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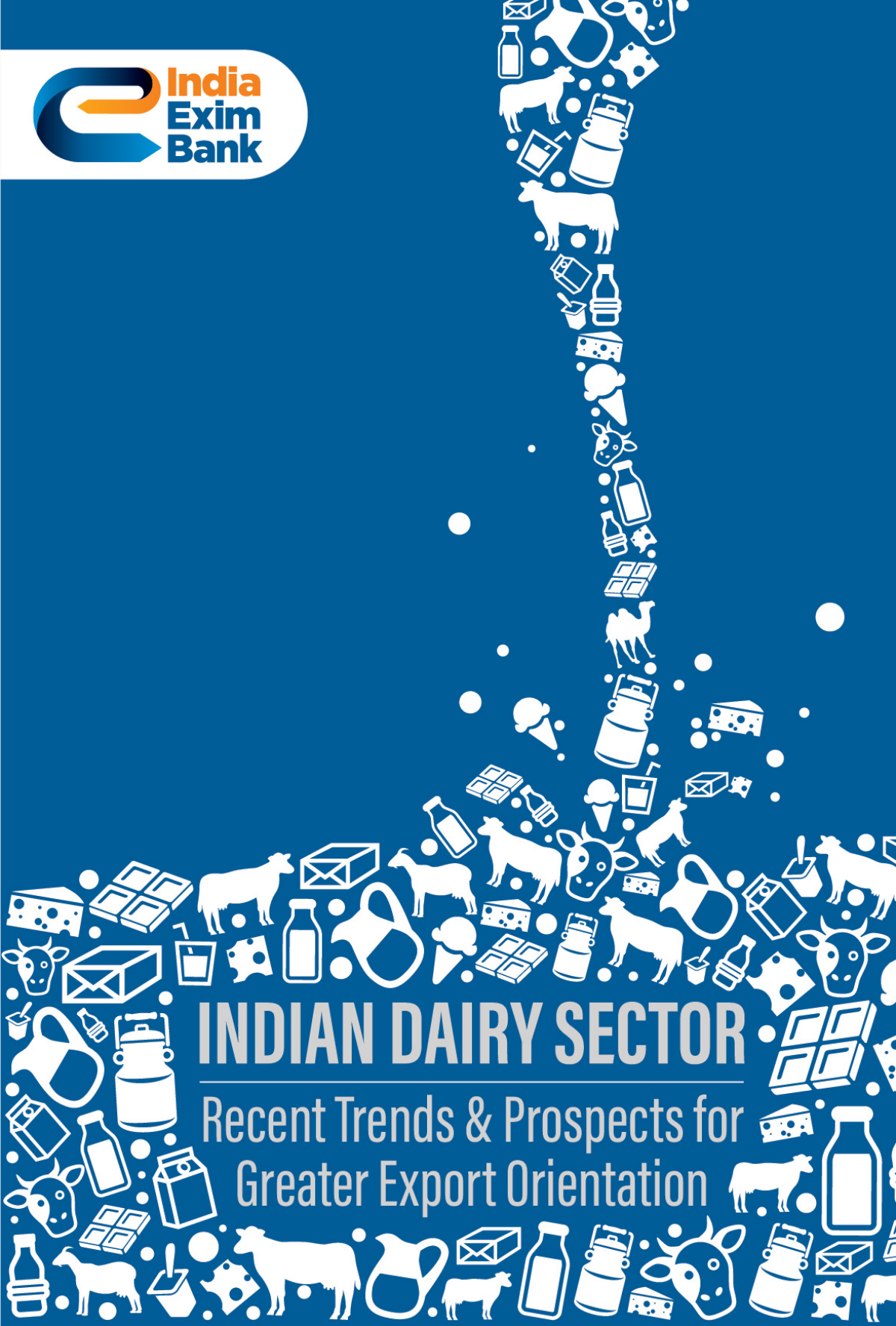

INDIAN DAIRY SECTOR

Recent Trends & Prospects for Greater Export Orientation

EXPORT-IMPORT BANK OF INDIA

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Indian Dairy Sector: Recent Trends and Prospects for Greater Export Orientation

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EXECUTIVE SUMMARY

Dairy refers to harvesting or processing (or both) of animal milk – mostly from cows or buffaloes, but also from goats, sheep, horses, or camels – for human consumption. Dairy started as a subsistence activity thousands of years ago, but is now commercialized to varying degrees across geographies.

India is the largest producer of milk, and the organized dairy sector in the country is engaged in commercial production of pasteurised milk and several value added products. The dairy sector is also an important area of interventions for the Government of India due to its significant impact on employment, livelihoods, and food security.

In spite of the large domestic production and the Government support, Indian dairy industry has been unable to effectively tap the international market. It is in this context that this Study attempts to analyse the global and Indian dairy industry, identify the export potential of Indian dairy products, and discuss the impediments to realization of the export potential. The Study also discusses the strategies to overcome the challenges faced by the Indian dairy industry, improve competitiveness of domestic dairy products, and build capacities for engendering growth in exports from the sector.

GLOBAL SCENARIO

Dairy Trade

Global exports of dairy products were estimated at US$ 81.6 billion during the year 2020, witnessing a decline of 0.9% as compared to the previous year. In spite of the decline in the recent period, global exports of dairy products recorded a Compound Annual Growth Rate (CAGR) of 2.2% during

the period 2010 to 2020. New Zealand was the leading exporter of dairy products with exports valued at US$ 11 billion (share of 13.4% in global exports) during 2020, followed by Germany (12.4%), the Netherlands (10.3%), France (8.8%), the USA (6.0%), and Italy (4.9%). India held the 44th position in the exports of dairy products, with a share of just about 0.2% in the global exports during 2020.

Germany was the leading importer of dairy products with imports valued at US$ 8.0 billion (share of 9.6% in global imports) during the year 2020, followed by China (8.3%), the Netherlands (5.1%), France (4.8%), Italy (4.6%), and the UK (4.3%).

Milk Production and Trade

Milk is the most consumed, processed and marketed dairy product. The global production of milk during the year 2019 was estimated at 852.4 million tonnes, witnessing a y-o-y increase of 1.3%. Milk production was further forecast to have reached 867.4 million tonnes during 2020. India is the leading producer of milk, with an estimated production of 191.8 million tonnes during 2019, and a share of 22.5% in the global milk production. The European Union has the second largest share in the global milk production, with estimated share of 17.9%, followed by the USA (11.6%), Pakistan (5.5%), China (4.2%), Brazil (4.2%), and Russia (3.6%).

Milk has a low export orientation, with only 2.4% of the milk produced in the world traded globally. In value terms, the global exports of milk[1] were valued at nearly US$ 29.1 billion in 2020, witnessing a marginal y-o-y decline of 0.7%. New Zealand, the 8th largest producer of milk in 2019 is the largest exporter of milk, with its share in global milk exports estimated at 22.4% during the year 2020. Germany, the USA, the Netherlands, and France, with shares of 10.1%, 7.9%, 7.5%, and 6.2%, respectively, were the other major exporters of milk during 2020. China was the largest importer of milk with a share of 15.5% in global milk imports during 2020, followed by Germany (6.2%), the Netherlands (4.2%), Belgium (3.7%), and Italy (3.5%).

[1] HS 0401 and HS 0402

Production and trade pattern of other major dairy products including cheese, butter, whey, and casein are also analyzed in the study. India was the leading producer of butter, with a share of 39.3% in the global butter production, but its share in global exports of butter stood at a mere 1.2% in 2020. India was also the 9th largest exporter of casein, with a share of 0.7% in the global casein exports.

INDIAN SCENARIO

India is among the largest producers and consumers of dairy products. In the global consumption of dairy products, India's share was estimated at 22.6% during 2018 while the share of India in the global production of dairy products was estimated at a relatively lower 20.6% during the same period. Most of the production in the dairy sector is utilized for catering to the large and growing domestic demand, and as a result, exports of dairy products from India have been low.

Milk production in India was estimated at 198.4 million tonnes during 2019-20, registering a y-o-y increase of 5.7%. Growth has been stable over the past decade, as the milk production in India increased from 127.9 million tonnes in 2011-12 to 198.4 million tonnes in 2019-20. The production of other dairy products exhibited a mixed trend, with intermittent periods of growth and decline across all major categories, except ice cream whose production has been continuously increasing since 2013-14, registering a CAGR of 5.3% during 2012-13 to 2019-20. The production of milk powder and butter in India witnessed double-digit decline of 16.7% and 25.6%, respectively, in 2019-20. Decline in production of milk powder in 2019-20 can be attributed to the late onset of flush season during the year.

The exports of dairy products from India reached US$ 376.2 million during 2018-19, with the trade surplus increasing to US$ 342.8 million during the year. Thereafter, the exports moderated substantially in 2019-20, before once again registering double-digit growth rate in 2020-21. India's export of dairy products was estimated at US$ 226.3 million during 2020-21. The UAE was the largest destination for India's dairy exports with an estimated share of

17.4% in dairy exports during 2020-21. Other major destinations for India's dairy exports during 2020-21 included the USA (16.6%), Bangladesh (10.7%), Bhutan (10.1%), Singapore (6.7%), and Saudi Arabia (6.6%).

IMPACT OF COVID-19

With the economic lockdown in place globally and in India, and restrictions on trade and commerce, the demand for dairy products reduced significantly both domestically and in key export destinations during the initial outbreak of COVID-19 (April- June 2020). With the closure of food services, such as hotels, restaurants and other catering services, the demand of dairy products was severely impacted. There was an estimated reduction of 25%-30% in demand, which resulted in sharp decline in prices of liquid milk. The dairy sector faced multi-dimensional losses not only in production and marketing but also in processing of liquid milk into milk products.

The exports of dairy products from India also witnessed a decrease during the peak period of the COVID-19 pandemic. The exports of dairy products decreased by 7.1% during Apr-Oct 2020-21, as compared to the corresponding period of the previous year. However, exports of dairy products recovered subsequently, and overall dairy exports registered y-o-y increase of 18.5% during 2020-21.

In order to mitigate the impact of COVID-19 on the dairy sector and give a fillip to the sector, the Government of India (GOI), as a part of its economic stimulus, approved setting up of the Animal Husbandry Infrastructure Development Fund (AHIDF) worth ₹ 15,000 crore. The AHIDF is primarily intended to incentivize investment in the establishment of infrastructure for dairy and meat processing and value addition, as well as establishment of animal feed plants in the private sector.

CHALLENGES AND STRATEGIES

Despite being among the largest producers of milk in the world, India's dairy exports have remained at low levels. There has also been a slump in the growth of the dairy sector in the recent years, which has further compounded

the challenges for exports from the sector. Some of the key challenges faced by the dairy sector, and strategies for alleviating these challenges have been discussed in the study.

Increasing Milk Productivity Through Breeding Policies and Genetic Improvement

In comparison to other countries, dairy sector in India is marked by low productivity. As per FAO estimates, the yield for cow milk in India was estimated at 16,981 Hg/an[2] during 2019. While the yield for cow milk in India has increased overtime, it remains lower compared to countries like New Zealand, the USA, Poland and Australia. Low milk productivity leads to lower exportable surplus in the country.

Productivity in livestock and dairy depends on multiple factors such as breed, feed, climate, and technology. India needs to focus on these aspects to enhance the productivity in milk production. There are also systemic shortfalls in cattle nutrition and genetics, which need to be improved for boosting productivity. Crossbreeding, herd management, and enabling favourable species composition will be the key strategies going forward for maximising milk production.

Streamlining Cattle and Buffalo Breeding Policies: Many states in India have their own cattle breeding policies, but the provisions of the policies differ across states. Considering the significance of these breeding policies in improvement of yields, a detailed cattle and buffalo breeding policy guidelines could be framed by the GOI, keeping in view the production traits, economic performance and draftability of breeds of animals, agro-climatic factors, existing infrastructure, and support systems. These guidelines could be taken as a benchmark for drafting state-level policies for cattle breeding. Institutions like the National Dairy Development Board (NDDB) or Niti Aayog could also undertake state-wise comparison of cattle and buffalo breeding policies to promote competitive federalism among states.

[2] Hg/an is hectogram per animal and is used to measure the yield for milk

Genetic Improvements: There is need for genomic selection to increase the rate of genetic gain[3], particularly for traits with low heritability, such as fertility and longevity. The most rapid and effective approach to genetically improve the largest chunk of non-descript zebu cattle population would be through crossbreeding with exotic dairy cattle breeds. Past experience of crossbreeding in India with exotic breeds like Holstein, Brown Swiss and Jersey helped improve productivity of non-descript cattle, leading to increase in milk production by 5 to 8 times.

There is also a shortage of progeny testing and evaluation programs, which is inhibiting genetic progress among the country's livestock. Breed-specific networking of organized farms and farmer's herds should be developed to form a large associated test mate population for undertaking large scale progeny testing of breeding bulls[4]. Such initiatives are essential as India's indigenous cows and buffaloes have much better yields in countries such as Brazil. The presence of higher frequency of A2 protein in milk of indigenous cow breeds is another reason for conserving and pregnancy testing of the indigenous breed.

Emerging developments in the area of molecular genetics is also opening up the possibility of identifying and using DNA level variation and major genes for genetic improvement of livestock. This could be a focus area for livestock genetic improvement programmes.

Improvement in Availability of Feed and Fodder

Livestock raising in India is plagued by shortage of adequate and quality feed and fodder. During 2015-20, availability of dry fodder and concentrate is estimated to have witnessed only a marginal growth, while availability of green fodder has seen a decline. Increasing milk production would necessarily entail replacement of smaller, indigenous livestock breeds with larger cross-bred cattle and buffaloes. These larger cross-bred cattle have higher energy

[3] "genetic gain," is defined as the improvement in average genetic value in a population or the improvement in average phenotypic value due to selection within a population over cycles of breeding

[4] Sreenivas D (2013) Breeding policy strategies for genetic improvement of cattle and buffaloes in India, Vet World 6(7): 455-460, doi:10.5455/vetworld.2013.455-460

requirements, which further accentuates the need for adequate availability of feed, and better feed management.

Dedicated Institution for Bolstering Availability of Animal Feed: There is need for establishment of a multi-stakeholder, institutional framework for regular assessment of the availability and production of various types of fodder and feed, associated policy planning to improve production, and follow-on identification of the gaps in implementation. In this regard, there is need for establishing a designated agency for effective policy formulation and research planning. The agency could provide precise data and policy advocacy on fodder crop production, productivity, and adoption of improved varieties and technology[5].

Price Deficiency Payment: Lack of any government support like the minimum support price is rendering forage production a low priority agricultural activity. The feed industries typically use maize, soybean, wheat and rice bran. To address the shortage of concentrates, Niti Ayog has recommended "Price Deficiency Payment" for the farmers cultivating maize, soybean and other crops for concentrates. This should be prioritised so as to increase the availability of raw material for feed industries.

