacity is 1031 LLPD in Cooperative system, 902 LLPD in private sector and around 36 LLPD at producer companies totaling to 1968 LLPD (AR of NDDB and DAHD 2022-23). These organizations have wide procurement and distribution networks, which include village-level milk collection/procurement, BMCUs and chilling plants for procurement of milk, processing and wide marketing/distribution network. The milk collected at the procurement centers is delivered to processing plants through chilling plants/BMCUs. Later milk is processed in dairy plants involving various processes such as standardization, pasteurization, packaging, and preparation of certain value-added products, branding and marketing. The matrix of milk value chain and corresponding stakeholders are depicted at Exhibit.6 on matrix of milk value chain:

The major milk processing firms in cooperative sector are Amul (GCMMF), Mother dairy, Orissa Milk fed, APDDCF, KMF, Aavin, etc. and companies in private sector are Hatsun agro, Parag Milk Foods, Schreiber Dynamix Dairies, Heritage Foods, Tirumala Milk Products, Sterling Agro Industries, VRS Foods, Nestle India, Prabhat Dairy, Indapur Dairy, Dodla Dairy, Creamline Dairy Products, SMC Foods, Milkfood, Gopaljee Dairy Foods and Anik Industries.

Exhibit. 4. Matrix of Milk Value Chain and Corresponding Stakeholders

Value Chain		Stakeholders
Inputs		
Fodder - Green, dry, silage, hay, fodder blocks	Cultivation and preservation	Self-Cultivation by farmers **or** by purchase
Feed	Feed Mixing by farmer **or** purchase	Feed mixing by farmers **or** by purchase
Health care	Village health worker or Veterinary hospital including mobile	DAH of respective Governments and PPA mode
Breeding aspects	Local AI worker or Veterinary hospital including mobile	DAH /Livestock boards of respective Governments and PPA mode
Dairy Farmers Manages the dairy animals Cows and Buffaloes and produces milk		Dairy farmers – Managemnet of animals, GAP and mechanization Dairy farm size with 1-10 animals – 90% Farm size more than 10 animals – <10%
Milk procurement		
Village collection centres at Dairy Cooperative Societies (DCS)	Village collection centres Private entities	Procurement centre/Collection agents Quality testing and BMC Transportation from collection centre to processing plant
Cooperative Dairy Plants	Private Dairy Plants	Quality check, standardization, pasteurization/UHT and/or product processing, packaging in Plants of Cooperatives, Private and MPCs
Liquid milk		
Milk product manufacturing		Processing plants in Cooperatives, Private firms to domestic markets through distributors and direct exports
Transportation and storage		Individual transport agents and logistic companies
Distributors		
Institutional Consumers and Retail Consumers		E-commerce, Supermarkets, Convenience stores, Retail traders

Local sales **or** Direct sales in near by towns **and** sales through Traders, vendors

Ingredient suppliers

Source: *Analysis by ASCI team*

4.2.6. Export and Import of Dairy Products

Export of Dairy products from India was 63738 MT to the world with a worth Rs. 2,260 Cr during the year 2023-24 as against 51422 MT and 1341 cr in 2019-20 with a growth rate of 24% in quantity and 68% in value. The Major Export Destinations were United Arab Emirates, Saudi Arab, USA, Singapore, and Bhutan.

Exhibit. 5. Exports of Dairy Products from India

Quantity in MT and Amount in Rs Crore

Year	2019-20		2020-21		2021-22		2022-23		2023-24	
Product	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount
Dairy Products	51422	1341.01	54762	1491.66	108711	2928.79	67573	2269.85	63738	2260.94

Source:*APEDA website*

India doesn't import liquid milk. It imports milk products such as milk albumin, lactose, lactose syrup, casein, ice-cream, infant food and cheese. Key suppliers to India are the United States, France, Thailand, Singapore, New Zealand, and the Netherlands. There are negligible imports of SMP and butter.

4.3. State-Wise Scenario

This Section discusses the State-level scenario of milk production and dairy sector of major milk-producing States and some fastest-growing States, the State government policies for infrastructure development and welfare of dairy farmers that are likely to have an impact on employment and livelihood, and the State infrastructure for skill development. As mentioned in previous sections, the all-India milk production in 2022-23 is 230.8 million tonnes with per capita availability of 459 grams/day. A few important facts related various states (Exhibit.6) are as under:

- The top 5 milk producing states are Rajasthan, Uttar Pradesh, Madhya Pradesh, Gujarat and Andhra Pradesh with respective share of 15.05%, 14.93%, 8.6%, 7.56% and 6.97 % of total milk production, respectively.
- The top 5 states with highest per capita availability of milk are Punjab with 1271 grams /day followed by Rajasthan (1138 grams/day), Haryana (1098 grams/day), Andhra Pradesh (799 grams/day) and Gujarat (670 grams/day). The states of Maharashtra, Bihar, Kerala, Jharkhand, West Bengal, Chhattisgarh, Odisha and all NE states and UTs have a per capita availability of milk less than the recommended level of 380 grams/day.
- It is observed that the States of Sikkim (17.16%), Nagaland (9.19%), Rajasthan (8.27%), Jharkhand (8.03%), Karnataka (7.86%), Manipur (6.33%), Chhattisgarh (5.78%), Madhya Pradesh (5.58%), Gujarat (5.48%) and Bihar (5.36%) have registered growth rate of more than the national average i.e 5.29% in 2021-22.
- In the states of Nagaland and Manipur have registered a negative growth rate in milk production.
- Ther are around 10000 progressive commercial dairy farms with more than 30 animal size in Punjab and these are growing at a very faster rate(Dairy global). The commercial farms are increasing in other states such as Gujarat, Tamil Nadu, Karnataka, Maharashtra, AP, Telangana, Haryana and nearby

- The states with highest Dairy Cooperative Society members are Gujarat, Karnataka, Tamil Nadu, Uttar Pradesh, Bihar, Maharashtra and Rajasthan where in the members are more than 10 lakh (Exhibit.6).

Exhibit. 6. State-wise Milk Production, Per Capita Availability and Growth Rates

S. No.	States/UTs	Milk production in '000 Tonnes			Per Capita Availability of Milk 2022-23 (gram/day)	Growth rate in 2022-23 over 2021-22 in %	% of share of each state in total milk production in 2022-23	DCS members in '1000
		2015-16	2021-22	2022-23	2022-23			
1	Uttar Pradesh	26387	33005	36242	426	9.81	15.72	712
2	Rajasthan	18500	33265	33307	1138	0.13	14.44	1095
3	Madhya Pradesh	12148	19004	20122	644	5.88	8.73	401
4	Gujarat	12262	16722	17281	670	3.34	7.49	3776
5	Andhra Pradesh	10817	15403	15448	799	0.29	6.70	666
6	Maharashtra	10153	14305	15042	329	5.15	6.52	1687
7	Punjab	10774	14077	14304	1283	1.62	6.20	427
8	Karnataka	6344	11796	12829	523	8.76	5.56	2644
9	Bihar	8288	12253	12503	274	2.04	5.42	1408
10	Haryana	8381	11630	11966	1098	2.89	5.19	329
11	Tamil Nadu	7244	10107	10317	369	2.07	4.47	1927
12	West Bengal	5038	6414	6969	194	8.65	3.02	226
13	Telangana	4442	5808	5855	423	0.81	2.54	293
14	Jammu & Kashmir	2273	2727	2817	572	3.32	1.22	41
15	Jharkhand	1812	2629	2774	195	5.50	1.20	29
16	Kerala	2650	2532	2580	198	1.87	1.12	1063
17	Odisha	1930	2402	2476	148	3.10	1.07	325
18	Chhattisgarh	1277	1848	1956	180	5.80	0.85	37
19	Uttarakhand	1656	1856	1859	442	0.12	0.81	165
20	Himachal Pradesh	1283	1615	1617	596	0.13	0.70	47
21	Assam	843	982	1006	78	2.48	0.44	48
22	Delhi	281	-	487.74	64		0.21	
23	Tripura	152	217	230	153	6.07	0.10	6
24	Meghalaya	84	90	94	77	3.64	0.04	0.8
25	Sikkim	67	87	87	347	0.01	0.04	17
26	Manipur	79	76	72	62	-4.87	0.03	6
27	Goa	54	63	64	112	1.53	0.03	19
28	Chandigarh	43	57	56	126	-1.54	0.02	
29	Puducherry	48	49.97	49.65	85	-0.64	0.02	42
30	Nagaland	77	61	50	61	-18.83	0.02	2
31	Arunachal Pradesh	50	46	46	81	-1.02	0.02	
32	Ladakh	-	27	31	280	13.63	0.01	
33	Mizoram	22	25	24	55	-0.45	0.01	1
34	A&N Islands	15	17	17	117	2.50	0.01	
35	Daman & Diu and Haveli	9	1.66	1.80	4	8.43	0.00	
36	Lakshadweep	3	0.42	0.41	16	-2.38	0.00	
All India		**155491**	**221064**	**230577**	**459**	**4.30**	**100.00**	**17441**

Source:*Basic Animal Husbandry Statistics, 2023, DAHD, MoFAHD*from NDDB Annual Report, 2022-23*

- Of the major milk producing states in the country, the states of Rajasthan, Uttar Pradesh, Gujarat, Andhra Pradesh, Karnataka, Maharashtra, Bihar and Tamil Nadu where the present coverage of dairy cooperatives (i.e quantity of milk procured, no of villages covered and active members) is comparatively high procuring nearly 70% of total milk collected by dairy cooperatives in the country (NDDB annual report). As the coverage is very high, there is little scope for increasing the membership and formation of new societies and therefore milk procurement can only be increased by increasing the per member milk contribution coupled with increasing the productivity and herd strength.
- In states like Madhya Pradesh, Orissa, West Bengal, Bihar, Chhattisgarh, Jharkhand and NE states where the dairy cooperative coverage is moderate or low, the procurement can be increased through the formation of new dairy coop-societies or MPC/FPOs or improving through promotion of private dairies. Where in skilling is needed much in core dairy entrepreneurship and procurement skills as well as promotion and management of farmers collectives.
- Further as aware, the role of women in dairying is very much appreciable and engagement of women in dairy farm activities at household level is about 60- 70%. However, the women membership in dairy cooperative societies is only 25-30%. The regional level analysis indicates that the share of women in cooperative membership has been low in eastern and northern regions. Engaging more women in dairy institutions and skilling of women in scientific management and technologies is very much required for their social, economic & financial empowerment.

GROWTH DRIVERS AND CHALLENGES

5. Growth Drivers and Challenges

5.1. Growth Drivers

Dairying plays a major role in rural economy contributing to food basket, draught animal power and also to ecological balance. It has played prominent socio-economic role and cultural beliefs have made to continue in the activity. Dairying has a significant role in generating gainful employment, particularly, among the small and marginal farmers and women. As mentioned in previous paragraphs, the Indian diary sector is a high growth sector for several years. It is poised to grow further and growth drivers are :

Use of Technology in Dairy Industry for Milking

- The livestock sector contributes significantly to rural farm income at about 29.4% in the year 2018-19 vs 19.85% in the year 2012-13 at all India level (NSS 77th and 70th round). This survey also indicates that the livestock's share in farm income is higher among smallholders (55.66%) with less than one hectare of land than the medium or large holders (15-25%). Dairy sector is more organised in the form of cooperatives which ensures regular income and sustained growth unlike other agriculture produce.
- The animal holding has been found to be more equitable as compared to land holding as 85% of the farmers, who are marginal, and small, own only 45% of farm land but 75% of bovines (NSS 77th round).
- As subsidiary occupation, it provides a continuous and remunerative outlet for landless labour and small farmers.
- Besides a source of income for rural households, milk ensures nutritional security of the rural folk. Experience shows that households owning milch animals in rural areas consume almost two to three times more milk than the families which don't have dairy animals. Further, milk is the only source of animal protein for the largely vegetarian population and thus attracting the consumer interest.
- Increasing awareness & availability of variety of dairy products through various channels in every corner including organised retail chain are also driving this growth.
- The consumption of milk and milk products in the country is on the rise in commensurate with increase in the purchasing power of people, increase per capita income, increase urbanization, changing food habits and life-styles and knowing importance of milk in health in the events of diseases.
- The demand for milk has been rising not only due to increase in per capita consumption, but also from enlargement of 'milk consuming population base' i.e. demographic growth-ever increasing population of the country. The milk production is estimated to reach about 30 crore tonnes by 2030 as per NITI Aayog report. To achieve this estimated milk production, it should continue to grow above 5% per annum as grown in last decade.