Promotion of Use of Silage: There is also a need for alternatives to green and dry fodder. One option could be good quality silage, which is a fermented fodder with high moisture content. Corn silage has the advantage of consistent quality, higher yields and more energy content as compared to other forage. It can be stored for two years, which ensures availability during dry-season as well. The Government could work in collaboration with seed companies to provide high quality silage suitable seeds to farmers and incentivize farmers to undertake mechanized silage preparation. Some state governments have taken steps to promote the use of silage, which could be adopted by other states as well. E.g., Punjab government provides 40% subsidy to farmers on Silage Baler-cum-Wrapper machines.

[5] Indian Grassland and Fodder Research Institute (IGFRI) – Vision Document 2030

Silvi-pastoral and Horti-pastoral Model for Improving Availability of Forage: Adopting Silvi-pastoral and Horti-pastoral models can also help in substantially enhancing the availability of forage for the livestock. While the forest department can undertake silvi-pastoral plantations through the Joint Forest Management Committees, horti-pastoral activities can be initiated by incentivizing farmers who are orchard owners[6].

Popularizing New and Improved Varieties of Fodder Seeds: There is a need to disseminate the benefits of using high-yield, quality fodder seeds and growing combination of crops among the farmers through front line demonstrations (FLD) and minikits. FLDs are a unique approach to provide a direct interface between researcher and farmers as the scientists are directly involved in planning, execution and monitoring of the demonstrations for the technologies developed by them and get direct feedback from the farmers' field about the crops production in general and technology being demonstrated in particular.

Attracting Investment from Global Feed Companies: Global feed companies can also be encouraged to invest in the domestic market. India is a growing market for animal protein and the low penetration of commercial feed offers substantial opportunities for the global firms. Global companies could introduce commercial feed formulations that suit local climate and maximise genetic potential of local breeds on the back of their R&D expense. The scope of the existing PLI scheme for food processing could be expanded to include animal feed.

Disease Management

There are quite a few diseases that could compromise the profitability of dairy business and also dairy driven food security. These include Foot and Mouth Disease (FMD), Haemorrhagic Septicaemia (HS), Black Quarter (BQ), infertility and parasitism. In order to elevate the animal health delivery mechanisms in the country to international standards, focus should be on upgrading the infrastructure both in terms of number of veterinary institutions

[6] Advisory on Measures to be taken for Increasing Availability of Fodder to Mitigate the Effect of Natural Calamities, DAHD (Issued on 01.05.2018)

and enhancing quality of delivery of services, that may include providing affordable services at the farmer's doorstep, especially for the large animals. The GOI's veterinary machinery also needs to reorient itself to focus more on preventive health care and control, containment and eventual eradication of economically important diseases.

Documentation and reporting are key areas that require urgent attention. To bridge the information gap, the Information Network for Animal Productivity and Health (INAPH) has been developed by the NDDB in collaboration with Infosys. The INAPH is a comprehensive software, which captures all the parameters and activities on dairy management, and can be used to estimate incidences of various diseases and also track movement of animals across the country. As of March 2021, 14.62 crore animals have been ear tagged and registered on INAPH, which is only 27% of the livestock population of the country. There is need for concerted efforts at all levels of governance to enhance the reach of INAPH and ensure the success of the programme in disease identification and management.

The challenge of veterinary infrastructure and manpower is more acutely felt in some states. Livestock units per veterinary institution are high in some of the poorest states such as Jharkhand, Bihar, Madhya Pradesh and Chhattisgarh. There is great potential for improved animal health and welfare policy development and the implementation of services in the veterinary domain through public-private partnership, especially in underserviced areas. One such initiative was taken in Jharkhand by the Jharkhand State Livelihood Promotions Society under the aegis of the Rural Development Department, Government of Jharkhand, which has helped create a supply chain of affordable veterinary vaccines and medicines in several areas of the State. PPP models in veterinary services have also been successful in several other countries, and have been highlighted in the Study.

Quality Adherence in the Value Chain

Poor quality of milk is often cited as one of the prime reasons for lack of competitiveness of Indian dairy sector in international dairy trade. Food safety remains a major challenge since a large part of India's total milk production is

handled and marketed by small vendors having limited exposure to efficient handling of milk. These small vendors also lack the capital or incentives to comply with regulations, which increases their cost of production.

Quality Upgradation in Value Chains: For quality upgradation, there is need for upgradation and integration of the entire value chain for dairy products. Upgradation of the dairy value chain would entail greater use of technology, skill development, and better management. The value chains also need to be better integrated for meeting quality requirements, as also for better traceability of dairy products.

Organized sector, which is better placed to implement the quality check points in their value chains, should be instructed to overhaul their processes. In this direction, the Scheme of Testing and Inspection to be adopted by dairy processing plants, issued by the FSSAI is a commendable step for strengthening the internal controls in the dairy processing units. However, the scheme focuses entirely on self-monitoring, without any mention of consequences or penalties that firms would face in the case of failure to comply. The punitive measures also need to be defined for effective implementation of the scheme. Apart from this, the AHIDF announced by the GOI should also be effectively utilized by the processing units for quality upgradations.

Focus on SCC Content of Milk: Harmonisation of quality parameters with international standards would be a critical factor for enhancing dairy exports. Developed countries such as the USA and the EU use somatic cell counts (SCC) in milk as a quality parameter and pay premiums for the milk having low SCCs. In India, on the other hand, milk quality and pricing are still based on the fat percentage in milk. There were no legal regulatory standards for SCC in milk production, until recently. In 2020, the NDRI has set the SCC limit for murrah buffalo milk at 1 lakh/ml and 1-1.5 lakh/ml for indigenous cattle milk. However, this limit is more stringent as compared to international standards. The EU, New Zealand and Australia have an SCC limit of 4 lakh cells/ml, while the USA has a very high threshold of 7.5 lakh cells/ml. Even the SCC count in India as estimated by researchers from time to time indicates that the value could realistically be in the range of 2 to 4 lakh cells/ml.

There is a need to revisit the SCC limits and bring them more in line with the international standard, which can also help improve the acceptance of these limits domestically. Through regulations, India could also move towards pricing based on a system of fat, SNF (solid-not-fat) and SCC, which would induce more farmers and processors to focus on SCC content of milk.

Promotion of Buffalo Milk

The preferred dairy animal in India is buffalo, unlike the majority of the world market, which is dominated by cow milk. Buffalo milk is better suited for the manufacture of fat rich dairy products as compared to cow milk due to its higher fat content, bigger size of the globule and higher proportion of solid fat, which leads to higher yield, lesser loss of fat in butter milk or skim milk, easier preparation of cream or butter and better texture. Higher levels of proteins and fat render buffalo milk a more economical alternative to cow milk for the production of casein, caseinates, whey protein concentrates and a wide range of fat-rich dairy products.

Other countries are already capitalizing on the opportunities arising from buffalo milk-based products. Italy, for example, enjoys legal protection for its *mozzarella di bufala*, with a protected designation of origin[7] for this product. Buffalo mozzarella is considered to be of higher quality than cattle's, and is sold at a premium.

An essential first step for export orientation of buffalo milk and milk-based products in India would be separate collection of buffalo milk. Separate collection of cow and buffalo milk from predominantly small-sized dairy farms in India is a huge challenge and requires substantial investment in infrastructure and procurement system. Technology will be an indispensable tool for effective separation of milk from cows and buffaloes at the collection point. Automatic Milk Collection System (AMCS) are already automating the milk collection process, making it efficient, transparent and less time consuming. Adoption of AMCS is also being supported through schemes of the

[7] Protected designation of origin identifies products that are produced, processed and prepared in a specific geographical area, using the recognized know-how of local producers and ingredients from the region concerned.

Central and State Governments. Focus should be reoriented towards adoption of AMCSs which serve as complete solutions, with capacity for capturing weight, measuring fat and SNF level and also checking the milk type (cow or buffalo milk). Existing schemes should be restructured to incentivise AMCSs with capacity for checking the type of milk and having built-in mechanisms to ensure milk from cows and buffaloes are not mixed. E.g., borrowers setting up AMCSs with such differentiation capabilities can receive up to 80% of the cost as funding under the Dairy Processing and Infrastructure Development Fund scheme, while those without such differentiation could receive lower financing.

Enhancing Price Competitiveness of Dairy Products

The dairy cooperatives consider factors, such as increases in costs for feed, fodder and other inputs when revising farm gate milk prices. Under current price setting mechanism, procurement prices remain sticky even in case of supply glut and while cooperatives are compensated by state government by subsidies, such support is not available to private dairies. Recent data indicates that while the retail prices of liquid milk has risen, cost of production have increased at a much faster pace. From 2011 to 2018, cost of the inputs such as fodder, mustard, and cottonseed oil cake witnessed CAGRs of 10%, 4%, and 24%, respectively, while WPI for milk registered a CAGR of 5.3% during 2011-12 to 2018-19. The increase in milk prices is a cause of concern for the Indian dairy products industry as raw materials dominate the overall operating cost for the industry. Clearly, reducing the milk prices either through efficiency gains or through government support would be important for the sector.

Within dairy, maximum subsidy support in the EU is provided to the segment of butter, which is one of the major export items for India in the dairy sector. It may be noted that these subsidies have helped establish the EU as one of the major suppliers of dairy products in the international market, with the share of the bloc in global exports ranging from 56%-86% in the dairy items receiving subsidy. There is a need to provide adequate subsidy support to the dairy industry in India in order to compete with the heavily subsidised dairy industry of other countries such as the EU and the USA. Some form of price support can be considered by the GOI for the industry. Several state governments have provided need-based price support to the industry, which

has greatly benefitted the industry, especially during the times of crisis. Similar support can be considered by other state governments or the GOI, with due consideration to the WTO compatibility of the schemes, as linkages with the quantum of exports can make these support mechanisms liable to contestations at the WTO.

Alternatively, the Government could consider enhancing the scope of PM Kisan to include dairy farmers. Under PM Kisan, income support of ₹ 6000 per year is given to small and marginal farmer families having combined land holding of upto 2 hectares. However, this does not include landless labours who are engaged in dairy farming. Including dairy farmers under the ambit of PM Kisan could be considered by the GOI.

Enhancing Cold Storage Facilities

According to industry estimates, a substantial amount of milk production is wasted in India due to inadequate cold chain infrastructure[8]. There is an estimated infrastructure gap of 120-130 MMT in the chilling infrastructure in India. According to estimates, there is requirement to the tunes of ₹ 19000-20000 crore[9] for meeting the gap in chilling infrastructure.

Addressing the Uneven Distribution of Cold Storage through State Participation: Before the BMCs were in place, the collected milk had to reach the dairy plant before the temperature starts soaring in the morning. The sheer need to hurry through the process, moreover, limited the number of animals that could be milked. With BMCs, the milk is chilled at source and remains fresh, which gives farmers the flexibility to deliver the milk to dairy plant.

The Government of India, under the Scheme for Integrated Cold Chain and Value Addition Infrastructure of Pradhan Mantri Kisan SAMPADA Yojana, provides support for creating cold chain infrastructure. Since 2008, 353 cold chain projects have been approved under the scheme, out of which 230 have been completed and 123 are ongoing. Out of the total 353 approved projects,

[8] ASSOCHAM and MRSS India (2017). FMCG Sector growth and Logistic Innovation- One more feather in the Make in India initiative

[9] Source: Dr J.V. Parekh, Prospects of Exporting Dairy Machinery and Equipment, Dairy Times (October-November 2020)

24.4% of the projects were for cold storage in the dairy sector[10], indicative of the substantial allocation under the scheme for dairy. However, some top milk producing states have availed relatively less funding for cold chain storage. For instance, Madhya Pradesh has a total of 12 approved projects under the scheme, out of which only 1 is for dairy sector. Bihar, which is also among top ten milk producers in India, has only 2 projects for the dairy sector. Clearly, the state governments need to encourage more cooperatives and dairy processors to avail financing under the facility. Encouragement can be given by the state governments through part-financing the borrower's contribution. The funds announced by the GOI under AHIDF as part of the Atmanirbhar Bharat stimulus package could also be leveraged by the cooperatives and processors for strengthening the cold storage network.

Use of Renewable Energy for Reliable Power in the Facilities: The cold storage facilities require steady power supply for maintaining the temperature, and intermittent power supply in some areas impacts the operations of the cold storages. The power cost also accounts for a substantial part of the overall cost of the cold storage facilities in the dairy industry. A shift towards renewable source of energy, particularly solar, could be beneficial for operation of the cold storage facilities. Use of renewable energy sources would not only lead to reliable power supply to the facilities, but also encourage setting up of bulk milk chillers and small storage facilities in remote areas as well.

Support for Use of Technology in Storage Infrastructure: IT enabled services could also be leveraged for efficient usage of cold chain infrastructure. There are multiple start-ups which are working towards leveraging the use of technology to improve dairy supply chain. Stellapps is one such start-up which has applied technologies like Internet of Things, Data Analytics and Big Data to optimize the dairy supply chain. India Exim Bank has supported Stellapps through its financing programs since its formative years, thereby partnering the company in revolutionizing the dairy value chain. Across-the-board support to such start-ups will be critical for further bolstering the storage infrastructure in the dairy sector through the use of technology.

[10] Consolidated list of state-wise approved cold chain projects (as on 30.06.2021), MOFPI

Strengthening the Processing Facilities

Processing capacity for India stood at mere 2% of the total production in 2018, compared to 21% in the USA, 24% in the Netherlands, 43% in New Zealand, and 48% in Germany. Clearly, there is a need for bolstering the processing facilities in the country to compete with the major dairy producing countries in the world.

There is need for awareness programs about the potential for non-conventional products in the dairy sector, especially among the small dairy cooperatives and producers, who may not be familiar with the international demand trends. For example, while Indian dairy cooperatives and producers are familiar with the production of paneer, whey that is produced as a by-product is thrown away. This not only impacts India's export potential for whey powder, but ends up making the country an importer of these products. Another such product is Ghee. Ghee is a type of clarified butter fat that has been produced and utilized in India since antiquity. It is fairly shelf stable because of low moisture content and also has high levels natural antioxidants. There has been an increase in the demand of Ghee in the overseas markets as they are suitable for low carb, high fat diets like keto and paleo that are gaining popularity. Such demand trends, especially in products where India has strong competence, need to be effectively tapped.

Since the COVID-19 pandemic, there is also a growing focus on immunity boosting properties of various Indian spices and ayurvedic ingredients. Processors can consider mixing botanicals or Ayurvedic ingredients into milk for added functionality and health benefits. This would diversify the range of processed products, while also improving margins.

The traditional milk sweets (*mithai*) could also be popularized in the international markets. The Government of India has undertaken several food promotion campaigns in the past, including the 'Incredible Tiffin' initiative. Other countries have also popularized their food items through similar campaigns. In Korea, for example, a group of young Koreans undertook a promotional campaign for a well-known Korean dish, Bibimbap. The campaign started in 2011 and was mostly paid for by the Ministry of Agriculture, Government of Korea, and a major Bibimbap chain. They served

over 9,000 bowls of bibimbap at 100 events at universities and other places, and received substantial domestic and international media coverage. Similar project was undertaken by a group of Turkish volunteers, who started the "Turkish Coffee Truck" initiative to promote Turkish coffee culture across the USA. Similar programme could be sponsored by the GOI for *mithai*. Use of sugar-free alternatives and focus on quality and hygiene aspects in such initiatives could also help in dissipating the negative perception about Indian food being greasy and unhealthy.

The Indian traditional milk sweets also need to be taken up for industrial production, which would allow uniformity in texture, taste, safety and packaging. The production facilities would need to ensure uniform quality of raw materials, which would require strict sourcing requirements for industrial units. Moreover, some parts of the value chain need to be automated. For example, use of rolling pin by artisans for making sweets may lead to difference in the size, necessitating machine rolled products for maintaining uniform product parameters. Machinery fabricators must work with product manufacturers to design proper machines for use in these processing units. The GOI could create synergies between the dairy machinery industry players and the processors/cooperatives through setting up of a dedicated Centre of Excellence for such value-added dairy products.

Skill Development

The dairy industry is witnessing greater application of new science and management practices across the entire value chain. Companies are increasingly opting for cost reduction through labour saving mechanisation, process automation and application of information technology in systems management. These developments are increasing the need for skill development in the industry. Further, the industrial requirement for quality and risk management in the export products and conformity with the SPS standards demand skilled and competent work force. Going forward, the success of the dairy industry would critically depend on the availability of manpower in the areas of food engineering, food packaging, quality assessment, among others. A close interaction between the dairy industry and educational institutions would be necessary to contribute to further development of dairy businesses in India.

Greater foreign investments can also contribute to the development of skills in the dairy industry. Foreign investments are often accompanied by efforts from the foreign companies to improve the technical know-how and upgrade the skills of local farmers and employees. A case in point is the Dairy Farming Institute in China, which has been set up by Nestle, and houses three training farms of different capacities, aimed at different target classes. In India as well, state governments can forge such agreements with leading global dairy firms to enhance their footprint locally, while also meeting the training and skill development needs of the industry. Such models can especially be adopted in states with weak dairy cooperatives, where the business model needs an overhaul.

Lack of Credit Availability

Low or non-availability of credit is cited as one of the major constraints for the development of livestock sector activities. According to estimates, the share of animal husbandry and dairying in the total agricultural credit has hardly ever exceeded 5%, despite their rising contribution to the agricultural gross domestic product[11].

Efforts are needed to augment institutional credit to dairy farming activities. One initiative in this direction by the GOI is the extension of Kisan Credit Card (KCC) to livestock and dairy farmers from 2018 onwards. However, the KCC for dairy farmers has not been able to gain much traction as banks are hesitant to provide KCC loans in the absence of collateral. Undertaking by milk cooperatives that the farmers supply milk to them is considered to be insufficient collateral by the banks.

Pratap S. Birthal et. al. (2016) note that value chain with its product market orientation can serve as collateral for financing dairy farmers. The value chain actors especially the lead firms or the governments should facilitate smallholder farmers' access to credit from financial institutions by use of contracts as collateral or guarantee. For the financial institutions, financing through a value chain is an important means of reducing the transaction costs and lending risks associated with asymmetric information on their potential

[11] Birthal, P.S., and D.S. Negi. 2012. Livestock for higher, sustainable and inclusive growth. Economic and Political Weekly 47 (26 & 27): 89–99

borrowers[12]. In some developing countries such as China, some provincial governments facilitate financing of smallholder farmers associated with value chains through tripartite agreement among lead firms, commercial banks and farmers using 'contracts as collateral'[13]. As the banks are not comfortable in extending KCC loans to dairy farmers on the back of an undertaking by the milk cooperatives that the farmers supply milk to them, the state governments need to provide the necessary guarantee as in the case of the Chinese model. Alternatively, other financing models could be invented, viz., the banks extending credit to the cooperatives, which in turn could extend credit to the farmers.

Technology Penetration and R&D

While technology penetration in the dairy industry is relatively less, over the last five years, several start-ups have mushroomed in this space. These start-ups have the necessary technology to revolutionize the industry, but do not have the reach which benefits the cooperative societies. Therefore, there is a need to create synergises between start-ups and cooperative societies to ensure that the technology solutions are leveraged effectively.

There is also a large reservoir of technologies which is available with R&D institutions, but most of the technologies have not been validated for up-scaling, consumer acceptance and marketing potential under field conditions. The effective utilization of these resources can be undertaken in a PPP mode, with the Government bearing the risk of failure of the projects, the R&D institutions providing the technical know-how and the private sector providing the required capital. Such PPP models will especially be crucial for the adoption of precision farming in Indian dairy. Precision Dairy Farming (PDF) can be defined as information and technology-based farm management system to identify, analyse and manage variability within farm management for optimum farm performance, profitability and sustainability. Despite the growing demand, adoption rates of most commercially available PDF

[12] Pratap S. Birthal et. al (2016). 'Formal versus Informal: Efficiency, Inclusiveness, and Financing of Dairy Value Chains in India', IFPRI Discussion Paper 01513

[13] Chen, K., P.K. Joshi, E. Cheng and P.S. Birthal. 2015. "Innovations in Financing of Agri-food Value Chains in China and India: Lessons and Policies for Inclusive Financing." China Agricultural Economic Review 7 (4):1–27.

technologies are limited. Research indicates that this is due to uncertainty regarding investment in PDF technologies due to the lack of information on the added economic value when the PDF technologies are implemented on the farm. Lack of validated research results concerning the effects of application, high capital input and high costs have ultimately led to lack of success stories and demonstrated effects. Therefore, there is a need for exploration of the feasibility of these technologies, especially for small holders in India, through a PPP mode of project implementation in pilot projects. The Government could share a major chunk of the associated risk of commercialisation in these projects, upon vetting of the projects by the National Dairy Research Institute.

There is substantial scope for exports of traditional Indian milk products, but intensive R&D efforts are needed to develop suitable technologies for large scale manufacturing and packaging of traditional Indian milk products. Alongside, scientific documentation of the desirable physico-chemical and shelf-life characteristics of region-specific traditional milk products would also be needed. A holistic framework for such studies needs to be developed, with involvement of the research institutions, the cooperatives, farmers, and processing units.

Foreign investments in the dairy products sector will also be crucial for technology upgradation. Analysis indicates that the foreign investment in the dairy sector in India has been relatively less, as compared to other milk producing countries. Going forward, more incentives are needed to attract investments from foreign dairy firms, especially in high value added activities of the supply chain.

Impact of India's FTAs

Over the past few decades India has signed numerous trade agreements with various countries and trade blocs. According to a study by the NDDB, out of the seventeen trade agreements signed by India, only seven of them contain provisions related to concession for dairy products[14]. The dairy producers and companies in India have not been able to exploit the tariff advantage

[14] Roadmap and Strategies to Promote Export of Dairy Products for the Organized Dairy Sector, NDDB

except in case of a few neighbouring countries, such as Nepal, Bhutan, and Bangladesh.

Recently, India decided against joining Regional Comprehensive Economic Partnership (RCEP) agreement as concerns were raised by the agriculture sector regarding the distortionary impact of the agreement. The dairy sector was concerned about heavy competition in both price and technology, as the deal offered zero-duty imports of cheaper dairy products. The underperformance of dairy sector under India's existing FTAs suggests an urgent need for re-evaluation and re-negotiation of these FTAs. Additionally, India is currently reported to have 28 trade agreements that are under negotiations. Given the significance of the sector from the point of output, employment and exports, dairy can be included in the sensitive list for FTAs with countries that are leading producers and exporters of dairy items. Alongside, India should also consider negotiations for tariff concessions for the dairy sector in FTAs with countries which run a significant trade deficit in dairy products, such as the UK.

Tackling the Non-tariff Measures

Indian dairy products face several non-tariff measures (NTM) in importing countries, which are mostly protectionist in nature. The presence of Foot and Mouth Disease (FMD) is one such NTM concern that has hindered India from realising its true potential in dairy sector. India faces market access challenges due to FMD, even for value-added products in the dairy sector.

There is a need to strengthen the testing and inspection infrastructure in the country for dairy exports to meet the NTM requirements. Several major milk producing states do not have enough testing labs. The NABL accredited laboratories in India are highly concentrated in nature, with 59% of such labs situated in just 5 states. The food labs per thousand km^2 of area for the top 4 milk producing states was below the all-India average of 0.004. The food labs per thousand metric tons of production was also lower than the all-India average for the top 5 milk producing states. This indicates that the laboratories and testing capacities in India for the dairy sector is relatively low and not well diversified across the country. Development of testing infrastructure in the top milk producing states will be a sine qua non for the

growth of dairy exports from the country. A comprehensive programme for building technical infrastructure by investing in setting up and equipping labs should be introduced.

It is further reported that merchant exporters frequently procure dairy products from domestic markets without FSSAI labelling, resulting in increase in rejection rate in foreign markets due to non-compliance with packaging and labelling requirements. Additionally, wrong product labelling by the merchant exporters to escape import duties and import restrictions in the foreign markets have also affected the perception of Indian dairy products in the international markets. Punitive measures need to be imposed on such practices to ensure quality exports from the country.

India has been able to harmonise certain standards with international standards such as the Codex Alimentarius and the standards of OIE in the case of milk products. Yet, there are differences across other standards that have been followed in India and those that are prescribed by Codex Alimentarius[15]. Hence, harmonization of standards still remains an unfinished agenda and needs to be actively pursued for penetrating the highly regulated markets.

Creation of Dairy Export Zones

Establishing and developing Dairy Export Zones (DEZ) may help in addressing barriers related to large herd size. These zones may be developed as exclusive regional zones for exports of dairy products with ability to address traceability requirements and manage quality as per the international standards. These could be set up in states which are FMD free. The zone could be spread across 50-100 acres, providing ample space for dairy related activities. The zones may be developed with focus on export oriented MSME dairy units. The DEZs could have common infrastructure facilities like cold chain, chilling plants, processing facilities, R&D facilities, and better connectivity to ports and airports. Foreign investments could also be encouraged in the DEZs for setting up of hi-tech dairy processing units and duty concession on import

[15] Arpita Mukherjee (2019), SPS Barriers to India's Agriculture Export: Learning from the EU Experiences in SPS and Food Safety Standards, Indian Council for Research on International Economic Relations

of dairy equipments in these DEZs could also be given. Policy regarding this could be announced in the Foreign Trade Policy.

EXPORT INCENTIVES FOR DAIRY

The Government of India has a wide array of programmes for incentivizing exports from the country. The Refund of Duties and Taxes on Exported Products (RoDTEP) scheme has been introduced by the Government of India, as a WTO-compliant substitute for the MEIS scheme. The scheme aims to provide refund of embedded central, state and local duties and taxes paid on inputs that were so far not refunded or rebated, to the exporters. In the RoDTEP, all the products from dairy sector would receive refund at the lowest rate of 0.5 percent. The refund under this scheme is lower than that provided under MEIS. Given the need for higher incentives to the industry for enhancing export orientation, especially in scenarios of price slumps, the Government, in consultation with the dairy industry, could look towards increasing the rates under the RoDTEP for the dairy sector.

In March 2022, the Government has decided to foreclose the Transport and Marketing Assistance scheme to revamp, redesign and refocus it for better outcomes. The revamped scheme needs speedy introduction and implementation as the freight prices have been on a rise, globally. The revamped scheme should also be made applicable for the dairy sector.

DIVERSIFICATION

Data from ITC Export Potential Map indicates that the dairy sector in India has an untapped export potential of US$ 165.6 million. Tapping this potential can nearly double dairy exports from India. Strengthening exports in areas of comparative advantage, building capacities in segments where the market penetration is low, and diversification of target markets, can further help increase the dairy exports.

Out of the 24 dairy products at 6-digit HS code level, there are 5 products where the share of India in global exports of that item is larger than the share of overall dairy exports from India in global dairy exports, i.e., 0.3%.

These products where India has already penetrated the exports market would be low-hanging fruits and important for enhancing exports from the country, in the short term. In the medium term, capacity building is needed in other areas where India's presence in the global market is currently limited.

Analysis of the dairy exports indicates that the top 10 export destinations accounts for approximately 83% of India's dairy exports. For comparative assessment of the extent of market concentration, a Market Concentration Index (MCI) has been constructed which measures the degree of export market concentration by indicating if a large share of exports is accounted for by a small number of countries, or on the contrary, exports are well distributed among the export destinations. The index ranges from zero to one, with a larger value denoting a higher concentration in the export markets. Analysis of the MCI for the top 10 exported commodity groups (by India) at 6-digit level in the dairy sector indicates that in several products, India's exports were highly dependent on few markets. In case of casein (HS 350110), MCI value was as high as 0.70. The products with high market concentration would need an appropriate market diversification strategy. Further analysis of the top exported dairy products which have an MCI of greater than 0.50 indicates that in all product categories, except casein (HS 350110), the top 5 global importers do not feature among the top 5 export destinations for India. China, which is a major importer in most categories, does not feature among the top 5 export destinations for India in any of the product categories. There is need for market penetration strategies for the top importing markets.

CONCLUSION

Despite having the largest livestock herd and being the largest producer of milk, India's dairy exports have been sub-optimal. The sector is plagued with productivity issues, incidence of diseases, poor quality, high raw material costs, inadequate cold chain infrastructure, lack of processing facilities, low availability of credit, among other issues. In the export markets, the dairy sector of India also has to grapple with ever-increasing non-tariff barriers and competition from highly subsidized dairy sectors of other countries. The country has also failed to effectively leverage FTAs to enhance market access.

While the sector faces these myriad challenges, it holds significant untapped export potential, estimated at US$ 165.6 million. If this potential is realized, exports from the sector can be nearly doubled. With efficiency gains, government support, enabling infrastructure, quality improvements, technological innovations and greater processing facilities, dairy exports can be further increased.

The strategies in the Study provide a broad template for strengthening the dairy sector of India, encompassing measures for improving productivity, enhancing availability of feed and fodder, improving disease management, addressing the quality issues in milk, strengthening the capacity to meet the NTMs in import markets, price support and income support to the Indian dairy farmers, enhancing market access, strengthening the cold chain infrastructure for dairy, promoting traditional areas of competence such as buffalo milk and traditional milk products, greater technology penetration and commercialization of technologies in the sector, improving the availability of credit to dairy farmers, and creating economies of scale in dairy production through dairy export zones. Adoption of these strategies would help develop Indian dairy sector, and its export growth.