Thus, demographic growth coupled with sustained economic growth and increase in per capita income is expected to boost milk demand substantially in the country. Social factors of sustainable livelihood to rural mass and nutritional security drives the milk production in future years.

5.2. Challenges

Though India has become the largest producer of milk in the world, the dairy sector faces numerous challenges slowing the growth in milk production, processing and organised marketing. Some of the important challenges being faced by the dairy sector are given below:

- Low Productivity, higher age of puberty at 3.5 to 4 years, high inter-calving period effecting the productivity.
- Feed constitutes to 60-70% of the production cost of the milk. There is a shortage of feed, dry fodder and green fodder in the country with variations across seasons and states. Many of the states are facing frequent droughts or floods which effects availability of fodder the most. Majority of the farmers are resorting to feeding of locally available feed and fodder resources which is resulting in imbalanced and low-quality leading to negative productivity. Majority of the farmers don't preserve the fodder in the form of nutritive/quality hay or silage or total mixed ration / fodder blocks.
- The input costs are increasing over the years and the commercial dairy farmers are facing reduced profits due to increased input costs.
- Though the government, cooperatives and private players are providing veterinary services, there is need for improvement in veterinary services as prevention is better than cure. Currently, the veterinarian's requirement in the country is around 1,63,000 against an availability of about 40,000 (Indian Dairy: Overview, Challenges and Suggestions, 2017, CII and imarc). The key factors are adequate and efficient veterinary service system with prompt services at short notice and at door step.
- Inspite of vast cooperative network, Indian dairy sector is still remains highly unorganized (para.4.2.5), most private dairies are not backward integrated.
- Limited infrastructure for procurement, cold chain, processing /value addition and distribution network which should be improved I line with the production.
- Lower availability of organised credit
- Lack of penetration in smaller cities/ towns in terms of milk marketing as these people still prefer freshly milked milk.
- Majority of the dairy farmers are the small-scale farmers and they are poor, illiterate or with secondary education. Most of these farmers practice dairy farming as a tradition and learned hereditarily. They lack skills in scientific management and enterprise managerial ability and have inadequate access to resources and infrastructure. Only a few dairy farmers are undergoing hands on skilling training and has professional degree to manage commercial dairy farms.

Challenges Involved in Dairy Sector

Technological Changes

6. Technological Changes

The Indian dairy sector is presently characterized more by "production by masses" rather than "mass production". In the next two to three decades, the economic environment, institutional arrangements, developments in infrastructure and linkages to the world markets shall change widely. The small-holder milk production would continue to link with organized milk procurement and processing system. Dairy farming in India is undergoing structural change from subsistence farming to profitable farming and from traditionally acquired knowledge to scientific knowledge-based system. These structural changes include, tilt of farmers towards efficient and profitable dairying, organized milk processing and organized marketing system.

The NDDB is emphasizing on improved productivity of dairy animals coupled with health and nutrition management inorder to increase milk production to meet the rapidly growing milk demand. It is also facilitating the rural milk producers with greater access to the organized milk procurement and processing. It focusing on manure management inline with initiatives of climate resilient agriculture.

Government of India and state governments are taking-up various steps like disease surveillance, vaccinations and deworming, enhancing outreach of veterinary services to prevent and cure diseases, dairy entrepreneurship and so on for betterment of dairy sector. Such initiatives are likely to increase demand for skilled professionals in the value chain of dairy sector. The changing technological landscape of Indian dairy sector is furnished below (Exhibit.7).

Exhibit.7. Existing Practices and Technological Advances and Future Requirements

S.No.	Area/ Sub-Sector	Existing Practice	Recent Trends	Future Technological Requirements
1	**Herd Keeping Practices and farm management**	➢ Small and medium dairy units are prevalent. ➢ A very few are (less than 10%) commercial dairies with strength of 50 or more animals ➢ No housing for 2 to 5 animal dairy units and proper housing only in commercial units ➢ Manual dairy farm management practices ➢ Manual milking operations	➢ Still small farmer holdings but transforming in to commercial dairying (50-100 animal) with intensive rearing and number of such farms are increasing ➢ Housing is picking up in small units also ➢ Still manual operations and a few small dairy farms also going for milking machines ➢ Mechanisation is picking up in fodder cultivation, delivery of feed, usage of milking machines and automation in cleaning the floor and milking in a few large farms.	➢ Commercial dairying (>50 animals) with intensive rearing will continue to raise ➢ Proper housing and its management for all types of units and must for commercial units ➢ Automation operation wise i.e floor cleaning, fodder, feed, milking operations, etc. ➢ Enhanced usage of milking machines and farmers adopting Solar milking machines also.

S.No.	Area/ Sub-Sector	Existing Practice	Recent Trends	Future Technological Requirements
		➢ Manual milking operations ➢ Mechanisation to some extent in fodder cultivation, delivery of feed in dairy farm, usage of milking machines ➢ Automation in cleaning the floor and milking in a few large farms ➢ Usage of community Milking machines to an extent ➢ No records	➢ Mechanisation is picking up in fodder cultivation, delivery of feed, usage of milking machines and automation in cleaning the floor and milking in a few large farms. ➢ Automated (semi or fully) farm operations in a few commercial farms with or without Computerised/ chip based farm management ➢ Semi /fully automatic milking parlours also being established ➢ Usage of community Milking machines going on ➢ Record keeping and linking with performance and expenditure at few farmers having high yielders /commercial farms	➢ Enhanced usage of milking machines and farmers adopting Solar milking machines also. ➢ Fully automated dairy farming operations with or without aligning to computerised data and management of farm ex. Baramati, Avon dairy, etc. ➢ Semi /fully and automatic milking parlours ➢ community Milking machines mobile milking machines will continue ➢ Digitised and RFID linking for insurance ➢ Animal Aadhar / Unique ID and maintenance of records for all animals with more focus on high yielders
2	**Breeding**	➢ Natural service and AI ➢ Genetically low productivity ➢ Higher age of puberty and inter-calving period	➢ AI continuing ➢ Just started usage of Sexed semen and ET ➢ Productivity improving year on year ➢ Comparatively early puberty and lesser inter-calving periods at a few farms due to better management coupled with good genetic potential	➢ Continued focus on AI ➢ Sexed semen on large scale and ET ➢ Productivity improving due to genetic and management betterment ➢ Comparatively early puberty and lesser inter-calving periods on majority of the farms to be obtained with better /scientific management practices

S.No.	Area/ Sub-Sector	Existing Practice	Recent Trends	Future Technological Requirements
3	**Feeding**	➢ Grazing by small units supplemented by concentrates ➢ Feeding locally available resources ➢ Extensive or Semi-intensive type of rearing ➢ Intensive rearing in large commercial farms only	➢ Ration balancing and feeding Balanced ration are going on ➢ Preservation of fodder in the form of enriched fodder blocks, Hay, Total Mixed Ration and Silage on a low scale	➢ Ration balancing and feeding of balanced feed at all levels ➢ Preservation of fodder in the form of enriched fodder blocks, Hay, Total Mixed Ration and Silage on large scale to prevent feed and fodder shortage and better utilization of existing resources ➢ Computerised data base and automated delivery of balanced feed in large commercial farms
4	**Mechanisation**	➢ To some extent in fodder cultivation, delivery of feed, usage of milking machines and automation in cleaning the floor and milking in a few commercial farms	➢ Mechanization in dairy farm operations, milking	➢ Commercial farms and Automation
5	**Milk supply chain**	➢ Quality testing at procurement site in organised dairies and linked to payment ➢ Old Processing infrastructure ➢ Cold chain maintained after procurement by the organised dairies	➢ New and fast equipment in testing and Testing and payment are linked ➢ Modern automated equipment in processing ➢ Maintenance of Cold chain after procurement by the organised dairies	➢ More emphasis on quality right from procurement to marketing of product coupled with traceability using IT interventions ➢ Complete cold chain throughout the value chain ➢ Digitization in value chain including payment system

S.No.	Area/ Sub-Sector	Existing Practice	Recent Trends	Future Technological Requirements
6	**Animal health**	➢ Farmer goes to Veterinary hospital during the need ➢ Prophylactic vaccinations and deworming by DAH ➢ Repeat breeding is a major problem	➢ Farmer goes and mobile clinics also reaches farmers ➢ More emphasis on prophylactic vaccinations and deworming to cover entire animal population through special drives ➢ Scientific heat and pregnancy detection, screening and identification of repeat breeders and curing is initiated ➢ Unique ID and animal health cards started	➢ Door step veterinary services coupled with hospital services ➢ Universal Prophylactic vaccinations and deworming at farmers doorstep ➢ Screening/surveillance for diseases, maintenance of data, its analysis and taking precautions ➢ Universal animal health cards
7	**Marketing**	➢ Organised marketing is around 25-30%	➢ Increase in organised marketing ➢ Online based supply started in a few cities ➢ During COVID, ayurvedic milk ex. Haldi/gold milk introduced	➢ Organised marketing to an extent of marketable surplus, ➢ More of e-marketing and online/app-based supply with common storage facilities at designated places ➢ New products which are nutraceuticals in nature
8	**Insurance**	➢ Subsidised insurance by Central and state governments	➢ Farmers are slowly coming forward to avail insurance for high yielders	➢ Universal insurance coverage for all animals
9	**Indigenous animals/breeds**	➢ Effort to conserve Indigenous breeds	➢ Effort to conserve Indigenous breeds along with peoples interest in indigenous cow's milk	➢ More emphasis on indigenous breeds with focus on selection for high yields and productivity
10	**Others**	➢ Manure to biogas and vermin-composting	➢ Manure to biogas ➢ Manure based electricity production in a limited way ➢ Manure to vermin-composting	➢ Manure to bio-gas, vermicompost will continue ➢ Manure and energy management - electricity, tapping of methane, etc.

Source: *Primary Survey and Analysis of ASCI*

SKILLING IN DAIRY SECTOR

7. Skilling in Dairy Sector

Capacity Building Program Conducted by NDDB at Assam

Skill is the ability to perform a task with effectiveness and efficiency to achieve pre-determined goals. Enough knowledge without skill doesn't equip a person to complete the task. Skill or expertise can be acquired through training and through deliberate, systematic and sustained effort in order to smoothly and adaptively carryout complex activities involving ideas (cognitive skills), things (technical skills), and/or people (interpersonal skills). In dairying cognitive skills are required to make better decisions, technical skills required for handling various implements/operations and interpersonal skills required for exchange of farm related information. Understanding the workforce dynamics, technical education and training of the workforce, skill development framework and policy support, skilling in dairying by existing institutions, skill gaps and need assessment and requirement of skilling of manpower in dairying are given in subsequent paragraphs.

7.1. Workforce Dynamics in Agriculture

Involvement of Whole Family in Dairying

The rural population in India constituting to 64.13 per cent of the total population (World bank data, 2023). The agriculture sector engages around 45.5% of the total workforce in the country in last 3 years (PLFS surveys), while its contribution to overall GDP is around 18.2 per cent (Economic survey, 2024) during the same period which indicates the overdependence of Indian workforce on agriculture resulting in disguised unemployment and lower productivity.

All crops, livestock, fisheries and forestry contribute to 53.68%, 34.02%, 7.55% and 7.65%, of the agriculture output value (NAS 2023-24), respectively as against the workforce deployed at 30%, 13% 0.6% and 0.3% of agri-workforce, respectively (PLFS survey 2022-23). Thus, the workforce deployed is much less in the high growth segments such as livestock, fisheries, etc. in comparison to crop production. The workforce in the dairy sector increasing (7.5 % to 11.65 % of agri workforce in 2021- 22 to 2022-23 as per PLFS) in conjunction with the output value of milk group at 20.17 % and 21.39 % of the output value of agriculture in the same period. Further, due to the fragmentation of land and small landholdings, the farmers are becoming self-employed i.e as per PLFS 82.8% of agri-workforce self-employed vs overall workforce at 57.3% and unable to provide employment to anyone else.

7.2. Skilling Level and Technical Advice in Dairying

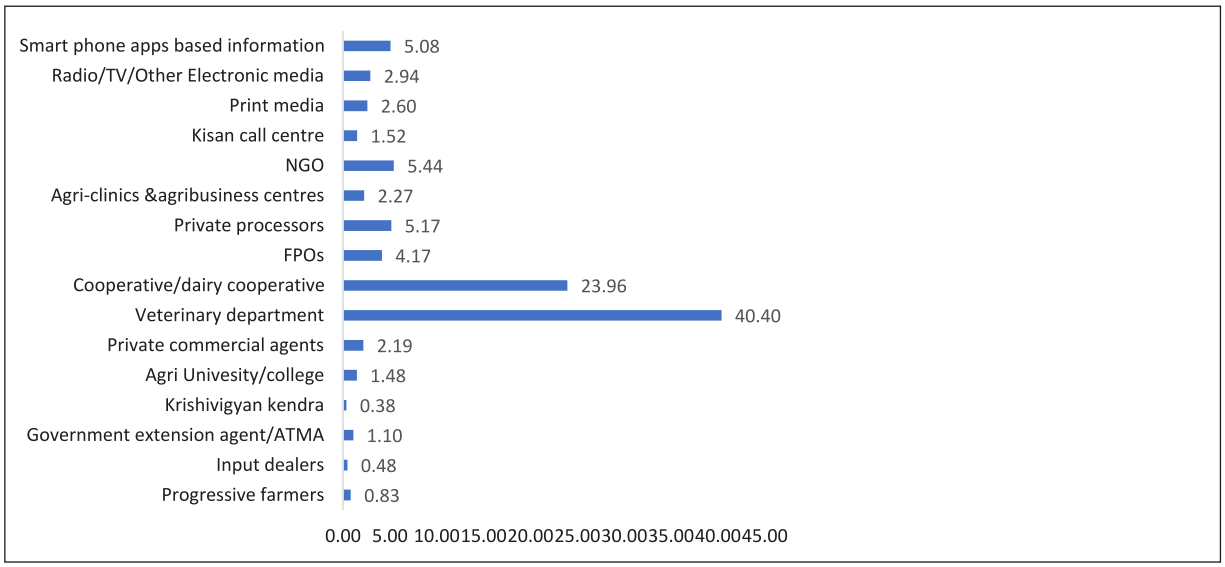
Fig.22 Technical Educational Training Conducted at NDDB

India has a demographic advantage (around 54% of the population is below 25 years of age, old-age dependency ratio of 12.5) compared to other countries (HDR report). However, the share of skilled (formal as well as informal) to total labour force, as per the PLFS, is 24.3% only in comparison to the advanced countries (>80%). In respect of agriculture and allied sectors including dairy farming, the skilled workforce is much lesser. With specific reference to agriculture including dairying, only 0.6 % of total workforce has received formal vocational and technical training (PLFS, 2022-23). As all aware, India's demographic dividend can't be reaped without skilled workforce.

In India there is vast system of agricultural extension and in general, the farmers get technical advice from various sources such as veterinary department, dairy cooperatives, NGOs, private processors, various types of media (print, electronic, app based), agri-clinics and agribusiness centres and others. Less than 50% of the agricultural households are accessing technical advice at all India level with regional variations from various sources inspite of spectacular growth in the sector (NSS 77th round). Among various sources, livestock farmers farmers preferred and approached government departments/agencies and cooperatives for technical advice in 'farming of animals' as furnished at below (NSS 77th round). Other important sources for technical advice in farming of animals are private processors, various types of media and apps, FPOs, Agri-clinics and NGOs.

An advanced dairy farming systems would certainly need people skilled in the application of technologies and practices. In such a scenario, the relevance of uneducated/ unskilled workers would vanish sooner than later and therefore, skilling is essential.

Exhibit. 8. Percent Agricultural Households Accessed Technical Advice in Farming of Animals from Different Sources



Source:*Situation Assessment of Agricultural Households and Land and Holdings of Households in Rural India, 2019 (NSS 77th round), MoAFW and analysis by ASCIILL*

7.3. Impact of Skilling After Skill Training

The primary survey (ASCI survey) of 50 skilled farmers in ASCI- QPs / job roles related to dairy farming and milk procurement in indicate that about 20% of the trainees were working as regular wagers, 2% as casual labour, and 64% trainees are self-employed. The income level of self-employed has increased by 25 to 35% after skilling in dairy farm management. The benefits of skilling include higher earnings, learning good management practices, higher yield per animal, better information, etc. (Exhibit.9). The trainees indicated that they were able to keep the shed in a better way, going for regular vaccination and deworming as per the schedule, feeding green grass and supplementing with concentrate feed, learned proper way of milking and keeping the udder of the animal cleanly to prevent mastitis. They would like learn about preparation of concentrate feed and azolla cultivation. About 98% of the respondents were willing to suggest others to undertake the skill training and they had already suggested several people to undertake the training as they found the training was very much benefiting and learnt many new things.

Exhibit. 9. Benefits of Skill Training

Parameter	SkilledFarmers Said Yes (%)
Improvement in income around 25% or more of existing income	38
Learned good practices of dairy farm management	
Shed	55
Udder hygiene and milking method	64
Regular Vaccination and deworming	79
Feeding in a better way after training	90
Higher productivity / efficiency	52
Better price realization (selling directly to consumers)	8
Support for access to credit	30
Support for placement	46

Source: *ASCI analysis*

Further, review of literature on impact of skilling in dairy enterprises and farming practices (Muragod.B.M., et. al., 2015, Devesh.T et al., 2022 and Aparna and Hundal, J.S., 2016), indicates that there is an improvement in the dairy farming practices among the skilled personnel. They have observed that before training, around 35-55% of trainees knew about calf management, vaccinations, milch animals/breeds, about shed and less than 30% of the trainees knew about clean milk production, deworming, common diseases in cattle, repeat breeding and causes of abortion, zoonotic importance of dairy animals, balanced ration and preparation of concentrate feed, making of silage, embryo transfer, etc. After skilling about 75-85% of the trainees knew about breeds used for commercial farming, calf management, heat cycle and AI for successful AI, feeding of different categories of dairy animals, about udder hygiene and proper milking method, deworming schedule and common diseases in dairy animals. More than 90% of the skilled trainees knew about vaccination schedule

7.4. Skill Development Framework, Policy Support and Interventions in Dairy Sector

Training at NDDB, Siliguri

The state governments through their animal husbandry departments, livestock development boards and dairy federations facilitating and providing capacity building in the form of awareness programmes, 3-7 days training programmes, exposure visits, demonstrations through their own budget and also under various schemes of government. They are also availing financial assistance from various resources such as GoI programmes and development institutions. Apart from governments departments, NDDB also training and providing funding assistance to cooperatives under various programmes.

The government programmes include **National Livestock Mission (NLM)** with a component of skill development, technology transfer, and extension. Various activities done under this submission are- IEC support for livestock extension, training and capacity building, livestock farmers' groups'/ breeders' association, organisation of livestock mela/ show, regional livestock fair, operationalisation of farmers' field schools, exposure visit to livestock extension facilitators, exposure visit of the farmer, staff component of livestock extension.

Training at NDDB, Siliguri

Next important scheme is "Prime Minister's Kaushal Vikas Yojana" is the flagship programme of the Ministry of Skill Development and Entrepreneurship. Under this, the third most popular course is the "Dairy farmer/ entrepreneur" and nearly 14 percent of the trainees opted for this course. Another one is DDU GKY of the MoRD and it is the placement linked skill training programme focusing on women, rural youth and dairy farmers under agri sector. Further, the Skill training through the National Apprenticeship Promotion Scheme is promoting apprenticeship as an effective tool to deal with the skill shortages in the country by imparting on-job practical training.

Another important programme is RKVY- RAAFTAR which is a flagship scheme under the Ministry of Agriculture, Cooperation and Farmers' Welfare (MoAFW) with the broad objective of making farming a remunerative activity for the farmers. One of the major objectives of the scheme RKVY is to empower youth through skill development, innovation and agri-entrepreneurship based agri-business models that attract them to agriculture. The courses of ASCI can be organised by the institutes of DAC & FW, DAHD & F, ICAR institutes, SAUs, KVKs, SAMETIs, and institutes under State agriculture and allied departments. More than 30000 farmers have been trained under RKVY in the last five years. The dairy farmer entrepreneur is one of the most common job roles under RKVY.

The National dairy development board (NDDB), conduct various training programmes through its regional training centres focusing on areas of advancements in dairying and scientific animal management, milk processing, feed and fodder, cost effective breed upgradations, preventive health management in bovines, quality control, cooperative management, and marketing strategies, etc. The training imparted at NDDB follow the Principles of Adult Learning and adopts a mix of methodologies like classroom sessions, simulation games, group work, hands on experiences and village stay and interaction. NDDB's capacity building efforts are carried out at all the levels of the dairy cooperatives, namely:

- Member producers and Board of Directors of dairy cooperatives, at village and Union level, with the objective of building a truly member controlled dairy cooperative Institutions, true to the cooperative spirit.
- Training the Human resource employed in the structure, at the two levels (DCS and Milk Union) to build professionalism in carrying out the mandate of the cooperative institution, in an efficient manner.
- Expanding learning through various platforms for dissemination of good practices and sharing experience.

NDDB's effort in capacity building spans over 57 years, and Capacity Building encourages aspiring entrepreneurs towards Scientific Animal Husbandry, Dairy Based Activities and Bee-Keeping, aligning with the nation's vision of augmenting farmers' income from dairy and allied activities. It has been ensuring participation of women members in the various training programmes. Each year, a large number of women members of dairy cooperatives come to the training centers to learn about animal rearing and also take lessons in collective action.

Each year about 15,000 stakeholders from the dairy sector including overseas trainees attend the trainings at NDDB. For overseas trainees, it is the training exposure to the cooperative dairy system in India which is an eye-opener. The NDDB organises training programs at Anand (Gujarat), RDTC Erode (Tamil Nadu), RDTC Jalandhar (Punjab), RDTC Siliguri (West Bengal), MIT Mehsana (Gujarat) & NDDB Bengaluru (Karnataka).

Under the flagship of NDDB Samvad, digital technology has been used to take the learning to the fingertips of the learner and till date has reached to more than 2.5 lakh viewers. Thus, with the changing time, NDDB has also emphasised the need for paradigm shift where the focus of the Capacity Building of an individual is progressed from being 'Captive Audience' to 'Self Propelled learner'. All digital interactive sessions are recorded and posted on NDDB YouTube channel as well, for others to view and benefit at their convenient timings.

With the concerted efforts of DAHD, NRLM and NDDB as nodal agency for implementation, A-HELP (Accredited Agent for Health & Extension of Livestock Production) training was conceptualized and is being gradually rolled out across India. Pashusakhis of respective states will be trained as A-HELP by Master Trainers and they will act as a last mile connecting resource between livestock owners and veterinary officers. With this, it is envisioned that the employment status of rural women will enhance and the cattle health in the area will also improve as well.

Till now more than 4000 Pashusakhis have been trained and accredited as A-HELP in 11 states. The A-HELP takes up the responsibility of a primary service provider and extension agent for animal health & management services at the village/ Panchayat level. In addition, the A-HELP will also act as a Local Resource Person for providing extension services at farmers' doorstep and as a connecting link with the Department of Animal husbandry.

NDDB has developed a robust Learning Ecosystem which acknowledges that capacity building is not a mere one-time training event but it is an on-going continued process which focuses on skill, knowledge and attitude of a person so that s/he can take the charge of own learning.

To remain relevant and thrive in the ever-changing global market, the producer owned organisations in dairy sector need to continue to re-invent themselves. Thus, NDDB is additionally working on various areas like:

- Collaborative relationships to inspire and motivate people-centric organisations to set bigger goals, capacity to build a high-performance team and work culture.
- Skilling and training young entrepreneurs to take up dairying as a major source of livelihood.

Skill Training by Department of Animal Husbandry and Dairying, GoI:

Training at KVK, Chandel

Department of Animal Husbandry and Dairying, GoI is focusing on training and skill development among the staff of state animal husbandry departments, its own organisations, farmers, etc. It has a Centre of Excellence for Indigenous Breeds (CoEIB) at Kalsi, Uttarakhand for providing training in IVF, Sexed Semen production, Genomics and retraining of skilled manpower in latest developments in breeding technologies. The Central frozen semen production and training institutes have also been playing important role in training of manpower in frozen semen technology. The Central cattle breeding farms (CCBFs) 7 in number, are also providing awareness training to the farmers and breeders.