1. INTRODUCTION

Dairy refers to harvesting or processing (or both) of animal milk – mostly from cows or buffaloes, but also from goats, sheep, horses, or camels – for human consumption. Dairy started as a subsistence activity thousands of years ago, but is now commercialized to varying degrees across geographies.

The dairy industry has been growing rapidly on the back of increasing global population as well as rising disposable income. The health and product consciousness of the population and growing preference for value-added milk products is also fuelling the growth in demand for dairy products. Alongside, rapid urbanization has engendered a consolidated and accessible market for dairy products, allowing for greater trade of these products. These trends are expected to gain further momentum, going forward, providing substantial opportunities to dairy farmers. An essential starting point for leveraging the opportunities in the dairy industry, would be understanding the structure of the industry, the production, processing and trade patterns in the sector, the emerging areas of growth, and the efforts needed by stakeholders to tap the opportunities.

CHARATERISTICS OF THE DAIRY INDUSTRY

Dairy has certain features that distinguishes it from other agricultural products. According to Vivien Knips (2005), as opposed to grains, milk is a bulky and heavy commodity which requires high-cost storage and transportation as it spoils quickly without cooling. Due to the fact that even the largest dairy farms cannot provide adequate quantities to supply a processing plant, but

each single dairy farm only supplies a small share of the total milk processed, the dairy industry in many countries are organised along co-operative lines. Milk producer co-operatives bundle the interest and supply of a large number of dairy farmers and strengthen their bargaining power towards processors or even run their own processing plants[16].

The dairy sector is also one of the most protected agricultural sectors, with several developed countries providing producer subsidies for encouraging production. The subsidies provided by developed countries to their dairy industry have also helped dairy farmers in these countries to tap a significant share of the global market for dairy products. Alongside, both developed and developing countries have also put tariff and non-tariff barriers to protect their dairy sector from 'unfair' competition[17]. These market distortions enhance the cost of trade in dairy products.

TYPES OF DAIRY PRODUCTS

At the product-level, dairy industry includes retail "end products" such as raw milk, fermented milks, pasteurized milk (whole, semi-skimmed, skimmed etc.), long life milk (whole, semi-skimmed, skimmed etc.), cheese (hard, soft cheese), cream, yogurt, ice-cream, cottage cheese, condensed milk, powdered milk, and butter, and 'ingredient products' such as milk powder, anhydrous milk fat (concentrated butter), milk protein concentrate, rennet casein, whey products, and lactose[18]. Some of the key dairy products and their characteristics are presented in Table 1.1.

[16] Knips, Vivien, 2005. "Developing Countries and the Global Dairy Sector Part I Global Overview," PPLPI Working Papers 23768, Food and Agriculture Organization of the United Nations, Pro-Poor Livestock Policy Initiative.

[17] Ibid.

[18] Dairy Industry Background Report, World Bank (2015)

Table 1.1: Dairy Products and Characteristics

Type of Product	Description
Liquid Milk	The most consumed, processed and marketed dairy product. Liquid milk includes products such as pasteurized milk, skimmed milk, standardized milk, reconstituted milk, ultra-high-temperature (UHT) milk and fortified milk. By volume, liquid milk is the most consumed dairy product throughout the developing world.
Fermented Milks	Commonly used to make other milk products. They are obtained from the fermentation of milk using suitable microorganisms to reach a desired level of acidity. Fermented products include yoghurt, koumiss, dahi, labneh, ergo, tarag, kurut and kefir.
Cheeses	Produced through the coagulation of milk protein (casein), which is separated from the milk's whey. Hundreds of varieties of cheese are produced, many of them being characteristic to a particular region of the globe. However, most cheese is produced in developed countries. Cheese can be soft, hard, semihard, hard ripened or unripened. The diverse characteristics of cheese emerge from differences in the composition and types of milk, processes applied and microorganisms used.
Butter and Ghee	These are fatty milk products. Butter is produced by churning milk or cream; in many developing countries, traditional butter is obtained by churning sour whole milk. Ghee is obtained by removing the water from butter and is especially popular in South Asia. Ghee has a very long shelf-life of up to two years.
Condensed Milk	Obtained from the partial removal of water from whole or skimmed milk. Processing includes heat-treating and concentration. Condensed milk can be sweetened or unsweetened, but is mostly sweetened.
Evaporated Milk	Result from the partial removal of water from whole or skimmed milk. Processing includes heat-treating to make the milk bacteriologically safe and stable. Evaporated milks are generally mixed with other foods, such as tea.
Dry Milk or Milk Powder	Obtained from the dehydration of milk and is usually in the form of powder or granules.

Type of Product	Description
Cream	The part of milk that is comparatively rich in milk fat; it is extracted by skimming or centrifuging the milk. Cream products include recombined cream, reconstituted cream, prepared creams, pre-packaged liquid cream, whipping cream, cream packed under pressure, whipped cream, fermented cream and acidified cream.
Whey Products	According to FAOSTAT, whey is "the liquid part of the milk that remains after the separation of curd in cheese making. Its main food use is in the preparation of whey cheese, whey drinks and fermented whey drinks. The main industrial uses are in the manufacture of lactose, whey paste and dried whey." Whey can be sweet (from the production of rennet-coagulated cheeses) or acidic (from the production of acid-coagulated cheeses).
Casein	Casein is the principal protein in milk and is used as an ingredient in several products, including cheese, bakery products, paints and glues. It is extracted from skimmed milk by precipitation with rennet or by harmless lactic acid producing bacteria.

Source: *Dairy Production and Products, Food and Agriculture Organization of the United Nations*

SCOPE OF THE STUDY

In India, dairy business has been practiced as a rural cottage industry since time immemorial. It was initially confined to particular localities or villages where people could trade in dairy products among each other. Semi-commercial dairy in the country started with the establishment of military dairy farms and co-operative milk unions throughout the country towards the end of 19th century. But the turning point for the sector came with the White Revolution during the 1970s. The revolution led to a sharp increase in milk production in the country and helped India achieve self-sufficiency in milk production. Today, India is the largest producer of milk, and the organized dairy sector in the country is engaged in commercial production of pasteurised milk and several value added products.

The dairy sector continues to be an important area of interventions for the Government of India due to its significant impact on employment, livelihoods and food security. Through various schemes such as the Scheme for

Integrated Cold Chain and Value Addition Infrastructure of Pradhan Mantri Kisan SAMPADA Yojana, Dairy Processing and Infrastructure Development Fund and Dairy Entrepreneurship Development Scheme, the Government is providing necessary support for growth of the sector.

In spite of the large domestic production and the Government support, the dairy industry in India has been unable to tap the international market for dairy products. It is in this context that the study attempts to analyse the global and Indian dairy industry, identify the export potential of Indian dairy products, and discuss the impediments to realization of the export potential. The study also discusses the strategies to overcome the challenges faced by the Indian dairy industry, improve competitiveness of domestic dairy products, and build capacities for engendering growth in exports from the sector.

2. GLOBAL SCENARIO

GLOBAL DEMAND OF DAIRY PRODUCTS

Dairy products are an integral part of the diets of people, globally. With growing population and rising demand for processed food, the global demand for dairy has remained robust, although there has been a slight moderation in the growth in demand in the recent period. The global demand for dairy products was estimated at US$ 721.3 billion during 2020, witnessing a y-o-y decline of 4.2% (Table 2.1). The reduction in demand comes in the backdrop of trade restrictions due to the COVID-19 pandemic.

The global demand for dairy products is projected to witness a Compound Annual Growth Rate (CAGR) of 2.8% during 2019 to 2024 and is expected to reach a level of US$ 863.7 billion by 2024 (Table 2.1). This would present considerable opportunities for major producers of dairy products.

Table 2.1: Projected Global Demand of Dairy Products by Value (2016-2024)

Year	Value (US$ billion)	Growth (%)
2016	638.4	0.2%
2017	714.5	11.9%
2018	755.4	5.7%
2019	752.8	-0.3%
2020	721.3	-4.2%
2021	796.8	10.5%
2022	828.4	4.0%
2023	840.6	1.5%
2024	863.7	2.7%
CAGR (2019-24)	**2.8%**	

Note: Value from 2020 onwards are forecasts
Source: Global Research & Data Services from Statzo, United Nations Industrial Statistics Database, Exim Bank Research

GLOBAL TRADE OF DAIRY PRODUCTS

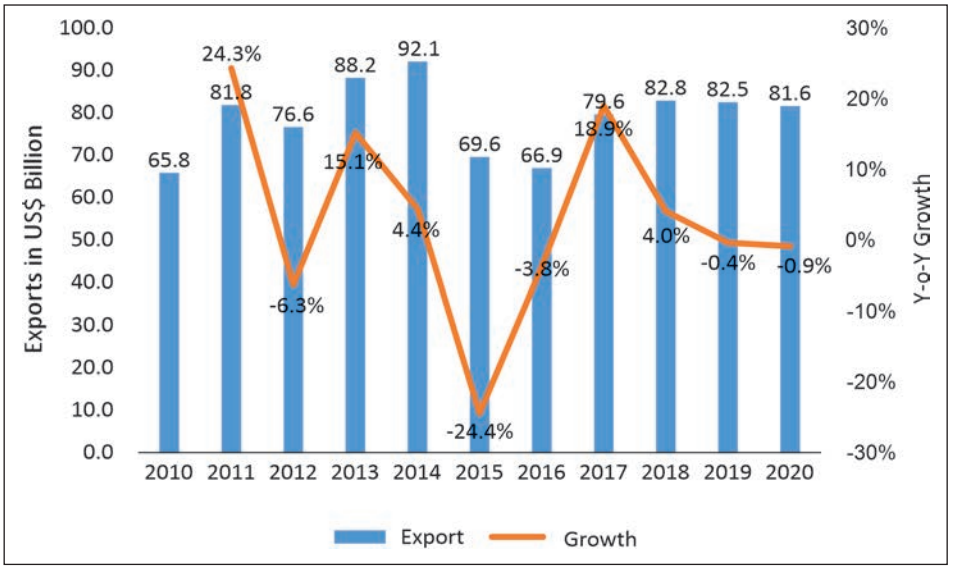
Global exports of dairy products[19] were estimated at US$ 81.6 billion during the year 2020, witnessing a decline of 0.9% as compared to the previous year (Exhibit 2.1). In spite of the decline in the recent period, global exports of dairy products recorded a CAGR of 2.2% during the period 2010 to 2020.

Global exports of dairy products were estimated to be the highest during 2014, valued at US$ 92.1 billion, after which the exports fell sharply by 24.4% during 2015 (Exhibit 2.1). The decline was due to a supply-demand imbalance during 2015. There was a decline in import demand for dairy products due to a plunge in demand of milk powder in China and ban of dairy products by Russia from Europe, both Russia and China being among the largest importers of dairy products. Alongside this dip in demand, milk supply in Europe grew substantially due to the production quotas set during this period. As a result of decrease in demand and increase in supply, the global prices fell and the dairy exports (in value terms) witnessed a decrease of 24.4% in 2015. The decrease in terms of volume, however, was relatively less during the period. The decline in global exports of dairy products continued in 2016, but recovered thereafter in 2017 and 2018. Over the last two years (2019 and 2020), global dairy exports witnessed marginal decline.

New Zealand was the leading exporter of dairy products with exports valued at US$ 11 billion (share of 13.4% in global exports) during 2020. Germany was the second largest exporter of dairy products with a share of 12.4% in the global exports of these products. Other major exporters of dairy products include the Netherlands (share of 10.3% in global exports), France (8.8%), the USA (6.0%) and Italy (4.9%). India held the 44th position in the exports of dairy products in the world, with a share of just about 0.2% in the aggregate global exports during 2020.

[19] HS 0401 (Milk and cream, not concentrated nor containing added sugar or other sweetening matter), HS 0402 (Milk and cream, concentrated or containing added sugar or other sweetening matter), HS 0403 (Buttermilk, curdled milk and cream, yogurt, kephir and other fermented or acidified milk and cream, whether or not concentrated or flavoured or containing added sugar or other sweetening matter, fruits, nuts or cocoa), HS 0404 (Whey, whether or not concentrated or containing added sugar or other sweetening matter; products consisting of natural milk constituents, whether or not containing added sugar or other sweetening matter, n.e.s), HS 0405 (Butter, incl. dehydrated butter and ghee, and other fats and oils derived from milk; dairy spreads), HS 0406 (Cheese and Curd) and HS 3501 (Casein, caseinates and other casein derivatives; casein glues (excluding those packaged as glue for retail sale and weighing net <= 1 kg)) as per composition of Principal Commodity Groups by DGCIS

Exhibit 2.1: Global Exports of Dairy Products



Source: ITC Trade Map, Exim Bank Research

During the period 2015 to 2020, exports from the top 10 dairy exporting countries witnessed a positive CAGR. Among the top 10 dairy exporters, Ireland witnessed the highest CAGR of 10.7% in its dairy exports during 2015-20. Italy and Poland also registered strong growth in dairy exports, recording CAGRs of 7.4% and 6.9%, respectively, during 2015-20. Among the top 10 exporters of dairy products, France registered the lowest CAGR in dairy exports of 1.0% during the period under consideration (Table 2.2).

Germany was the leading importer of dairy products with imports valued at US$ 8.0 billion (share of 9.6% in global dairy imports) during the year 2020. China was the second largest importer of dairy products in 2020, with a share of 8.3% in global dairy imports. Other major importers during 2020 included the Netherlands (share of 5.1%), France (4.8%), Italy (4.6%) and the UK (4.3%) (Table 2.3). During the period 2015 to 2020, global imports of dairy products witnessed a CAGR of 3.0%. Among the top 10 importers of dairy products, all the countries, except the USA, registered a positive CAGR. Among these top 10 importing countries, China registered the maximum increase in imports of dairy products, witnessing a CAGR of 15.5% during 2015 to 2020 (Table 2.3).

Table 2.2: Top Dairy Products Exporting Countries (Values in US$ Billion)

Country	Value in 2015	Value in 2020	Share in 2020^	CAGR (2015-20)^
New Zealand	8.9	11.0	13.4%	4.3%
Germany	8.7	10.1	12.4%	3.1%
The Netherlands	6.9	8.4	10.3%	4.0%
France	6.9	7.2	8.8%	1.0%
The USA	3.9	4.9	6.0%	4.8%
Italy	2.8	4.0	4.9%	7.4%
Ireland	2.3	3.8	4.6%	10.7%
Belgium	2.8	3.4	4.2%	4.1%
Denmark	2.2	2.5	3.1%	2.6%
Poland	1.7	2.4	3.0%	6.9%
World	**69.6**	**81.6**	**100.0%**	**3.3%**

Note: ^CAGR and share are calculated on absolute values

Source: ITC Trade Map, Exim Bank Research

Table 2.3: Top Dairy Products Importing Countries (Values in US$ Billion)

Country	Value in 2015	Value in 2020	Share in 2020^	CAGR (2015-20)^
Germany	6.3	8.0	9.6%	4.8%
China	3.4	6.9	8.3%	15.5%
The Netherlands	3.4	4.2	5.1%	4.2%
France	3.3	4.0	4.8%	4.0%
Italy	3.8	3.8	4.6%	0.0%
The UK	3.5	3.5	4.3%	0.3%
Belgium	3.0	3.5	4.2%	3.4%
The USA	2.7	2.7	3.2%	-0.1%
Russia	1.7	2.6	3.2%	8.9%
Spain	1.8	2.0	2.4%	2.1%
World	**71.9**	**83.2**	**100.0%**	**3.0%**

Note: ^CAGR and share are calculated on absolute values

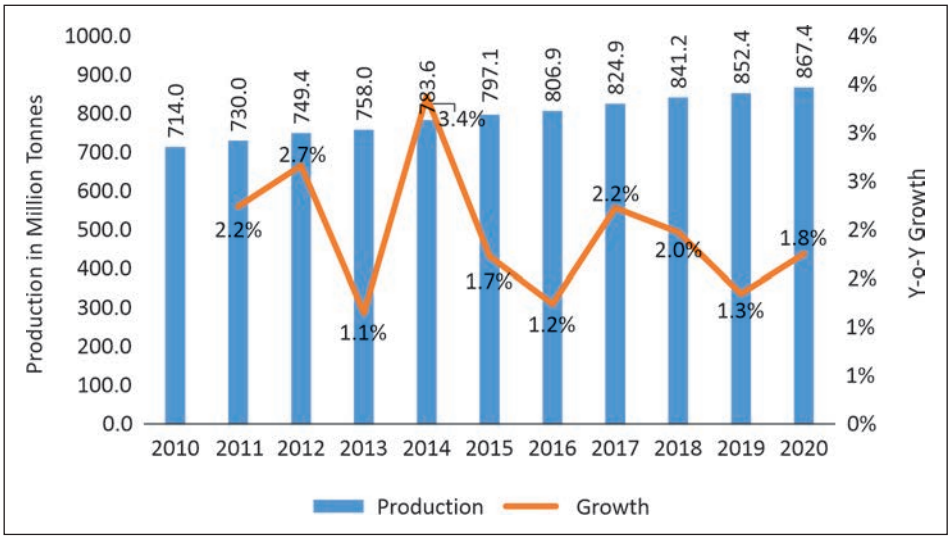
Source: ITC Trade Map, Exim Bank Research

PRODUCTION AND TRADE OF MILK

Production of Milk

The global production of milk[20] during the year 2019 was estimated at 852.4 million tonnes, witnessing an increase of 1.3% during 2019, as compared to the production in 2018. The production of milk has witnessed a secular increase over the period under consideration, recording a CAGR of 2% during 2010 to 2019. Milk production was further forecast to have reached 867.4 million tonnes during 2020 (Exhibit 2.2).

Exhibit 2.2: Global Milk Production



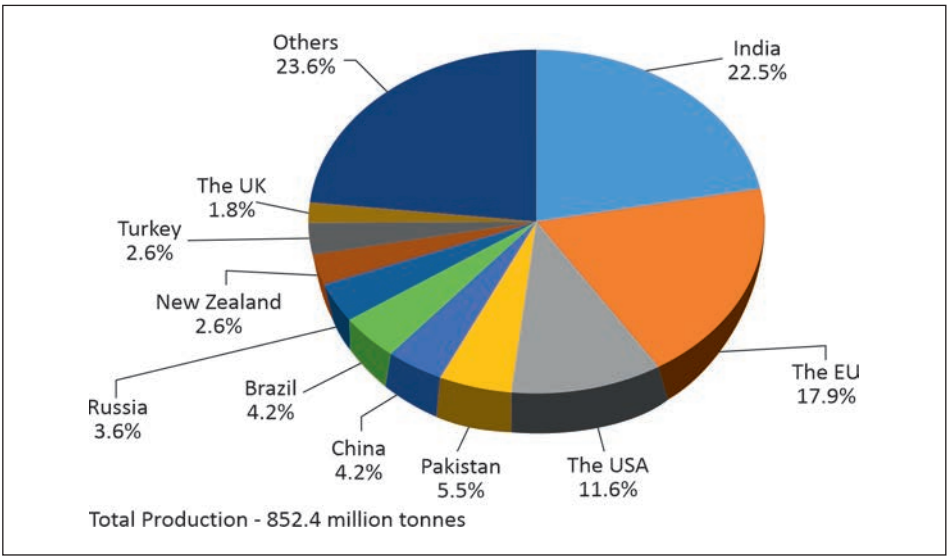
Source: OECD-FAO Agricultural Outlook, Exim Bank Research

Asia is the largest milk producing region, with large scale production in countries like India, China and Pakistan. India is in fact the leading producer of milk, with an estimated production of 191.8 million tonnes during 2019. India constituted a share of 22.5% in the global milk production during 2019. With production of 152.6 million tonnes in 2019, the European Union had the second largest share of 17.9% in the global milk production. The EU was followed by the USA with an estimated production of 98.5 million tonnes, and a share of 11.6% in global milk production during 2019. Other major

[20] OECD-FAO Statistics

milk producing countries during 2019 included Pakistan (share of 5.5%), China (4.2%), Brazil (4.2%), and Russia (3.6%) (Exhibit 2.3).

Exhibit 2.3: Top Milk Producing Countries (2019)



Source: OECD-FAO Agricultural Outlook, Exim Bank Research

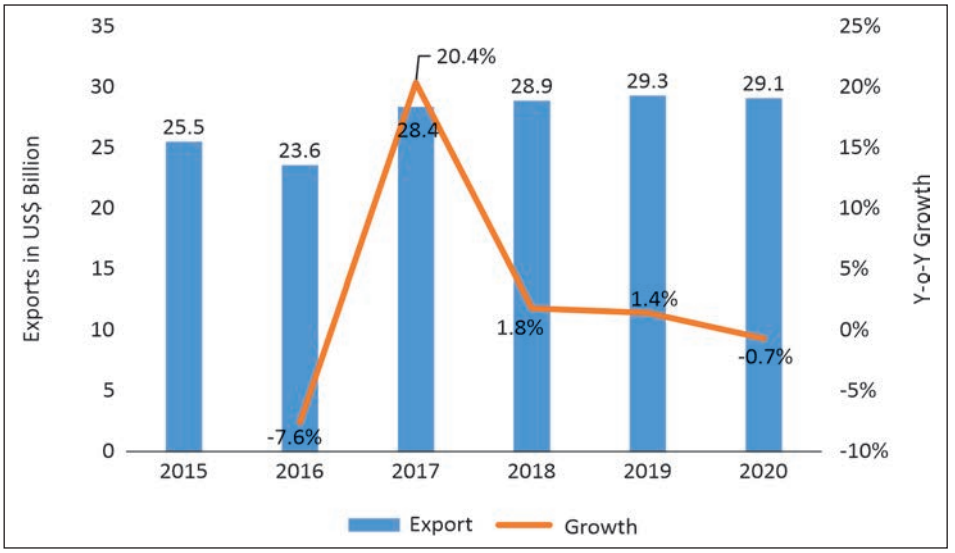
Global Trade of Milk

Milk has a low export orientation, with only 2.4% of the milk produced in the world traded globally. In value terms, the global exports of milk[21] was valued at nearly US$ 29.1 billion in 2020, witnessing a marginal y-o-y decline of 0.7% (Exhibit 2.4). In spite of the decline, global exports of milk recorded a healthy CAGR of 2.7% during 2015 to 2020.

New Zealand, the 8th largest producer of milk in 2019, is the largest exporter of milk, with its share in global exports estimated at 22.4% during the year 2020. Germany, the USA, the Netherlands, and France, with shares of 10.1%, 7.9%, 7.5% and 6.2%, respectively, were the other major exporters of milk in the world (Table 2.4). India, in spite of being the largest producer of milk, held 54th position among the exporters of milk, and accounted for a minor share of 0.1% in the global exports of milk in 2020.

[21] HS 0401 and HS 0402

Exhibit 2.4: Global Milk Exports



Source: ITC Trade Map, Exim Bank Research

Table 2.4: Major Exporters of Milk (Values in US$ Billion)

Country	Value in 2015	Value in 2020	Share in 2020^	CAGR (2015-20)^
New Zealand	4.7	6.5	22.4%	6.8%
Germany	2.7	2.9	10.1%	1.5%
The USA	1.6	2.3	7.9%	7.4%
The Netherlands	2.0	2.2	7.5%	2.0%
France	1.7	1.8	6.2%	1.4%
Belgium	1.2	1.5	5.2%	4.2%
Australia	0.9	0.9	3.3%	0.6%
Poland	0.6	0.8	2.9%	7.2%
Ireland	0.3	0.8	2.7%	22.3%
The UK	0.6	0.7	2.5%	2.6%
World	**25.5**	**29.1**	**100.0%**	**2.7%**

Note: ^CAGR and share are calculated on absolute values

Source: ITC Trade Map, Exim Bank Research

Global imports of milk[22] were estimated at US$ 30.0 billion in 2020, witnessing a decrease of 1.2% as compared to the previous year. China, which was the 5th largest producer of milk in 2019, was also the largest importer of milk in 2020 with its share in global imports estimated at 15.5% during the year. Germany, the Netherlands, Belgium, and Italy, with shares of 6.2%, 4.2%, 3.7% and 3.5%, respectively, were other major importers of milk during 2020 (Table 2.5). The top ten milk importing countries accounted for nearly half of the global milk imports in 2020. Among the major milk importing countries, China registered the highest CAGR of 18.2% during 2015 to 2020 (Table 2.5). Demand for milk in China has plenty of space to grow further due to the low per-capita consumption in the country and strong private and public investment into the sector due to the growing consciousness about the health benefits of dairy products.

Table 2.5: Major Importers of Milk (Values in US$ Billion)

Country	Value in 2015	Value in 2020	Share in 2020^	CAGR (2015-20)^
China	2.0	4.6	15.5%	18.2%
Germany	1.4	1.8	6.2%	5.6%
The Netherlands	1.0	1.3	4.2%	4.5%
Belgium	0.9	1.1	3.7%	4.5%
Italy	1.2	1.1	3.5%	-2.3%
Hong Kong	1.5	1.0	3.5%	-7.7%
Algeria	1.0	1.0	3.4%	0.4%
Saudi Arabia	1.0	0.9	3.0%	-1.5%
Mexico	0.7	0.8	2.6%	3.1%
Nigeria	0.4	0.8	2.6%	12.1%
World	**27.0**	**30.0**	**100.0%**	**2.1%**

Note: ^CAGR and share are calculated on absolute values

Source: ITC Trade Map, Exim Bank Research

[22] HS 0401 and HS 0402

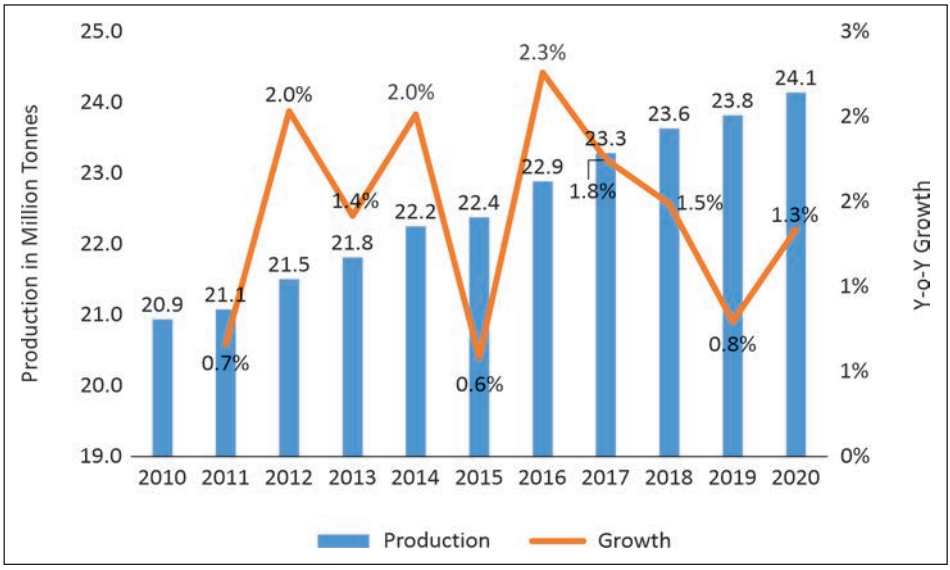
PRODUCTION AND TRADE OF PROCESSED DAIRY PRODUCTS

Cheese

Production of Cheese

Global production of cheese[23] during 2019 was estimated at 23.8 million tonnes, witnessing a marginal increase of 0.8% over the previous year. There has been a nearly consistent increase in production of cheese during 2010-19. The production of cheese is forecast to have reached 24.1 million tonnes during 2020 (Exhibit 2.5).

Exhibit 2.5: Global Cheese Production



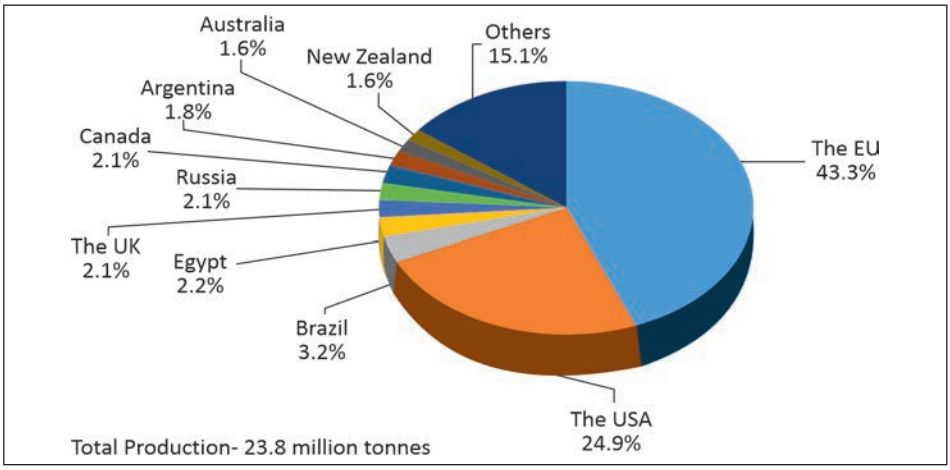
Source: OECD-FAO Agricultural Outlook, Exim Bank Research

The European Union (EU) was the leading producer of cheese, with an estimated production of 10.3 million tonnes during 2019. The EU constituted a share of 43.3% in the global cheese production. Member countries of the EU produce thousands of different varieties of cheese, of which more than 250 varieties have protected geographical status.