The NIAW organised a five day training programme on Cow Science and Technology for Gaushala managers and workers regarding the importance of the local breed, Gopalan, prominence of diseases in cattle, Feed and fodder requirement, Panchgavya, Housing and Management of Gaushala, Veterinary aspects and treatments, milk production, etc. and also training prog on Animal welfare rules and regulations and Vetero-legal issues, their handling for amicable solution (Annual Report, DAHD).

Capacity Building activities of DAHD includes Farmer Workshops, Dairy Farm Management training, production of antibiotic-free milk and ethno-veterinary practices. About 91 accredited AI training institutes existing in the country are imparting training to AI technicians and paravets. During last year basic training in AI has been given to 15459 Multi-purpose AI Technicians in Rural India (MAITRIs). Further, Central Fodder Development Organizations under which Eight Regional Fodder Stations have conducted 5250 no of demonstrations, organized 86 training programmes and 69 farmers' fairs/field days. Department has extended capacity building among farmers through training programs on Dairying and Livestock Management for 80000 farmers through three-day training programs through 400 Krishi Vigyan Kendras (KVKs) across the country (Annual Report, DAHD).

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Capacity building also done under NPDD scheme under Component A and B. Under component A, training is provided to farmers on good hygienic practices/good manufacturing practices etc. and under Component B, trainings are provided to farmers on clean milk production and good hygienic practices, milch animals rearing, adoption of cattle feed, green fodder and mineral mixture, etc. More than 12 lakh farmers trained under restructure NPDD scheme from 2021-22 (PIB release ID: 1944753, 1st August, 2023).

Skill Development in by Various Other Organisations:

A few private players engaged in the Skill Development undertake skill development work as part of their core business and/or as part of CSR activities through Foundations/ Trusts/ NGOs. Some more private players i.e private training institutes conduct trainings for publicly run programmes on skill development (Ganguly et. al. 2019).

- **The ISAP runs an entrepreneurship development programme (EDP)** as part of the Agriclinics and Agribusiness Centres (ACABC) Scheme steered by the National Institute of Agricultural Extension and Management (MANAGE) with EDP locations at 11 states in Northern India. The programme is 60 days of training and one year of handholding support. The training covers modules for soft skills, business skills, preparation of Detailed Project Reports (DPR) for access to credit, and the support phases include mentoring and guidance.
- **The National Skill Foundation of India (NFSI),** a non-profit organisation, focuses on skill development and entrepreneurship for enhanced and suitable outcomes. The NFSI provides training need analysis, training, and evaluation facilitates certification and provides incubation services. Skill development in dairy entrepreneurship is one of the projects implemented by NSFI.
- **NABARD** under its development initiatives provides grant support for skill upgradation programmes, establishment of demonstration unit and need based critical infrastructure in the areas of agriculture and allied activities as well as rural off-farm sector activities. The eligible institutions are NSDC affiliated Training Institutes, Government agencies, RUDSETIs/RSETIs, Corporate Partners, NGOs and others as per the stipulated terms and conditions. Eligible institutions should apply online at nabskill portal and concerned Regional Office will sanction the proposal.

7.5. Existing Skill Training Ecosystem in Dairy Sector

National Dairy Development Board

There are many organisations i . e ICAR organisations, Universities, KVKs, government departments, private players and developmental institutes are conducting various capacity building programmes in dairy sector. These organisations generally design the programmes as per the need and have their own content for each programme they are conducting. Sometimes the content is customised as per the need of the client also. Quite a few of these organisations are training partners of ASCI and conducting programmes as per the ASCI job roles, QPs as per the NSQF framework. The general extension and training framework in dairy sector and role of various organisations in capacity building are furnished at Exhibit.10.

Exhibit. 10. Skilling /Training Ecosystem in Dairy Sector

S.No.	Category	Role in Capacity Building	Special Initiatives
1	**ICAR and its Institutes**	Skilling programmes of 1-2 weeks duration, Extension services under ***'Mera gaon mere gaurav'*** by adopting villages, Demos help line for queries, Running a webportal - mKisan portal and mobile app service for timely advisories to the farming community Associated with ASCI on their own or through KVKs	Incubation cell and assistance for sale of products and adoption of FPOs also Quite a few ICAR institutes sell various produce/products, fodder seed, nutritional supplements and additives to farmers.
2	**State Agricultural Universities (SAU) /Veterinary Universities**	Through Extension education division and training cell, conducting awareness programmes, demos, exposure visits and Melas/exhibitions. A few skilling programmes are also conducted. Internship for students Incubation centre at university level	A few universities are having attached CoEs/cells and doing skilling programmes and associated with ASCI also.
3	**Krishi Vigyan Kendra's (KVKs)**	1 day awareness programmes Fild days at villages 1-2 weeks skilling programmes ASCI associated Job roles	Providing hand holding support for entrepreneurs who took skilling training

S.No.	Category	Role in Capacity Building	Special Initiatives
4	**Government department**	Policy, Budget, designing of schemes and their implementation, training and funding support to training, melas, competitions for breeds and prizes, free Vaccination and deworming, Treatment, labs and mobile clinics State government dairy farms supply quality calves to the farmers, supply semen for AI in field hospitals, fodder seed/cuttings, subsidised feed, silage/TMR/Fodder blocks in a few states to the poor farmers	Polytechnic /Diploma courses in veterinary/livestock management
5	**Industry**	Commercial dairy – dairy farm management Milk Processing – procurement related Feed industry – feeding regime Machinery – operation when purchased newly Pharma – Animal health related	Mostly conducting skill training on rolling basis or for new employees at their units. Quite a few of the programmes are conducted for farmers also.
7	**Development Organisations**	Conducting and funding for Capacity building programmes	Core sectoral skilling as well as Cooperatives/FPOs ex. NDDB, NABARD, DFID, GIZ etc. provide financial assistance to skill development programmes

Source:*Stakeholder discussions and analysis by ASCI team*

The ASCI team has interacted with representatives of various categories of institutions and held discussions regarding the specific training areas and type of capacity building and special initiatives of various stakeholder institutions. The summary of the discussions is furnished at Exhibit.11.

Exhibit. 11. Skill Training Area, Level and Specialties

S. No.	Institutions	Training Area	Level of Training	Specialties	Content
1	NDRI	Farming and Processing	Progressive farmers, start-ups, Government Sponsored programmes, ToT programmes	Training start-ups NDRI associated with ASCI also	
2	GADVSU, Baramati KVK	Extension services	Training of all types of livestock farmers, PMKY programmes, 2 weeks specialized dairy programmes	2 weeks Dairy skill development programme Many KVKs are organising ASCI associated skilling programmes each year	

S. No.	Institutions	Training Area	Level of Training	Specialties	Content
3	Vidya dairy	Skill development	Milk and milk products processing	Processing	Each organization have their own content for each programme they are conducting. Sometimes the content customised as per the need of the client.
4	AMUL, SARAS, KMF and other cooperatives	Trainings and extension services	About Cooperatives, their management, entrepreneurship, dairy farm related management	Clean milk production, ration balancing, Milk procurement, formation and management of dairy Cooperatives	
5	ITC, Nestle, Gopalji	Safe milk production	Farmers	Food safety	
6	NDDB	Balanced ration programme and other dairy related programmes of 1 to 2 weeks Programmes under NDP also	Farmers and cooperatives On milk procurement and quality	Dairy Entrepreneurship development programme Usage of software app	
7	Delaval	Dairy machinery	Farmers / Entrepreneurs	Farm mechanization	
8	Kemin, Godrej and Kargill	Feed related	Farmers	Balanced ration and feeding regime	
9	BAIF and Tata trust	Training Programmes related to all livestock	Focuses on value chain	Scientific Management of livestock including dairy	
10	Ayurvet	Health related programmes	Farmers	Animal health	

Source: *Interaction and Analysis by ASCI*

7.6. Skill Gaps in Dairy Sector

Women Empowerment in Indian Dairy Sector

The stakeholder discussions with various categories of organisations revealed that there are skill gaps in the areas of GAP including health related, breeding aspects, mechanization in dairy farming, clean milk production, balanced feeding and adoption of technologies in feeding, fodder conservation and dairy entrepreneurship coupled with economics/profitability at producer level. The skill gaps at procurement and processing level include operation of milk testing infrastructure to identify adulterants and contaminants, regulatory compliance and registration, HACCP, value addition of milk, digital marketing and so on. There is a skilling need for management of farm waste and its better utilisation in the form of bio-gas, boi-gas to electricity/energy and composting. Utmost need for skilling in usage of software applications in dairying and digitization. The YES Bank report (2015) indicated that majority of dairy farmers in India are unaware of technical skills regarding breeding practices, including record keeping and progeny testing which acts as an impediment for improving herd quality. The skill gaps identified in dairy farming, milk procurement and milk value chain are furnished below:

Exhibit. 12. Identified Skill Gaps in Dairy Sector

S. No.	Category	Profile /details	Skill Gap	Remarks
A	**Skill Gaps in Dairy Farm Structure**			
1	Small farms	Illiterate farmers or educated up to secondary level	• Animal health care, feed and nutrition, breeding techniques and AI, hygienic practices	75 % of dairy animals in the hands of small farmers
2	Commercial farms	Education level varies from primary /secondary to high qualified people from various parts of country	• Animal health care, breeding practices, Artificial insemination, modern techniques in animal farming, hygienic practices of production, mechanisation in the farms, • Shed managemnet • Milk quality and storage • Marketing	Usually, Commercial farms sell milk on their own and very few pour to organised players
3	Milk procurement and supply chain	Qualified with Bsc or Msc from food and dairy sectors	• Milk testing and quality assaying, operation of chilling machinery/equipment, cold chain operation, transportation and maintenance	
B	**Skill Gap at Milk Collection Points in India**			
1	Village milk collection centers	Co-operatives as well as Private Dairies	• Need skilling in Milk testing equipment, skilling in testing of adulterants and contaminants and other infrastructure in terms of technology. • Need Personnel with technical training to manage village-level collection and BMCU/chilling centres.	Process of procurement is technologically improving from time to time and hence skill upgradation of existing manpower also needed and it is a continuous process

2	Contractors/ aggregators/ vendors	Local vendors and middle men	• Registration and regulatory compliance & Training in hygiene, cleaning, and sanitation quality checking and Safe milk collection and delivery	
C	**Dairy Entrepreneurship**			
1	Dairy farm entrepreneur ship	Rural youth and women	• Commercial dairy farming principles • Economics and profitability of dairy farm, schemes and incentives available • GAP including breeding aspects, health management, balanced feeding and preparation of concentrate feed, Fodder production and conservation • Mechanization in dairy farm • Usage of Software/SMS/Apps for farm management and marketing of milk	Attracting educated unemployed youth to dairy farming is a challenge
2	Organic dairy farming	All farmers	• Organic principles in dairying	Upcoming area
D	**Farmers collectives**	Cooperatives, MPCs, FPOs and others	• General Management • Accounts and finances • Milk procurement, storage, processing • Marketing • Fodder production, conservation and supply to needy members of farmers collectives	GoI promoting lots of FPOs specifically under dairy sector Separate fodder FPOs also initiated recently
E	**Students**	School students Graduation level	• Making them aware of prospects in dairying • Latest technologies ex. Dairy farm mechanization, cold chain maintenance, etc.	

Source: *Primary Research and ASCI analysis*

7.7. Skilling Need in Dairy Sector

Rearing of Buffaloes

There is a wide gap between the developed countries and India in the farm size, productivity and practices of the dairying. Though, India is the world's largest producer, milk yields per animal are currently only one-eighth of the level achieved in North America, other countries (OECD - FAO 2019). To bridge the yield gap/productivity in milk, there is a need for improving skills and efficiency of the dairy worker, apart from addressing other challenges and technological interventions.

According to the YES Bank report (2015), the requirement of skilled labour is more in the dairy sector than in agriculture. The report also indicates majority of the dairy farmers holds small dairy farms (less than 5 animals), are poor illiterate/ education below 12th, lack skills and managerial ability, have inadequate resources and operates in unorganised manner with inadequate infrastructure. The Yes bank report also highlighted about the lack of education among the dairy farmers and inefficient training programmes. The biggest difference between the dairy industry in India and the developed countries is that there the farmers are themselves formally educated with various certificate/diploma/degrees in farm management, cattle health and milk productivity. They work in coalition with the veterinarians and laboratories in order to optimize the milk production.

Skill development of dairy farmers can enhance family income and provide a sustainable source of livelihood. Augmenting knowledge and skill levels of the workforce is essential to enhance resource productivity, boost innovation, manage finance, mitigate risks, and improve decision-making ability will enable sustainable dairy farming. Skill provision includes training in clean milk production, artificial insemination, treating minor injuries/ wounds, feed/ fodder preservation, milk preservation, etc. (Datta 2018). The Indian Dairy Association in its 46th Annual conference highlighted that "manpower needs of the dairy industry should be assessed accurately and the existing workforce needs to be continuously trained to improve their professional skills and competencies". Women play a significant role in the dairy sector from the rearing of the animal to selling milk, they should be trained in the field of scientific animal breeding and economic feeding, (Recommendations of the 47th Dairy Industry Conference, Indian Dairyman, Conference Special, Part-1, March 2019).

The Sub-group of Chief Ministers on Skill Development noted that:

- Major demand areas identified for Skill Development are for various job roles in respect of dairy farm management, milk collection and handling livestock health management
- Focus on dairy development should be on multi-task artificial insemination technician in rural India, dairy entrepreneurs, and animal breeders
- Training needs to be imparted on supporting activities such as Azolla cultivation, silage making and cultivation of high yielding varieties of fodder

The Committee on Doubling of Farmers' Income, GoI (DFI 2018) has identified a few technological interventions needed to improve productivity and increase output of the dairy and livestock sector that are likely to create more demand for skilled manpower. These include:

- Provision of timely and quality artificial insemination (A.I.) facilities and reducing the gap in demand and availability of good quality male germplasm.
- Advanced technological interventions like Genome selection and Embryo transfer (ET)/IVF for sustained breed improvement.
- There is the need for greater dissemination of region-specific technology for green fodder production on variety of land types and fodder conservation
- A tracking and tracing system for the cattle feed supply chain with compliance to appropriate BIS standards for feed and fodder quality and animal safety.

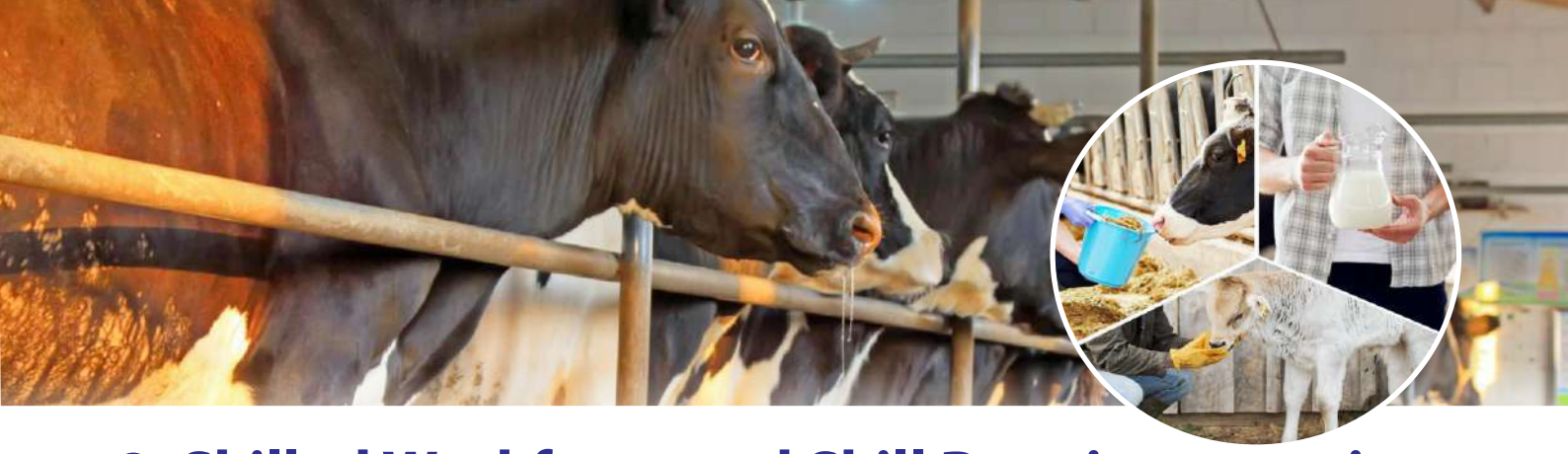
The complete cold-chain infrastructure to maintain the quality and to expand the range of milk supply to be strengthened and the milk processing plants need to be modernised inorder to improve competitiveness and capturing international markets.

The Strategy for New India @75 by NITI Aayog also identifies the following steps for further growth of the dairy sector:

- Breeding should be a tool for reducing inbreeding and enabling greater gene coverage, reduced diseases, and greater resilience to climate change
- Promote and develop bull mother farms for adopting embryo transfer technologies to significantly enhance milk productivity through the supply of cattle with enhanced milk potential to farmers
- Strengthening of Village level procurement systems through provision of adequate infrastructure

Therefore, skilling of existing dairy farmers and personnel working in the value chain of milk is very essential to reap the real benefits. Emphasis on skilling of youth will make then to retain in dairy farming with good income. As women play an important role in the dairy sector from the rearing of the animal to selling milk, the focus on skilling women in the field of scientific animal management, breeding and economic feeding is necessary.

SKILLED WORKFORCE AND SKILL REQUIREMENTS IN DAIRY INDUSTRY



8. Skilled Workforce and Skill Requirements in Dairy Industry

8.1. Workforce in Dairy Farming and their Skill Level

The estimated work force (ps+ss) under each category of dairy sector as per PLFS surveys is given below in the Exhibit.13 from 2017-18 to 2022-23. The major workforce is involved in raising of animals solely and as mixed farming and the workforce associated with direct dairy farming is about 25.23 million farmers in 2022-23 as against 6.073 million farmers in 2017-18. The share of workforce in 'direct dairy farming' has increased from 1.63% of total workforce to 5.34% and there is a decline in workforce in respect of 'support activities for animals and manufacture of dairy products' which might be due to mechanization, efficiency and new models of delivery. Acosta et al.,2021 opined that new patterns of consumer and business behaviour emerged, innovations and transition to newer business models has occurred and companies which have quickly evolved in response to the pandemic fared extremely well. Such new models (ex. E-commerce, orders on Apps, etc.) have been observed during COIVD time and continuing later also.

The PLFS survey 2022-23 indicates that only 3.3% of the workforce above 15 years of age has technical education and training either Degree or Diploma and about 96.6% of total workforce above 15 years of age don't have any technical education. Among these who don't have technical education, formally skilled persons are only 3.4% (2021-22) as against 2% in 2017-18 and others (16.1%) are trained in an informal manner i.e hereditary, self-learning and learning while doing job. Rest of the personnel didn't receive either formal or informal vocational/technical training. Similar situation prevails in agriculture sector as a whole as well in dairy sector also.

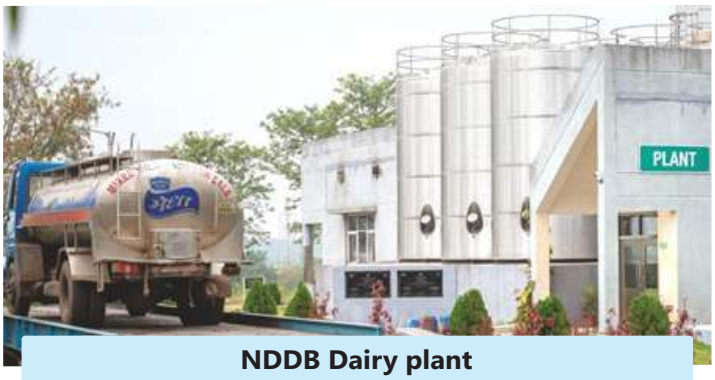
Various Generations and Gender Involved in Dairy

Exhibit. 13. Estimated Working Persons (PS+SS) under Each Category of Dairy Farming and Associated Livestock Activities

Type of work (code description) and NIC 2008 code in parenthesis	Year-wise percent distribution and estimated working persons (ps+ss) in lakhs under each category of Dairy farming												Average growth rate %
	2017-18		2018-19		2019-20		2020-21		2021-22		2022-23		
	%	Number in lakhs	%	Number in lakhs	%	Number in lakhs	%	Number in lakhs	%	Number in lakhs	%	Number in lakhs	
A. Livestock Sector													
i. Rising of cattle and buffaloes (0141) - **Dairyfarming**	1.63	60.73	2.03	77.25	2.4	102.42	2.83	123.82	3.42	157.02	5.34	252.33	**31.53**
ii. Mixed farming (crops and various livestock)(0150)	1.41	52.53	1.44	54.80	1.58	67.43	2.03	88.82	3.03	139.12	3.63	171.53	**25.63**
iii. Support activities for animal activities (0162)	0.04	1.49	0.05	1.90	0.02	0.85	0.01	0.44	0.02	0.92	0.01	0.47	**-5.24**
iv. Wholesale of agricultural raw material and live animals (0462)	0.18	6.70	0.23	8.75	0.15	6.40	0.21	9.19	0.20	9.18	0.23	10.87	**11.48**
v. Veterinary activities by Veterinarians and including ambulances (0750)	0.03	1.11	0.03	1.14	0.03	1.28	0.03	1.31	0.02	0.92	0.03	1.42	**6.69**
vi. Production of hides skins from slaughter houses (1010)	0.10	3.72	0.08	3.04	0.09	3.84	0.08	3.50	0.11	5.05	0.11	5.19	**7.30**
vii. Manufacture of dairy products (1050)	0.11	4.09	0.08	3.04	0.09	3.84	0.08	3.50	0.09	4.13	0.06	2.84	**-5.85**
viii. Manufacture of prepared animal feed (1080)	0.01	0.37	0.01	0.38	0.02	0.85	0.01	0.44	0.03	1.38	0.01	0.47	**42.20**
A. Livestock Sector	**3.5**	**130.78**	**4.4**	**167.45**	**4.38**	**186.92**	**5.28**	**231.02**	**6.09**	**317.72**	**6.92**	**445.13**	**28.10**
B. Total Estimated workers under PLFS survey		**3726.19**		**3805.69**		**4267.48**		**4375.41**		**4591.28**		**4725.23**	
C. % of Agricultural workers		**44.1**		**42.5**		**45.6**		**46.5**		**45.50**		**45.80**	
D. Workers in Agriculture		**1643.25**		**1617.42**		**1945.97**		**2034.56**		**2089.03**		**2164.12**	
E. % Workforce in Livestock sector (A) to Agriculture sector (D)		**7.96**		**9.29**		**9.61**		**11.35**		**15.21**		**20.57**	
F. Incremental workforce added in dairy farming (in lakh numbers /annum)- difference inyear-wise figures of point i of A			**16.52**		**25.16**		**21.40**		**33.19**		**95.31**		

Calculation : *The % of workers (under A each row of the year) and total estimated workers (B)taken from PLFS survey.*
Number of workers for each type under dairy = % of workers at each type at A x Total estimated workers in each year at B
Incremental workforce added in dairy farming (in numbers /annum) =difference of workforce under raising of cattle and buffaloes in the subsequent year on year

8.2. Workforce in Dairy Processing Industry and their Skill Level



NDDB Dairy plant

The Annual survey of industries (ASI) indicate that there are 1899 operational manufacturing units under the segment of 'dairy products' in 2021-22 as against 1886 in the year 2016-17 (Exhibit.15). A total of 2.04 lakh persons engaged in dairy processing sector in 2021-22 and out of these 75% are workers and 10% are Supervisory and managerial personnel and rest (15%) are in other roles. These dairy product units grew with an average growth rate of 1.26% while the growth rate in workforce (employment) is @ 3.89%. The average growth rate per annum in workers and managerial personnel is in the range of 4.53 to 4.61 per cent (Exhibit.14).