[23] OECD-FAO Statistics

The USA was the second largest producer of cheese, with an estimated share of 24.9% in the global production of cheese. The USA was followed by Brazil with an estimated production of 0.7 million tonnes, and a share of 3.2% in the global cheese production during 2019. Other major cheese producing countries include Egypt (share of 2.2% in 2019), the UK (2.1%), Russia (2.1%), and Canada (2.1%) (Exhibit 2.6).

Exhibit 2.6: Major Cheese Producing Countries (2019)



Source: OECD-FAO Agricultural Outlook, Exim Bank Research

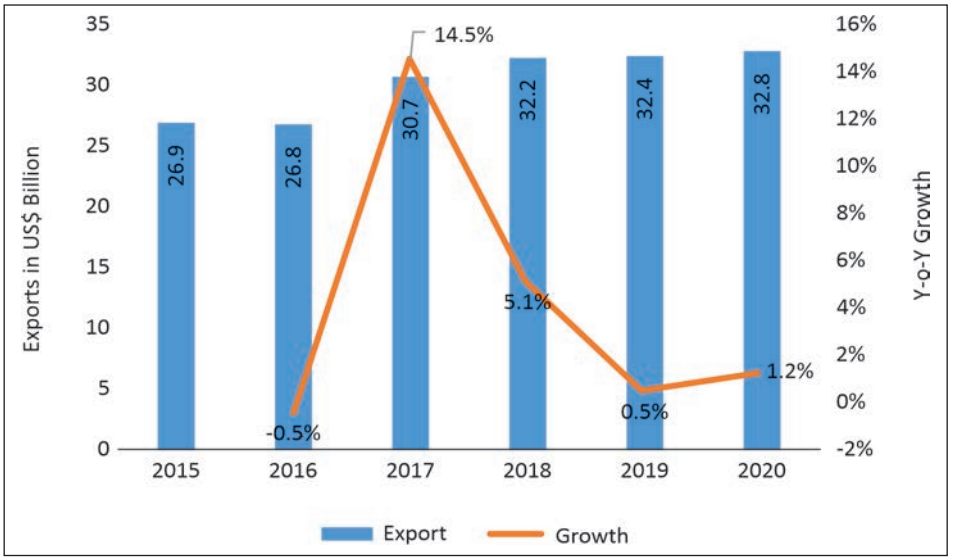
Global Trade of Cheese and Curd

Global exports of cheese and curd[24] were estimated at US$ 32.8 billion in 2020, witnessing a y-o-y increase of 1.2% (Exhibit 2.7). During 2015 to 2020, the exports of cheese and curd witnessed a strong CAGR of 4.0%.

European countries dominate the exports market for cheese and curd. Germany was the largest exporter of cheese and curd with estimated exports of US$ 4.8 billion in 2020, accounting for a share of 14.6% in the global cheese and curd export. Other major exporters of cheese and curd during 2020 included the Netherlands (share of 12.9%), Italy (10.9%), France (10.7%), and Denmark (4.9%) (Table 2.6). All the top 10 cheese and curd exporting countries witnessed a positive CAGR during 2015 to 2020, with Belarus registering the highest CAGR of 10.2%.

[24] HS 0406

Exhibit 2.7: Global Exports of Cheese and Curd



Source: ITC Trade Map, Exim Bank Research

Table 2.6: Major Exporters of Cheese and Curd (Values in US$ Billion)

Country	Value in 2015	Value in 2020	Share in 2020^	CAGR (2015-20)^
Germany	3.8	4.8	14.6%	4.9%
The Netherlands	3.4	4.2	12.9%	4.2%
Italy	2.5	3.6	10.9%	7.3%
France	3.3	3.5	10.7%	1.0%
Denmark	1.4	1.6	4.9%	3.1%
The USA	1.4	1.6	4.9%	3.0%
New Zealand	1.2	1.3	4.0%	2.5%
Ireland	0.8	1.2	3.6%	8.5%
Belarus	0.6	1.0	3.2%	10.2%
Belgium	0.8	1.0	2.9%	4.5%
World	**26.9**	**32.8**	**100.0%**	**4.0%**

Note: ^CAGR and share are calculated on absolute values
Source: ITC Trade Map, Exim Bank Research

Import demand for cheese and curd has grown significantly over the period 2015-20, with the CAGR for global imports being 3.8% during this period. Among the top 10 importers of cheese and curd, only the USA registered a negative CAGR of (-) 1.8% during 2015 to 2020, while all other importers among the top 10 witnessed a positive CAGR. Imports of cheese and curd by Russia recorded a double-digit CAGR of 11.7% during the period 2015-20 (Table 2.7).

Germany was the largest exporter as well as largest importer of cheese and curd in 2020. The imports of cheese and curd by Germany have been increasing since 2015. This can be attributed to the high per capita consumption of cheese in the country (37 kg per person) and the wide assortment of cheese consumed in Germany, many of which can only be produced in specific regions due to the systems of protected designations of origin (PDO) and protected geographical indications (PGI) in the EU.

Table 2.7: Major Importers of Cheese and Curd (Values in US$ Billion)

Country	Value in 2015	Value in 2020	Share in 2020^	CAGR (2015-20)^
Germany	3.8	4.7	14.4%	4.6%
The UK	2.0	2.2	6.6%	1.8%
France	1.5	2.1	6.3%	6.9%
Italy	1.8	1.9	5.7%	1.0%
Belgium	1.2	1.6	4.8%	5.4%
The Netherlands	1.2	1.4	4.3%	2.5%
Japan	1.1	1.3	3.9%	4.0%
The USA	1.3	1.2	3.8%	-1.8%
Russia	0.7	1.2	3.7%	11.7%
Spain	1.0	1.2	3.6%	3.9%
World	**27.2**	**32.8**	**100.0%**	**3.8%**

Note: ^CAGR and share are calculated on absolute values

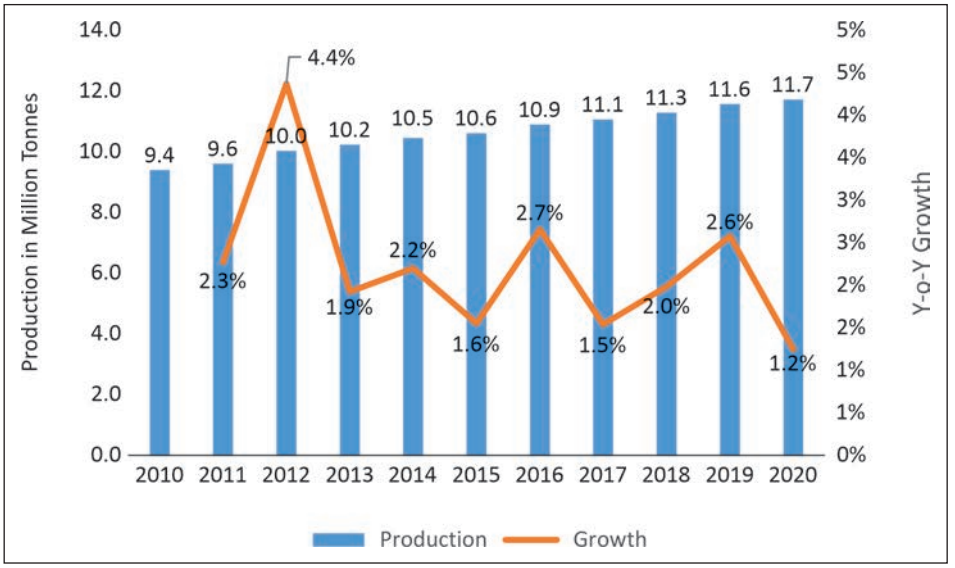
Source: ITC Trade Map, Exim Bank Research

Butter

Production of Butter

Global production of butter[25] during the year 2019 was estimated at 11.6 million tonnes, witnessing an increase of 2.6%, as compared to the previous year. On account of consistent growth over the past several years, the production of butter recorded a CAGR of 2.5% during 2010-19. Production of butter is forecast to have reached 11.7 million tonnes during 2020 (Exhibit 2.8).

Exhibit 2.8: Global Butter Production

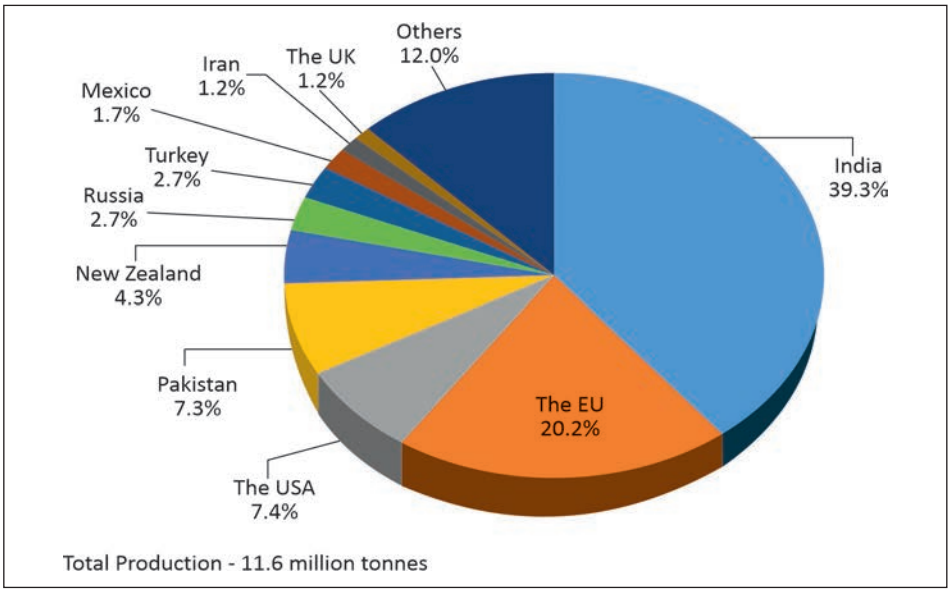


Source: OECD-FAO Agricultural Outlook, Exim Bank Research

India was the leading producer of butter, with an estimated production of 4.5 million tonnes during 2019. Butter production in India accounted for 39.3% of the global butter production. The EU is the second largest producer of butter, with an estimated share of 20.2% in the global butter production during 2019. The EU was followed by the USA with an estimated production of 0.8 million tonnes, and a share of 7.4% in the global butter production during 2019. Other major butter producing countries include Pakistan (share of 7.3% in 2019), New Zealand (4.3%), Russia (2.7%), and Turkey (2.7%) (Exhibit 2.9).

[25] OECD-FAO Statistics

Exhibit 2.9: Major Butter Producing Countries (2019)



Source: OECD-FAO Agricultural Outlook, Exim Bank Research

Global Trade of Butter

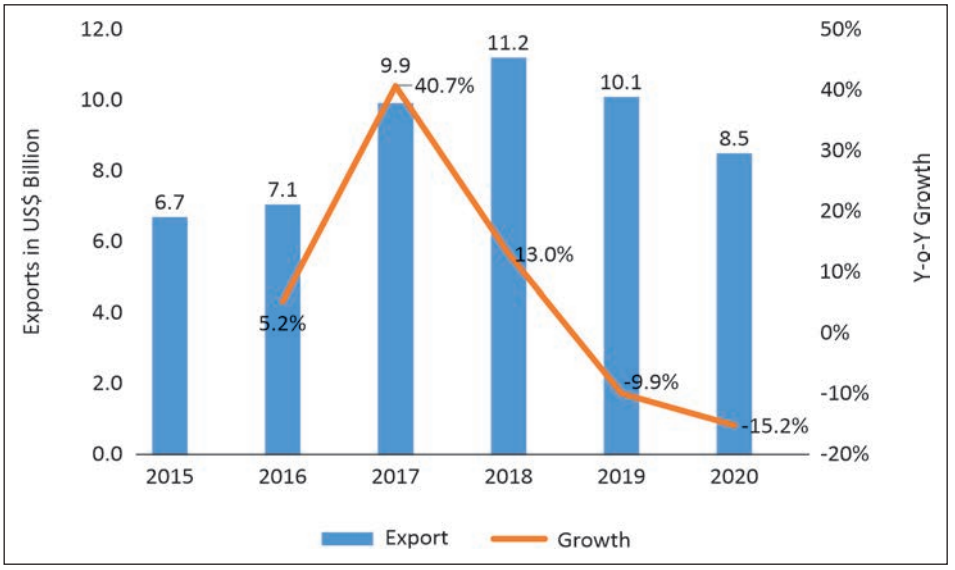
Global exports of butter[26] were estimated at US$ 8.5 billion in 2020, witnessing a decrease of 15.2% as compared to the previous year (Exhibit 2.10). This was the second consecutive year of decline in exports of butter. However, over a longer horizon, growth in exports of butter has been strong, registering a CAGR of 4.9% during 2015 to 2020.

New Zealand was the largest exporter of butter with estimated exports of US$ 1.9 billion in 2020, and a share of 22.2% in the global butter exports. Exports of butter from New Zealand witnessed a y-o-y decrease of 17.7% in 2020 due to fall in global prices and weaker global demand as a result of the COVID-19 crisis. Other major exporters of butter in 2020 were the Netherlands (share of 16.4%), Ireland (13.6%), Germany (7.8%), and Belgium (7.1%) (Table 2.8). The top five exporters of butter accounted for nearly two-third of the global butter exports in 2020. India, in spite of being the largest producer of butter, was not among the top ten exporters of butter. During

[26] HS 0405

2020, India was the 12th largest exporter of butter, accounting for a mere 1.2% of the global exports.

Exhibit 2.10: Global Exports of Butter



Source: ITC Trade Map, Exim Bank Research

Table 2.8: Major Exporters of Butter (Values in US$ Billion)

Country	Value in 2015	Value in 2020	Share in 2020^	CAGR (2015-20)^
New Zealand	1.6	1.9	22.2%	3.0%
The Netherlands	1.0	1.4	16.4%	7.1%
Ireland	0.7	1.2	13.6%	10.8%
Germany	0.6	0.7	7.8%	3.1%
Belgium	0.5	0.6	7.1%	3.6%
France	0.5	0.5	6.1%	3.1%
Belarus	0.3	0.4	4.4%	6.5%
Denmark	0.2	0.3	3.1%	4.8%
The UK	0.2	0.2	2.8%	6.5%
Poland	0.1	0.2	2.6%	11.2%
World	**6.7**	**8.5**	**100.0%**	**4.9%**

Note: ^CAGR and share are calculated on absolute values
Source: ITC Trade Map, Exim Bank Research

France was the largest importer of butter with estimated imports of US$ 827.7 million in 2020, witnessing a decrease of 22.5% as compared to the previous year. France accounted for 9.5% of the global butter import during 2020. Other major importers of butter included Germany (share of 9.1% in 2020), the Netherlands (7.7%), Russia (6.9%), and China (6.3%). Among the major butter importing countries, imports from China, the USA and Russia registered double-digit CAGRs of 15.5%, 15.2% and 14.8%, respectively, during 2015-20. On the other hand, top importing countries like the UK, Belgium and Italy registered negative CAGRs in butter imports during 2015-20 (Table 2.9).