Exhibit. 14. Workforce in Dairy Processing Industry

S.No.	Particulars	Years						Average growth rate in last 5 years
		2021-22	2020-21	2019-20	2018-19	2017-18	2016-17	
A	**Factories**							
1	Number of factories	2170	2185	2159	2120	2064	2039	1.26
2	Number of factories in operation	1899	1881	1904	1867	1812	1886	0.17
B	Total Persons engaged	204918	195874	214845	189470	176956	171497	3.89
1	Workers (numbers)	153247	145405	158363	143282	133107	124104	4.53
1.1	Directly Employed	74207	69563	77673	72971	66230	66100	2.61
	Men	64671	62806	68883	65855	59078	58125	2.37
	Women	9536	6757	8790	7116	7152	7974	6.14
1.2	Employed through contractors	79040	75841	80689	70310	66877	60005	5.91
2	Employees other than workers (numbers)	51354	50177	56244	45912	43540	45105	3.21
2.1	Supervisory andManagerial	20385	20170	20039	17173	15669	16490	4.61
2.2	Other employees	30969	30007	36205	28739	27871	28615	2.52
3	Unpaid family members/ proprietors,etc.	316	292	238	276	309	289	
C	**Percentage of various categories of workforce to total workforce**							
1	% Workers to total workforce	75	74	74	76	75	72	
	% Supervisory and managerial workforce	10	10	9	9	9	10	
	% Other employees	15	15	17	15	16	17	

Source: *Annual Survey of Industries of various years, MoSPI, GoI and analysis by ASCI team*
As per the MoFPI report, 2022, there are operator level employees @74%, top management @5%, middle management @8% and lower management or supervisory are 13%. These are more or less corroborating with those of data of Annual survey of Industries. The percent distribution of workforce as per the job profiles, their education level and experience are furnished below in Exhibit.15.

Exhibit. 15. Workforce Distribution in Dairy Manufacturing and Education Level

S. No.	Particulars of Workforce	Details of workforce	% Workforce to total workforce in Dairy manufacture*	Education level	Experience
1	Top Management	Head of the plant, Senior Plant manager	5	Any UG with MBA or UG in dairy technology	Experience of 10 years for large plants and 3-5 years for small units
2	Middle management	Procurement, Production, Quality control, sales & marketing R&D in big plants	8	UG in Engineering	Experience of 8-10 years for large plants and 3-5 years for small units
3	Lower management	Sourcing, Line in-charges/ supervisors of various products, Quality analysts, Filed supervisors, area sales,	13	Diploma/ITI	3-4 years' experience in industry
4	Operator- Level Employees	Total operator level	74		
		Loader and Unloader	5	10-12th or less	1-2 years' experience in industry
		Helpers	21	10-12th or less	
		Supervisors	6	Diploma/ITI	
		Packaging	25		
		Cleaning and pre-processing	27	10-12th or less	
		Machine operators	7	Diploma/ITI	

Source:*Data from Study to assess Human Resource and Skill Requirement in Food Processing Sector from 2021-2030, MoFPI report, 2022 and analysis by ASCI*

The employees in dairy manufacturing sector (ASI reports) are highest in Gujarat followed by Maharashtra, Tamil Nadu, Uttar Pradesh, Karnataka, Andhra Pradesh, Punjab, Haryana, Madhya Pradesh, Telangana, Rajasthan, Kerala and Bihar and these states contribute to 90% of the employment and it corresponds to the level of milk production, procurement and processing in these states.

8.3. Skill Requirement Estimates

Various NSQF-QPs with various job roles are notified by ASCI which are as under :

- Animal Health Worker
- Artificial Insemination Technician
- Bulk Milk Cooler (BMC) Operator
- Chilling Plant Technician
- Dairy Farm Supervisor
- Dairy Worker
- Dairy Farmer- Entrepreneur
- Milk Procurement & Input Supervisor
- Milk Tester
- Village Level Milk Collection Centre Incharge
- Veterinary Clinical Assistant

As per the above QPs, the skill requirement is estimated under following categories:

- Milk Production,
- Farm Management,
- Breeding,
- Health and
- Nutrition

With regard to milk processing units, there are no specified job roles with NSQF-QPs which include milk processing segment at plant level; Village resource person to provide various information regarding ration balancing, vaccination, ect. at village level; fodder conservation in the form of silage/hay/TMR/fodder blocks and new emerging activities such as usage of drones in dairying, IoT initiatives for animal identification in traceability, insurance and health initiatives, etc. Skill requirements for all these activities are provided separately.

8.3.1. Skill Requirement Estimates in Milk Production, Farm Management, Breeding, Health and Nutrition

As mentioned under para 8.1 and Exhibit.13, the workforce in dairy farming who are raising cattle and buffaloes are 60.73 lakhs in 2017-18 which raised to 252.33 lakhs in 2021-22 with an average growth rate of 31.53 %. The average incremental workforce added per year under dairy farming (rising of cattle and buffaloes) was 38.31 lakhs during last 5 years. The year-wise growth rate reveals that the growth rate was lower in 2020-21 and 2021-22 when compared to earlier and later years which may be due to COVID lockdown.

The PLFS survey is being conducted from July to June every year which corresponds to the COVID phase 1 and 2 (March 2020 to June 2021). During COVID period, reverse migration from urban areas to rural areas was observed and which has resulted in increase in agricultural labour as well as in dairy farming sector when restrictions are over. The milk production in last five years is increasing between 5-6%. The productivity is also increasing. Further, the progressive farmers are around 5% (SAAH, 2019). Keeping in view all these, the assumptions for estimation of skill requirement is as under :

A. Milk Production: Dairy Farmer or Dairy Entrepreneur

Dairy Farmers and Entrepreneurs

The average incremental workforce added per annum is 38.31lakhs in last 5 years. Methodology for estimation of skill requirement of dairy farmer/entrepreneur is as under :

- 5% of the dairy farmers are progressive farmers (SAAH, 2019).
- Estimated Skill requirement in 2023-24 is @ 5% of the average of the 'incremental workforce added in last 5 years' in dairy farming.
- As every year the workforce in dairy farming is increasing in accordance with milk production (growing>5%) which is coupled with entering of the new people in to the dairying and hence the skilling should be enhanced @ 3-5% per year in next 5 years (2024-25 to 2027-28) over the base year 2023-24. Therefore, 3% increase is considered for next 5 years (exhibit below).

Exhibit. 16. Estimated Skilling Requirement under Milk Production Segment

(In numbers)

SNo.	Job role	Average Incremental workforce added /year between 2017-18 to 2021-22	Year-wise skill requirement in dairy farming/Entrepreneurship					Total skill requirement from 2022-23 to 2027-287
			2023-24	2024-25	2025-26	2026-27	2027-28	
A	Dairy farmer or Dairy entrepreneur	3831909	191595	201175	211234	221796	232885	1058686

Source: *Data from PLFS surveys and estimation by ASCI*

The dairy farmer/entrepreneur programme covers animal Husbandry including balanced ration for feeding of animals. These farmers and entrepreneurs may be trained in usage of e-Gopala App for balancing the ration of their animals by themselves.

B. Farm Management Segment: Dairy Farm Manager, Supervisor and Worker:

Vaccination Done by Veterinary Field Assistant

As mentioned in less than 5% of the dairy animals are under commercial farming with more than 30 animals. Which roughly works out (based on number of milch animals as per the census) to around 1 lakh animals under commercial farms in India. In India, dairying is primarily dominated by small & marginal farmers. The experts indicate that due to promotion of dairying through various state and central schemes, the commercial farms are added a few every year. Inorder to encourage commercial dairying by youth and existing farmers, they may be trained. It may be considered on an average one (1) commercial farm per district which would become 750.

- Assumed incremental commercial dairy farms added every year 750 (above para)
- Every farm requires a Farm manager, farm supervisor with diploma in animal husbandry/dairying qualification and 5 skilled workers.
- The skill requirement for Managers and supervisors would be 750 each in a year
- Skilling for workers 5 persons per farm = 750 x 5 =3750
- Thus, the skill requirement is as under

Exhibit. 17. Estimated Skilling Requirement under Segment-Dairy Farm Management

(In numbers)

S.No	Job Role	Skill Requirement					
		2023-24	2024-25	2025-26	2026-27	2027-28	Total from 2022-23 to 2026-27
1	Dairy Farm Manager	750	750	750	750	750	**3750**
2	Dairy Farm Supervisor	750	750	750	750	750	**3750**
3	Dairy Farm Worker	3750	3750	3750	3750	3750	**18750**

C. Breeding and Livestock Health

The breeding programmes are under implementation in India inorder to improve genetic quality of dairy animals through progeny testing, evaluation of bulls, recording of milk of the progeny, semen production, sexed semen and AI to the animals. For smooth operation of these activities, the skilled man power as Bull keeper, Bull handler, Semen station technician, Milk recorder, etc. are needed. As per DAHD, RGM, every year progeny testing of 75 bulls and milk recordings of 700 to be done. Since these programmes are long term, the yearly programmes are overlapped. Therefore, according to the above target, the man power for skilling and assumptions are as under and skill requirements at Exhibit.18 :

New Born Calf

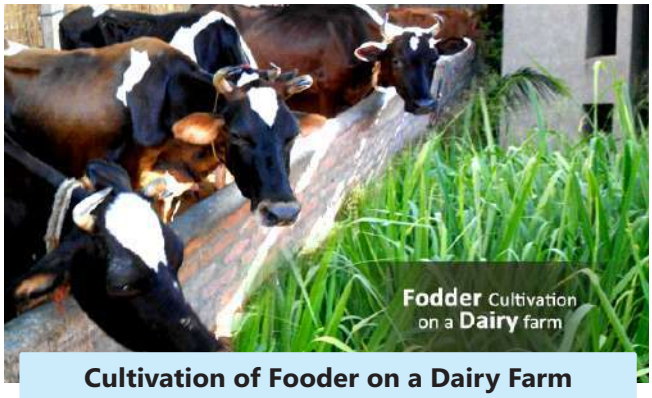
- **Assumptions under Breeding Segment:** Bull handler Target for bull progeny testing is 200 bulls /year (revised RGM guidelines) and minimum milk recording will be 700 per annum (DAHD) per bull. The bull handler and keeper will @ 200 bulls incrementally added (as against 75 earlier) every year. So 125 x 2 workers = 250 workers each newly added in the year 2023-24. Every year replacement 20.
- **Milk Recorder:** Under Progeny Testing and Pedigree selectin projects implemented under RGM at present around 2000 milk recorders are engaged. The Milk recorders require training for accurate milk measurement, milk sampling and data entry in Bharat Pashudhan Application. Considering temporary assignment there is around 20% turn-over of manpower in this role. Thus, each year 400 milk recorders need to be trained. Further there is requirement of another 2500 milk recorders for National Milk Recording Project. Central Herd Registration Scheme also engages milk recorders. Considering these requirements, in 2024-25, new 3000 milk recorders need to be trained and every year around 1000 new milk recorders would be required to be trained from 2025-26.
- **Semen Collectors:** Semen collection for frozen semen production is a very skilled job which requires experience of bull handling and additional skills for semen collection. On an average each semen station will have 4-5 semen collectors based on production capacity of the semen station. Thus around 300 semen collectors are required in the country. Considering around 10% new recruits, around 30 new semen collectors are required to be trained each year.
- **AI Technicians/ Multi-Purpose AI Technicians in Rural India (MAITRIs):** Against the requirement of 2,02,469 AI technicians 1,16,586 AI technicians are available in the country (DAHD annual report 2021). Thus additional 90,958 AI technicians will be required for extension/expansion of AI coverage from present 30% to 70%. In 2021-22 and 2022-23, the MAITRIs trained were 15459 DAHD AR 2022-23). Therefore, as per the achievement, every year the aim for skilling would be 8000.
- **Animal Typers:** For type evaluation of animals that are covered under performance recording, there is requirement of skilled personnel. At present around 60 such people are working on this job. Each year there will be requirement of around 6 such newly trained person.
- **Supervisors:** for each 15 milk recorders there is a need for one supervisor. Similarly, one supervisor is required for every 25 AITs. Thus, for total 5000 milk recorders around 350 supervisors and for 1.15 Lakh AITS, there is requirement of 6000 supervisors. Considering around 5% replacements, around 320 new supervisors need to be trained each year.

- **Animal Health Worker (AWH):** There are about 630000 villages in India. One AHW /paravet per 5-6 villages needed (ex. Bihar BPSY Pashu palan news update 2nd June 2023). At this rate the requirement would work out to 1,00,000 AHWs. Number of AHW available as of now is 63306. These paravets to be trained over a period and every year 10% of the gap and 3% of the existing ones as replacement can be skilled and the skilling aim would be 1900 +2000=4900.

D. Feed and Nutrition

Feed Plant Technician:

About 130 Cattle Feed Plants are assumed to be operating in the country. Feed mixing plants at the farm level and with smaller capacities are not included in the number. keeping in view that every year 20% manpower would be trained annually for existing plants. About 5 % manpower may be added for new plants.



Cultivation of Fooder on a Dairy Farm

- The technicians @ 2 per plant for existing 130 plants would be 260 technicians and out of these 20% i.e 52 will be skilled.
- About 5 new plants every year @ 4 technicians per plant = 20 newly inducted.
- Total per annum would be 72 per year.

Exhibit. 18. Estimated Skilling Requirement under Breeding, Health and Nutrition Segments

(In numbers)

Segment	Mode of Dairy Value Chain	Incremental Addition/Year 2021-22	2023-24	2024-25	2025-26	2026-27	2027-28	Total from 2023-24 to 2027-28
Breeding	Bull Keeper	20	250	20	20	20	20	**330**
	Bull Handler	20	250	20	20	20	20	**330**
	Semen Station (Collector) Technician	30	30	30	30	30	30	**150**
	Milk Recorder	1400 (400+1000)	3000	1400	1400	1400	1400	**8600**
	Supervisors - milk recording	320	320	320	320	320	320	**1600**
	Animal Typers (job role yet to be developed)	6	6	6	6	6	6	**30**
	AI Technicians	7500 + replacement 500	8000	8000	8000	8000	8000	**40000**
Livestock Health	AnimalHealth Worker		4900	4900	4900	4900	4900	**24500**
Feed-Nutrition	Cattle Feed Plant Technician and skilled workers		72	72	72	72	72	**360**

Source: *Analysis by ASCI*
Note: Basis for Breeding activities mention in previous page, In first year added new additions due to change in schemes and in subsequent years the incremental /replacement only added.

8.3.2. Skill Requirement Estimates in Milk Procurement

Milk procurement infrastructure includes collection point with milk testing equipment, chilling centre or BMC. The workforce of milk procurement system includes 'Milk Pooling point Secretary / Milk collection centre in-charge', Milk Pooling Supervisor, Milk Cooling & Chilling centre Operator, Bulk Milk Coolers Operator and other testing equipment operators. The milk procurement is 589.04 LKPD in 2022-23 and liquid milk marketed is 427 LKPD (NDDB annual report 2022-23) and private dairy plants also procuring similar amount (as shown at para 4.2.5). Assumptions for estimation of skill requirement for milk procurement is as under:

- **Milk Tester:** The testing equipment includes AMCU, DPMCU and EMAT which are established at collection point and FTIR based milk analyser established at dairy plant. All together around 20000 units of all types of milk testing equipment per year were established during last 3 years (Annual report, DAHD) under various schemes. Therefore, skilling requirement also similar in number and so the same considered as incremental skilling requirement in subsequent years.

Use of Technology in Milk Procurement

- **BMCs :** Assessment of the Cold Chain Market in India, March 2023, EFC report indicates that BMCs for milk chilling increased from 37500 in 2018 to 52147 in 2020 and incremental added per annum are 7500. The milk procurement chilling infrastructure (BMCs) in cooperative sector are increasing by around 1500 to 2000 units every year in recent past (Annexure.II). Similar number is increasing in the private level also. Therefore, per annum incremental units in BMCs are around 3000 per annum and one person per BMC are to be skilled.
- **Milk Pooling Point Secretary / Milk Collection Centre In-Charge:** On an average 50-60 LLPD capacity of dairy processing plants in Cooperative as well as in private is added per annum (DAHD data on various schemes and NDDB AR 2022-23). If average procurement per collection centre/DCS is around 500 litres, the number of additional collection centres/DCS would be 16000. Hence one person per collection centre (as Milk Pooling point Secretary / Milk collection centre in-charge) for 16000 collection centres per annum.
- **Milk Pooling Supervisor:** It is assumed that one supervisor for every 15 collection centres and the requirement would be around 1000 per annum.
- **Milk Cooling & Chilling Centre Operator/Chilling Plant Technician:** The country has 520 operational chilling plants at the moment and their use is slowly decreasing. Each chilling plant has two staff one for utilities and one for milk chilling operations. Since these are old plants the replacement of staff on attrition or retirement is required and every year 10% replaced also the number will be 520 x 2 = 1040 and 10 % of it would be 104.

Exhibit. 19. Estimated Skilling Requirement under Milk Procurement Segment

(In numbers)

Mode of Dairy Value Chain	Incremental Addition / Year 2021-22	2023-24	2024-25	2025-26	2026-27	2027-28	Total from 2023-24 to 2027-28
Milk Tester (all types of testing equipment operator)	20000	20000	20000	20000	20000	20000	**100000**
Bulk Milk Coolers Operator	3000	3000	3000	3000	3000	3000	**15000**
Milk Pooling point Secretary / Milk collection centre in-charge	16000	16000	16000	16000	16000	16000	**95606**
Milk Pooling Supervisor	1000	1000	1000	1000	1000	1000	**23901**
Milk Cooling & Chilling centre Operator / ChillingPlant Technician	104	104	104	104	104	104	**520**

Here, the skilling requirement for Reefer van driver/operator is not included as it is covered under Farm mechanization skilling requirement.

8.3.3. Skill Requirement Estimates in Milk Processing Segment

About 1899 registered milk manufacturing/processing units operating in India (para 8.2, Exhibit 19 as per the ASI, 20 21-22) with total workforce at 2.05 lakhs. The employees at managerial level are 51354 and workers are 153247. The workforce growth rate more or less flat not reached to pre-covid level. Out of total 2.05 lakh persons engaged in dairy processing sector in last 3 years, on an average 74% are workers and 10% are Supervisory and managerial personnel and rest (16%) are in other roles. As per the MoFPI report, 2022 there are operator level employees @74%, top management @5%, middle management @8% and lower management or supervisory are 13%. These manpower categories are more or less corroborating with those of ASI data. The assumptions to estimate the skill requirement in this segment are as follows :

- **Managerial Level:** Skill requirement in 2023-24 would be assumed as 5% of the top management, lower & middle management employees in 2023-24 with growth rate @ 5% in subsequent years. Generally, the managerial employees belong to B.Tech/M.Tech in dairy technology or Mechanical engineering with or without MBA. Especially in large plants, the employees are of experienced people. Thus, they need skill training in management roles, leadership and behavioral aspects, etc. Hence, only 5% of the managerial employees in 2021-22 are considered with a growth rate of 3.2% (average growth rate of managerial as per ASI in last 5 years) year on year for skilling requirement from 2023-24.
- **Workers /Operator Level:** CII skill report 2021 indicates 30% of diploma holders are job ready and others need skilling. Hence, 70% of incremental workers added are considered for skilling from 2023-24 and with 3.9% (average workers growth rate as per ASI in last 5 years) growth rate in further years. Further, the milk processing units require quite a lot hygiene practices, HACCP, quality control at each level and hence all workers need skilling continuously. In India 50-60% of the milk plants are with old machinery and hence require skilling of the workers especially in case of machine operators and supervisors as and when new machinery is installed. The skill requirement estimate in respect of milk processing is furnished below at Exhibit.20.

Exhibit. 20. Estimated Skilling Requirement under Milk Procurement Segment

S. No.	Particulars of Workforce	Job role	% category-wise workforce to total workforce		Incremental work force added in 2021-22	Skill Requirement per annum					
			(Industry/ MoFPI)	(ASI survey)		2023-24	2024-25	2025-26	2026-27	2027-28	Total
1	**Top Management**	Plant managerand Sr. Plant manager	**5**	**10**	**215**	23	24	24	25	26	**122**
2	**Lower and Middle management**	Personnel looking after Sourcing, Production (Line in-charges/supervisors of various products,Quality analysts) & marketing	21	16	962	102	106	109	113	116	**546**
3	**Total Operator-Level Employees/ workers**		**74**	**74**	**7842**	5926	6157	6397	6647	6906	**32033**
	Operator-Level Employees/workers	Plant worker (for Loader and Unloader, Helper, Cleaning and pre-processing)	53		4516	3413	3546	3684	3828	3977	**18447**
		Supervisor	6		470	355	369	383	398	414	**1920**
		Packaging operator	25		1960	1481	1539	1599	1661	1726	**8006**
		Machine operator	7		549	415	431	448	465	483	**2243**

***Source**: Data from Industry/MoFPI and Analysis by ASCI*
***Calculation:** Skill requirement in 2022-23 = 5% of the top management employees and lower & middle management employees with growth rate @ 3.2% in subsequent years and Workers /operator level : CII skill report 2021 indicates 30% of diploma holders are job ready and hence 70% of workers category to be skilled in 2022-23 and with 3.9% growth rate in further years.*

8.3.4. Skill Requirement in Upcoming Fields and Advanced Technologies

Dairy FPOs:

Small dairy face numerous challenges in livestock feeding, poor animal health care, weak extension services, poor credit mechanisms and improper milk marketing as described under chapter on challenges. Collectivization of dairy farmers in the form of cooperatives in many states has shown the way of solving many of these challenges. As improved collective organizations i.e producer companies as hybrid of dairy co-operatives and business companies are an emerging concept. NDDB through its NDS has promoted many milk producer companies MPCs) and those members benefitted from improved delivery of input mechanisms to milk marketing. National dairy Development Board (NDDB) spearheaded the formation of dairy producer companies in areas which had low coverage of cooperatives and procurement and started organizing MPCs in year 2005 in Saurashtra-Kutch region. (NDDB). At present 210 active milk producer companies exist in India; 81 percent of them are less than 5 years old; 50 percent of top 20 farmer producer companies are dairy based (D.Thakur, 2020). Some of India's large milk producer companies are Maahi (Guajarat), Paayas (Rajasthan), Saahaj (UP), Baani (Punjab) and Sreeja (AP).

As per NABARD (website nabfpo) about 2065 FPOs are formed and of these 351 (17%) are dairy FPOs.

Institutions Available in India for Development of Dairy

Government of India has given emphasis on organization of Farmer producer organisations (FPOs) with a target of 10,000 farmer producer organisations by 2023-24 (GOI, 2020 budget). Aditionally, GoI initiated formation of minimum of 100 FPOs under fodder specifically due to deficit of fodder. The current deficit is due to seasonal factors coupled with and regional variation and presently the inflationary trend in fodder is due to decline in wheat and maize crops due to climatic conditions and rise in input costs like diesel, etc. The total area under fodder is limited and stagnant for last 4 decades at about 4.6 per cent of cropped area.

Thus, there is a scope for formation of FPOs in dairy sector to a tune of 100 FPOs/annum under dairy. The skill requirement in FPOs is 100 x 5 persons/FPO/year=500

Fodder Conservation

- **Fodder Conservation:** As mentioned under Challenges (para 4.3.2), there is a deficit in dry fodder, green fodder and concentrates. The DAHD annual report highlighted on the deficit of dry fodder as crop residue is burned (93 million tonnes) annually. Therefore, crop residue to be collected and utilized in making of TMR and/or fodder blocks. Further, green fodder to be conserved in the form of silage or hay as green fodder is produced in limited way as negligible availability of village common lands and grazing lands and restriction to forest areas for grazing. Therefore, skill requirement in fodder conservation is proposed @ 10 farmers per block in 7256 blocks of India.
- **Cattle Feed Plant Officers for Quality Control :** There is need for quality control of cattle feed which is prepared in feed plants. Quality control always helps in provision of quality and nutritious feed as per the standards inorder to enhance the production performance of animals.

IoT Initiatives and Drones

- IoT initiatives for animal identification in traceability, insurance and health initiatives, etc. Skill requirements for all these activities are provided separately. IoT devices helps farmers to measure and monitor various parameters such as relevant vitals of animals, movement, body temperature, humidity, heat detection, medical parameters, food intake, etc. The data collected in these devices useful for monitoring of animal health, alerts for AI, stress alerts, calving alerts, etc.
- Drones are used in dairying for animal tracking and counting, management of animal health conditions and farm security in bigger farms, etc. The skill requirement in IoT and Drones would be @ 2 per districts = 700x 2= 1400 per annum in each category.