Table 2.9: Major Importers of Butter (Values in US$ Billion)

Country	Value in 2015	Value in 2020	Share in 2020^	CAGR (2015-20)^
France	0.7	0.8	9.5%	3.7%
Germany	0.5	0.8	9.1%	7.8%
The Netherlands	0.5	0.7	7.7%	8.4%
Russia	0.3	0.6	6.9%	14.8%
China	0.3	0.5	6.3%	15.5%
Belgium	0.5	0.5	5.6%	-1.9%
The USA	0.2	0.4	4.2%	15.2%
The UK	0.4	0.3	3.5%	-5.2%
Italy	0.3	0.3	3.1%	-0.4%
Saudi Arabia	0.2	0.3	3.0%	6.3%
World	**6.8**	**8.7**	**100.0%**	**5.2%**

Note: ^CAGR and share are calculated on absolute values
Source: ITC Trade Map, Exim Bank Research

Whey Powder

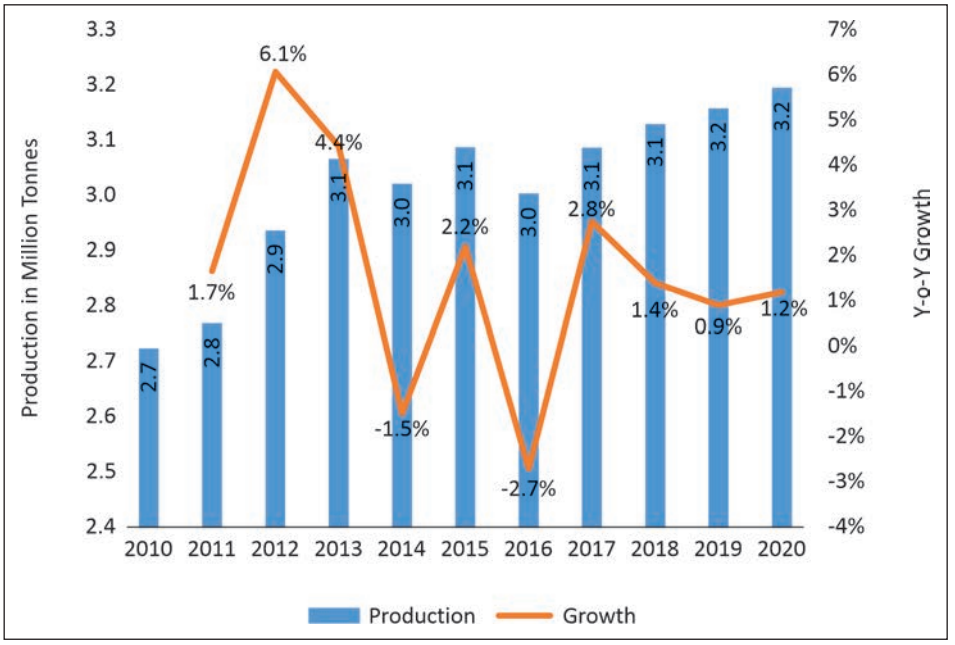
Production of Whey

Global production of whey[27] during 2019 was estimated at 3.15 million tonnes, and is forecast to have reached 3.19 million tonnes during 2020 (Exhibit 2.14). Global production of whey has witnessed intermittent periods

[27] OECD-FAO Statistics

of growth and decline during 2010-19, but the CAGR was healthy at 1.8% during this period.

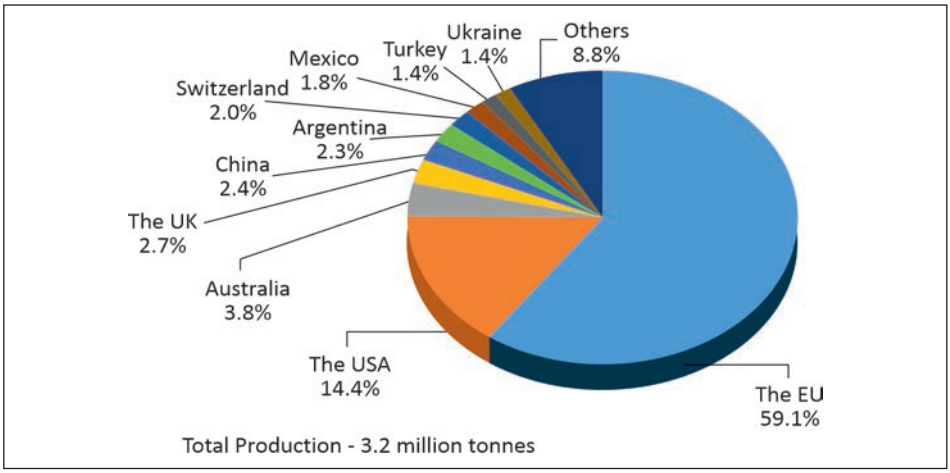
Exhibit 2.11: Global Whey Powder Production



Source: OECD-FAO Agricultural Outlook, Exim Bank Research

The European Union was the leading producer of whey powder, with an estimated production of 1.9 million tonnes during 2019. The EU accounted for a share of 59.1% in the global whey powder production during 2019. The USA was the second largest producer of whey powder, with an estimated share of 14.4% during 2019. The USA was followed by Australia with an estimated production of 0.1 million tonnes, and a share of 3.8% in the global whey powder production during 2019. Other major whey powder producing countries in 2019 included the UK (share of 2.7%), China (2.4%), Argentina (2.3%), and Switzerland (2.0%) (Exhibit 2.12).

Exhibit 2.12: Major Whey Powder Producing Countries (2019)

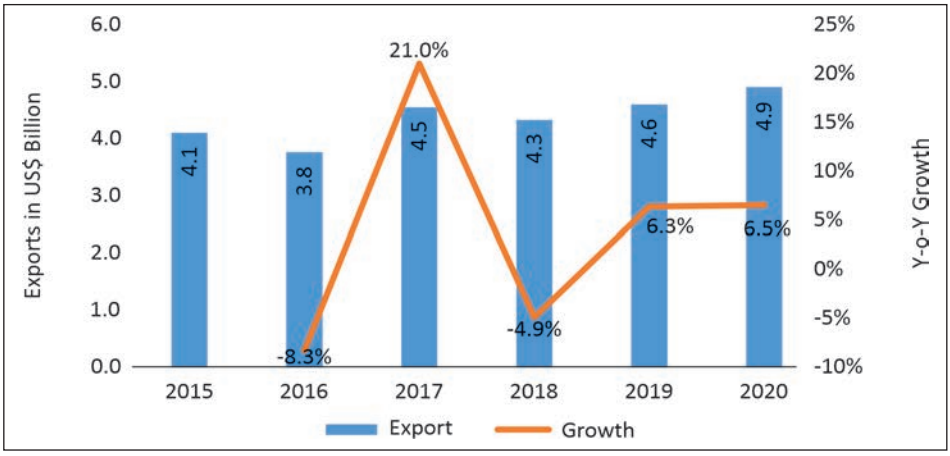


Source: OECD-FAO Agricultural Outlook, Exim Bank Research

Global Trade of Whey

In spite of the challenges due to the COVID-19 pandemic, global trade in whey remained strong during 2020. Global exports of whey powder[28] were estimated at US$ 4.9 billion in 2020, witnessing an increase of 6.5% over the previous year (Exhibit 2.13). During 2015-20, exports of whey powder recorded a CAGR of 3.6%.

Exhibit 2.13: Global Exports of Whey



Source: ITC Trade Map, Exim Bank Research

[28] HS 0404

The USA was the largest exporter of whey powder with estimated exports of US$ 744.5 million in 2020, accounting for a share of 15.2% in the global exports of whey powder. The exports of whey powder from the USA witnessed a robust y-o-y increase of 15.7% during 2020. Other major exporters of whey powder in 2020 included Germany (share of 12.6%), France (10.7%), New Zealand (9.6%), and the Netherlands (9.5%) (Table 2.10). The top five exporters of whey powder accounted for around 58% of the global exports of these products. Among the top ten exporters of whey powder, all except France and New Zealand registered a positive CAGR in whey exports during 2015 to 2020 (Table 2.10).

Table 2.10: Major Exporters of Whey Powder (Values in US$ Billion)

Country	Value in 2015	Value in 2020	Share in 2020^	CAGR (2015-20)^
The USA	0.7	0.7	15.2%	2.1%
Germany	0.5	0.6	12.6%	3.5%
France	0.6	0.5	10.7%	-1.1%
New Zealand	0.5	0.5	9.6%	-0.4%
The Netherlands	0.3	0.5	9.5%	6.2%
Poland	0.2	0.2	4.5%	3.1%
Italy	0.1	0.2	4.2%	8.4%
Denmark	0.1	0.2	3.7%	10.1%
Ireland	0.1	0.2	3.7%	5.3%
Austria	0.1	0.1	2.4%	2.7%
World	**4.1**	**4.9**	**100.0%**	**3.6%**

Note: ^CAGR and share are calculated on absolute values

Source: ITC Trade Map, Exim Bank Research

China is the largest importer of whey with estimated imports of US$ 817.8 million in 2020. Imports of whey powder by China witnessed a y-o-y increase of 34.6% during 2020, and accounted for 17.2% of the global imports of whey powder. Other major importers of whey powder included the Netherlands (share of 9.9% in 2020), the USA (6.1%), Germany (5.1%), and France (4.1%). Among the top ten importers of whey powder, China and South Korea

witnessed a robust CAGR of 9.3% and 8.7%, respectively, in whey imports during 2015-20, while whey imports by Indonesia, the USA and Italy witnessed negative CAGRs during the same period (Table 2.11).

Table 2.11: Major Importers of Whey Powder (Values in US$ Billion)

Country	Value in 2015	Value in 2020	Share in 2020^	CAGR (2015-20)^
China	0.5	0.8	17.2%	9.3%
The Netherlands	0.4	0.5	9.9%	1.0%
The USA	0.3	0.3	6.1%	-2.8%
Germany	0.2	0.2	5.1%	1.0%
France	0.2	0.2	4.1%	2.6%
South Korea	0.1	0.2	3.6%	8.7%
Indonesia	0.2	0.2	3.2%	-3.7%
Japan	0.1	0.1	2.9%	0.3%
Italy	0.2	0.1	2.7%	-3.2%
Malaysia	0.1	0.1	2.1%	0.4%
World	**4.3**	**4.8**	**100.0%**	**2.1%**

Note: ^CAGR and share are calculated on absolute values

Source: ITC Trade Map, Exim Bank Research

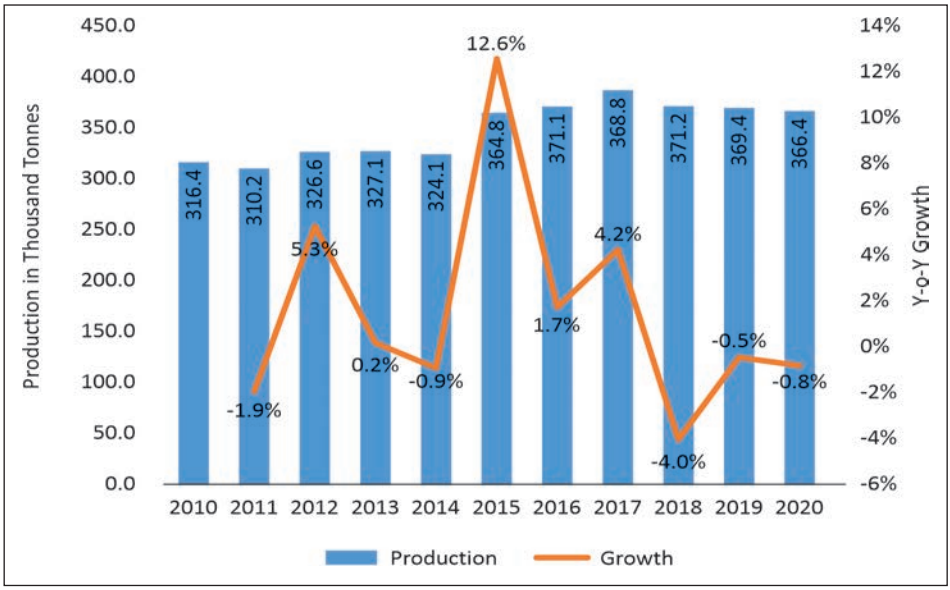
Casein

Production of Casein

Global production of casein[29] was estimated at 369.4 thousand tonnes during 2019. Production of casein witnessed a consistent increase during the period 2015-17, but registered a decline in the following two years, and is forecast to have witnessed further decline in 2020 to reach 366.4 thousand tonnes (Exhibit 2.14). The stagnation in global casein production is due to decrease in production of casein in New Zealand, the largest producer. The decline has been partly compensated by a concurrent increase in production of casein in the EU.

[29] OECD-FAO Statistics

Exhibit 2.14: Global Casein Production



Source: OECD-FAO Agricultural Outlook, Exim Bank Research

Global Trade of Casein

Global exports of casein[30] were estimated at US$ 1872.4 million in 2020, witnessing a y-o-y increase of 19.9% (Exhibit 2.18). In spite of the robust increase during 2020, global exports of casein recorded a negative CAGR of (-) 0.9% during the period from 2015 to 2020. There was sharp decline in exports of casein during 2016 and 2018, and in spite of the recovery thereafter in 2019 and 2020, exports could not recover to the levels of 2015. The decline in value of exports in 2016 and 2018 can be largely attributed to the sharp fall in global prices of casein during these periods.

New Zealand was the largest exporter of casein in 2020, with exports of US$ 681.1 million, and a share of 36.4% in the global casein export. It was followed by Ireland with an estimated share of 22.8% in the global casein export. Other major exporters of casein in 2020 included France (share of 15.9%), Germany (9.1%), Poland (3.6%), and the Netherlands (2.6%). India had a share of 0.7% in the global casein exports in 2020, down from 1.8% in 2015.

[30] HS 3501

Exhibit 2.15: Global Exports of Casein

Source: ITC Trade Map, Exim Bank Research

Several countries among the top 10 exporters of casein registered a negative CAGR in exports of these products during 2015 to 2020. India, which was among the top exporters of casein, registered one of the steepest decline in exports, registering a CAGR of (-) 18.9% during 2015 to 2020 (Table 2.12).