Specialised Roles in Animal Breeding Services at Veterinarians level:

As per the experts, there is dearth of technical personnel (Veterinarians and Specialist breeders) for following roles inorder to provide quality semen, breeding bulls upon progeny testing and alos technological interventions like IoT. It is proposed to train 2 per district in 700 districts every year inorder to look after these activities.

- AI network managers
- Veterinarians providing infertility treatment support
- Specialists working on IoT devices to be used for heat detection
- Veterinarians required for implementing specialized breeding projects like Progeny Testing
- Veterinarians for bull production activities
- Veterinarians specialized in semen production and bull management
- Quantitative Genetics specialists
- Veterinarians specialized in extension services
- Lab technicians and lab managers

Exhibit. 21. Skill Requirement in Upcoming Fields and Advanced Technologies

S. No.	Job Role	Skill Requirement					
		2023-24	2024-25	2025-26	2026-27	2027-28	Total
1	Dairy FPO management (both dairy & fodder)	500	500	500	500	500	2500
2	Cattle feed plant managers for Quality control	50	55	60	65	70	300
3	Fodder Conservation technician	10000	10000	10000	10000	10000	50000
4	Technician IoT devices in dairy	1400	1400	1400	1400	1400	7500
5	Drone technician for dairy farming	1400	1400	1400	1400	1400	7500
6	AI network managers	1400	1400	1400	1400	1400	7500
7	Veterinarians providing infertility treatment support	1400	1400	1400	1400	1400	7500
8	Specialists working on IoT devices to be used for heat detection	1400	1400	1400	1400	1400	7500
9	Veterinarians for Progeny Testing	1400	1400	1400	1400	1400	7500
10	Veterinarians for bull production activities, bull management and semen production	1400	1400	1400	1400	1400	7500
11	Quantitative Genetics specialists	1400	1400	1400	1400	1400	7500
12	Veterinarians specialized in extension services	1400	1400	1400	1400	1400	7500
13	Lab technicians and lab managers	1400	1400	1400	1400	1400	7500

Source: *Analysis by ASCI. The assumptions are given in above paragraphs*

8.4. Summary of Skill Requirement Estimates in Dairy Sector

The summary of skill requirement estimates in dairy sector for all activities and corresponding ASCI job roles and future job roles is furnished below :

Exhibit. 22. Summary of Skill Requirement in Dairy Sector

(In numbers)

S.No.	Job Role	Year-wise Skill Requirement in Diary Sector					Total Skill Requirement for 5 Years
		2023-24	2024-25	2025-26	2026-27	2027-28	
I	**Skill Requirement with ASCI Job Roles**						
A	**Dairy farmer or Dairy entrepreneur**	191595	201175	211234	221796	232885	**1058686**
B	**Dairy Farm Management Segment**						
1	Dairy Farm Manager	750	750	750	750	750	**3750**
2	Dairy Farm Supervisor	750	750	750	750	750	**3750**
3	Dairy Farm Worker	3750	3750	3750	3750	3750	**18750**
C	**Breeding and Livestock Health**						
1	Bull Keeper	250	20	20	20	20	**330**
2	Bull Handler	250	20	20	20	20	**330**
3	Semen Station (Collector) Technician	30	30	30	30	30	**150**
4	Milk Recorder	3000	1400	1400	1400	1400	**8600**
5	Supervisors -milk recording	320	320	320	320	320	**1600**
6	Animal Typers (jobrole yet to be developed)	6	6	6	6	6	**30**
7	AI Technicians	8000	8000	8000	8000	8000	**40000**

(In numbers)

S.No.	Job Role	Year-wise Skill Requirement in Diary Sector					Total Skill Requirement for 5 Years
		2023-24	2024-25	2025-26	2026-27	2027-28	
D	**Animal Health**						
1	Animal Health Worker	4900	4900	4900	4900	4900	**24500**
E	**Feed and Nutrition**						
	Cattle Feed Plant Technician and skilled workers	72	72	72	72	72	**360**
F	**Milk procurement**						
1	Milk Tester (all types of testing equipment operator)	20000	20000	20000	20000	20000	**100000**
2	Bulk Milk Coolers Operator	3000	3000	3000	3000	3000	**15000**
3	Milk Pooling point Secretary / Milk collection centre in- charge	16000	16000	16000	16000	16000	**95606**
4	Milk Pooling Supervisor	1000	1000	1000	1000	1000	**23901**
5	Milk Cooling & Chilling centre Operator / Chilling Plant Technician	104	104	104	104	104	**520**
I	**Total**	**253777**	**261297**	**271356**	**281918**	**293007**	**1395863**
II	**Skill Requirement with Future ASCI Job Roles**						
A	**Milk Processing**						
1	Top Management - Plant manager and Sr. Plant manager	23	24	24	25	26	**122**
2	Lower and Middle management - looking after Sourcing, Production	102	106	109	113	116	**546**
3	Operator-Level Employees/workers	5926	6157	6397	6647	6906	**32033**
B	**Upcoming fields and advanced technologies**						
1	Dairy FPO management (both dairy & fodder)	500	500	500	500	500	**2500**
2	Cattle feed plant managers for Quality control	50	55	60	65	70	**300**
3	Fodder Conservation technician	10000	10000	10000	10000	10000	**50000**
4	Technician IoT devices in dairy	1400	1400	1400	1400	1400	**7500**
5	Drone technician for dairy farming	1400	1400	1400	1400	1400	**7500**
6	AI network managers	1400	1400	1400	1400	1400	**7500**
7	Veterinarians providing infertility treatment support	1400	1400	1400	1400	1400	**7500**
8	Specialists working on IoT devices to be used for heat detection	1400	1400	1400	1400	1400	**7500**
9	Veterinarians for Progeny Testing	1400	1400	1400	1400	1400	**7500**
10	Veterinarians for bull production activities, bull management and semen production	1400	1400	1400	1400	1400	**7500**
11	Quantitative Genetics specialists	1400	1400	1400	1400	1400	**7500**

(In numbers)

S.No.	Job Role	Year-wise Skill Requirement in Diary Sector					Total skill Requirement for 5 Years
		2023-24	2024-25	2025-26	2026-27	2027-28	
12	Veterinarians specialized in extension services	1400	1400	1400	1400	1400	**7500**
13	Lab technicians and lab managers	1400	1400	1400	1400	1400	**7500**
II	**Total**	**24550**	**24555**	**24560**	**24565**	**24570**	**127800**
III	**Grand Total (I+II)**	**278327**	**285852**	**295916**	**306483**	**317577**	**1523663**

CONCLUSION AND POLICY IMPLICATIONS




9. Conclusion and Policy Implications

The dairy sector in India has witnessed a sustained growth in past few decades. India is now the largest milk producing country in the world as well as self-sufficient in milk production. Consumption of milk and milk products constitutes a major part of diet and source of nutrition. This sector is dominated by small and marginal farmers for whom dairy is an important livelihood activity and has immense employment potential. However, the skill base in milk production industry is very low. More attention need to paid on skill development of the dairy workers for improving productivity of milch animals, raising income levels of milk producers, cost-cutting, and for increasing share in global market. The productivity of Indigenous animals is still a challenge as India has an average productivity of 987 kgs of milk production per annum as against the global average of 2038 kgs. Any efforts to raise productivity of animals will not yield intended results until skill up-gradation of vast number of dairy workers is given due care.

Even within this low skill base of the dairy industry women are particularly disadvantaged in terms of access to formal skill training. Women constitute a large share of dairy workers. As per Department of Animal Husbandry and Dairying, the dairy sector is considered to be a source of income to 70% of rural woman households. Therefore, skill development of women needs special attention.

There are some healthy trends observed in recent years. The number of skilled dairy workers have increased in almost all the States. Few States which had no skilled dairy workers in 2011-12 have also seen an increase in their numbers. However, there is wide regional disparity in availability of skilled labour. In this regard, north-east States needs special focus in all skill development programmes.

Secondly, there is a trend of increasing commercialisation, market-oriented and organised milk production. Such trends will create more employment opportunities for skilled labour. Several States have taken progressive initiatives like setting up of bulk milk coolers, milk testing equipment artificial insemination centres, subsidising fodder and subsidies for setting-up or expansion of dairy farms. Such initiatives will also generate demand for skilled labour.

Given the facts that among a large section of workers knowledge and skills are transmitted through informal methods including hereditary and self-learning and there are large numbers of small producers for whom attending long duration courses is difficult, there should be the promotion of short term courses and recognition of prior learning through NSQF certificates to increase the responsiveness of the workers towards skill training and to reach out to a large section of the population within a short period. A sizeable number of the dairy labour are trained via traditional ways, learned skills on the job, and various informal ways. Sufficient arrangements should be made for upskilling/ reskilling of these traditional dairy labour for better productivity and incomes.

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ANNEXURE

Annexure-I

State-wise Agricultural households accessing technical advice and agricultural households who adopted technical advice among those who accessed technical advice during the year 2018-19

S. No.	Name of the State	Percentage of Agricultural households that accessed technical advice (%)		Percentage of Agricultural households who adopted technical advice among those who accessed technical advice (%)	
		Jul18- Dec18	Jan 19- Jun 19	Jul18- Dec18	Jan 19- Jun 19
1	Andhra Pradesh	73.5	65.2	91.8	90.5
2	Arunachal Pradesh	18.9	16.0	87.6	69.9
3	Assam	26.3	18.6	91.0	92.2
4	Bihar	35.4	41.5	91.3	92.1
5	Chhattisgarh	43.8	17.4	96.6	62.8
6	Gujarat	42.5	45.2	87.0	86.6
7	Haryana	61.7	63.0	98.0	97.3
8	Himachal Pradesh	65.0	58.8	76.1	85.0
9	Jammu & Kashmir	67.5	48.7	97.2	97.4
10	Jharkhand	33.3	22.0	88.9	86.6
11	Karnataka	47.7	46.2	77.8	79.3
12	Kerala	71.1	61.9	88.1	76.9
13	Madhya Pradesh	45.4	48.5	78.5	83.7
14	Maharashtra	64.1	46.6	93.3	92.1
15	Manipur	23.6	9.3	94.9	68.2
16	Meghalaya	6.7	12.5	34.8	50.3
17	Mizoram	80.2	79.0	84.9	85.9
18	Nagaland	39.4	19.3	78.0	81.0
19	Odisha	65.1	26.4	84.4	76.8
20	Punjab	40.7	44.7	98.6	99.8
21	Rajasthan	34.5	23.5	92.9	92.7
22	Sikkim	54.2	54	93.8	91.5
23	Tamil Nadu	78.6	62.8	91.5	91.5
24	Telangana	63.0	48.0	95.3	97.4
25	Tripura	39.7	22.7	92.5	99.9
26	Uttarakhand	29.0	16.3	93.0	95.4
27	Uttar Pradesh	50.6	50.2	90.8	92.2
28	West Bengal	36.6	40.7	93.7	94.3
29	All India	48.7	42.2	89.8	89.5

Source : *Situation Assessment of Agricultural Households and Land and Holdings of Households in Rural India, 2019 (NSS 77 th round), MoSPI, GoI*

Annexure-II

Milk procurement and processing infrastructure under Cooperative dairy sector

S.No.	Cooperative dairy Sector - A Glance	Year-wise cumulative figures				
		2018-19	**2019-20**	**2020-21**	**2021-22**	**2022-23**
1	Dairy Cooperative Societies in Numbers	190516	193195	196114	226415	231951
2	Producer members (000')	16929	17232	17263	17552	17441
3	Milk procurement (000' kg/day)	50769	48001	51823	59178	58904
4	Liquid milk marketing (000'litres/day	35453	37126	36146	39085	42673
5	**Cold chain Infrastructure**					
a	BMC (TL)	41447	43430	48901	57156	58668
b	Chilling centres (TLPD)	18190	18366	18287	18653	23257
c	Dairy plant (TLPD)	81524	85846	89262	95508	103080

***Source**:Situation Assessment of Agricultural Households and Land and Holdings of Households in Rural India, 2019 (NSS 77 th round), MoSPI, GoI*

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