Table 2.12: Major Exporters of Casein (Values in US$ Million)

Country	Value in 2015	Value in 2020	Share in 2020^	CAGR (2015-20)^
New Zealand	813.3	681.1	36.4%	-3.5%
Ireland	323.5	426.1	22.8%	5.7%
France	231.0	298.0	15.9%	5.2%
Germany	240.0	169.9	9.1%	-6.7%
Poland	43.5	67.6	3.6%	9.2%
The Netherlands	41.0	49.3	2.6%	3.7%
Ukraine	27.6	37.8	2.0%	6.5%
The USA	33.0	27.5	1.5%	-3.6%
India	35.5	12.5	0.7%	-18.9%
Belarus	13.8	11.7	0.6%	-3.3%
World	**1960.2**	**1872.4**	**100%**	**-0.9%**

Note: ^CAGR and share are calculated on absolute values
Source: ITC Trade Map, Exim Bank Research

The USA is the largest importer of casein with estimated imports of US$ 505.4 million in 2020, registering an increase of 10.5% over the previous year. The USA accounted for 21.4% of the global casein import in 2020. Other major importers of casein in 2020 included China (share of 10.6%) and Germany (7.9%). Some of the major casein importing countries like the USA, Germany, Japan, and Spain witnessed a negative CAGR in their imports of casein during 2015-20 (Table 2.13).

Table 2.13: Major Importers of Casein (Values in US$ Million)

Country	Value in 2015	Value in 2020	Share in 2020^	CAGR (2015-20)^
The USA	676.3	505.4	21.4%	-5.7%
China	171.8	250.8	10.6%	7.9%
Germany	193.9	185.6	7.9%	-0.9%
Mexico	127.6	133.8	5.7%	1.0%
Japan	120.4	109.1	4.9%	-1.9%
The Netherlands	87.0	106.9	4.5%	4.2%
Poland	55.5	86.4	3.7%	9.3%
Spain	89.1	79.9	3.4%	-2.2%
Indonesia	52.9	77.2	3.3%	7.9%
South Korea	55.1	66.4	2.8%	3.8%
World	**2300.5**	**2358.4**	**100%**	**0.5%**

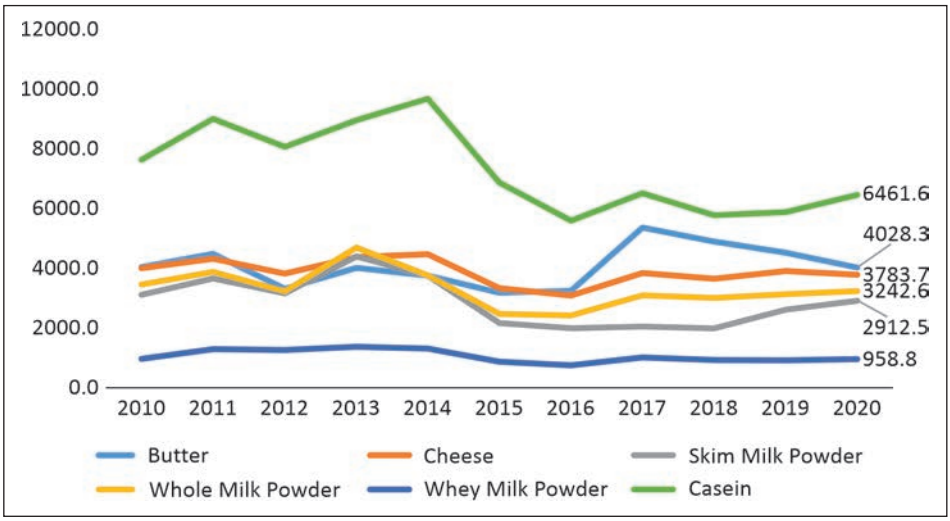
Note: ^CAGR and share are calculated on absolute values

Source: ITC Trade Map, Exim Bank Research

GLOBAL PRICES

The prices of dairy products fell considerably after 2014, as import demand was subdued and the supplies increased globally. The steepest decline was registered in prices of casein, and in spite of the recent recovery in 2019 and 2020, prices of casein have remained below the record levels achieved in 2014. Prices of butter had spiked in 2017, but have moderated in the following years, registering a consistent decline during 2018-20. Prices of Skim Milk Powder (SMP) and Whole Milk Powder (WMP) also increased during 2019 and 2020, with the prices of SMP witnessing a major increase of 31.7% in 2019 and a further 11.1% in 2020 (Exhibit 2.16).

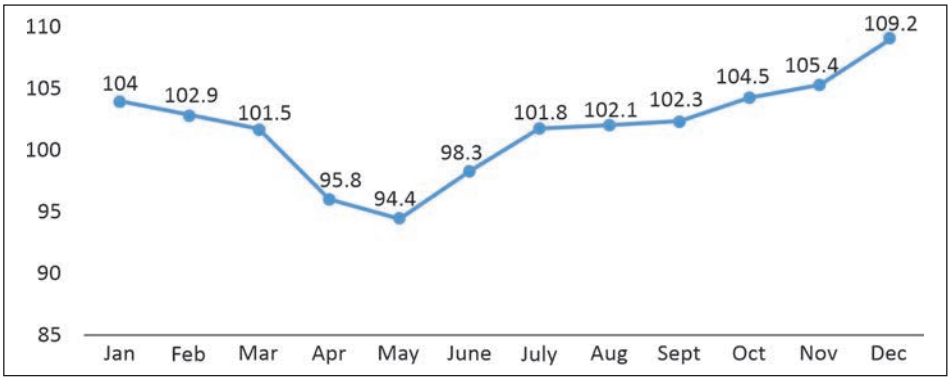
Exhibit 2.16: Global Dairy Products Prices (US$/tonne)



Source: OECD-FAO Agricultural Outlook, Exim Bank Research

The FAO Dairy Price Index[31] witnessed considerable fluctuations in 2020, due to the impact of COVID-19 pandemic. The index witnessed a dip and was below 100 during April-June 2020, when the impact of COVID-19 on the global economy was severe. However, the index witnessed an increase after June 2020, and since then has been on an upward trajectory (Exhibit 2.17).

Exhibit 2.17: FAO Dairy Price Index (2020)



Source: FAO, Exim Bank Research

[31] The FAO Dairy Price Index is derived from a trade-weighted average of a selection of representative internationally traded dairy products

IMPACT OF COVID-19 PANDEMIC

The COVID-19 pandemic had a major impact on all economies, both from the supply side as well as demand side. As a result, most of the sectors were negatively impacted. Dairy sector was also hit as dairy products are highly perishable and depend on integrated and time-sensitive supply chains. As lockdowns were in place in many countries, milk producers globally, especially the smaller ones, faced challenges with respect to sale of their output; with producers even resorting to dumping of milk across several parts of the world.

In the USA, it was estimated that about 5% of the country's milk output in April 2020 was dumped, and the percentage was estimated to be higher in May and June 2020. Also, as a response to the meat shortage and milk surplus in the pandemic, the dairy farmers in the USA sent 2.3% more milking cows to slaughter in April 2020, and the total number of milking cows in the USA is estimated to have dropped[32]. Although the USA has one of the most efficient and reliable farm-to-market food systems in the world, its food system for dairy and many other products suffered from unprecedented disruptions and uncertainty due to COVID-19. Many dairy farms in Canada and the UK also reported difficulty in staying in business and many of them had to dump milk due to sharp decline in demand for milk and other dairy products during the pandemic.

During the pandemic, many governments resorted to lockdowns, quarantines and other measures, which resulted in disruptions in commerce and transportation, shortage of farm labour, and difficulty in sourcing feed and other farm inputs. These shortages significantly increased the production costs for many dairy farms. For instance, commercial dairy farms in China reported a shortage of workers in February 2020 and an increase of about 5%–10% in average feed costs[33].

On the demand side, the sharp decrease in demand for milk and other dairy products resulted in significant surpluses and as a result led to a decrease

[32] Impacts of the COVID-19 pandemic on the dairy industry: Lessons from China and the United States and policy implications, Science Direct

[33] Ibid

in the farmgate prices. With the shutdown of food services, such as coffee shops, gelatos, restaurants, offices and other consumer sections for milk and milk products, the demand was significantly affected. Also, many dairy processing units were shut during the pandemic to combat the spread of the pandemic and many of these units could not sustain the loss due to closure, especially the smaller ones, resulting in permanent closure of the plants.

Due to the lack of demand, many producers resorted to processing the milk into milk powder for storage in the pandemic period. This was seen in countries like the USA and China. The EU and India also witnessed stock development of SMP.

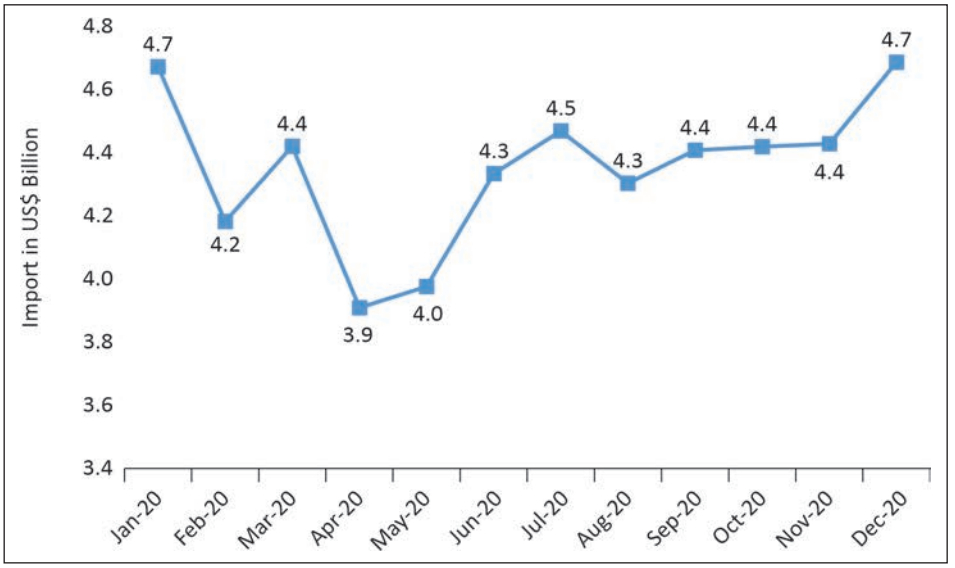
On the positive side, the negative effects of the pandemic have encouraged many dairy farms and cooperatives to develop detailed roadmaps about how to deal with surplus milk when farmgate prices are too low, or when a pandemic or natural disaster hits. For example, large dairy cooperatives have been investing in processing facilities to process fluid milk into milk powder, and also have been increasing their storage capacity for these products.

The prices of the dairy products during the pandemic declined sharply. Economic recession exerts downward pressure on prices, especially for high value-added commodities. This was evident in the FAO dairy price index, as discussed earlier. The major impact was during March-June period, after which the prices started picking up, pushing the index slightly above the pre-pandemic level for the first time in October, mostly underpinned by strong import demand from China, the revival of imports in some oil-dependent countries and an increase in internal demand in Europe. The demand for dairy products has witnessed an upsurge with easing of restrictions that were put in place due to COVID-19.

The imports of dairy products witnessed a decline at the beginning of 2020, as a result of the early phase of the pandemic associated disruptions. As the situation improved and the restrictions were lifted, the demand witnessed an increase and the imports also started to increase (Exhibit 2.18). The increase was largely attributable to high import demand from China with the resurgence of economic activities in the country. There was also an increase in import orders from Algeria, Saudi Arabia and Nigeria, reflecting a gradual

recovery in petroleum prices and boost in consumer sentiments in these economies. Australia, Colombia and the Russian Federation also stepped-up imports in line with growing domestic demand.

Exhibit 2.18: Monthly Import of Dairy Products by Major Importers (2020)



Note: Import figure is aggregate of import of dairy products by China, The USA, The UK, The EU(27), and Russia—the top dairy importing countries, accounting for 74% (approx.) of global dairy imports during 2020

Source: ITC Trade Map, Exim Bank Research

OUTLOOK

Product-wise analysis of demand indicates that milk and cream would continue to be the largest consumed dairy product globally and will display a steady demand during the period 2020-2024, followed by cheese, butter and whey[34]. Demand for yoghurt and dairy spreads is projected to stagnate unless new innovative products are positioned. Demand for ice cream is also projected to display a lean growth during the period 2020-2024. The growing demand offers considerable prospects for producers in developing countries to tap the emerging opportunities, as the developing economies are also expected to be the major drivers of the growth in demand of dairy products.

[34] United Nations Industrial Statistics Database

3. INDIAN DAIRY SCENARIO

India has a wide variety of milch animals. Population of most categories of livestock witnessed an increase in the 20th livestock census of 2019, as compared to the 19th livestock census of 2012. The overall livestock population witnessed a CAGR of 0.6% during the period 2012-2019 (Table 3.1).

Table 3.1: Livestock Population (in Million)

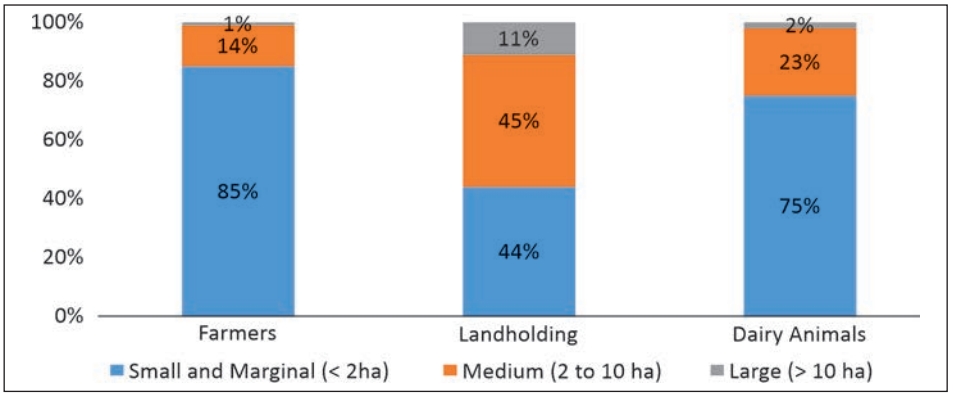
Species	19th Livestock Census 2012	20th Livestock Census 2019	CAGR (2012-2019)
Cattle	190.90	193.46	0.2%
Buffalo	108.70	109.85	0.1%
Yaks	0.08	0.06	-3.5%
Mithuns	0.30	0.39	3.3%
Total Bovines	**299.98**	**303.76**	**0.2%**
Sheep	65.07	74.26	1.7%
Goat	135.17	148.88	1.2%
Pigs	10.29	9.06	-1.6%
Other Animals	1.54	0.80	-7.9%
Total Livestock	**512.06**	**536.76**	**0.6%**

Source: Department of Animal Husbandry and Dairying (DAHD), Ministry of Fisheries, Animal Husbandry and Dairying, Government of India

Dairy is an essential means of livelihood for landless and poor farmers in India. About 80 million rural households in the country are currently engaged in milk production[35]. Farmers with small and marginal land holding (< 2 ha) own around 75% of the milch animals (Exhibit 3.1). Small land base encourages the farmers to practice dairying as a subsidiary activity along with agriculture to supplement their incomes.

[35] Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India

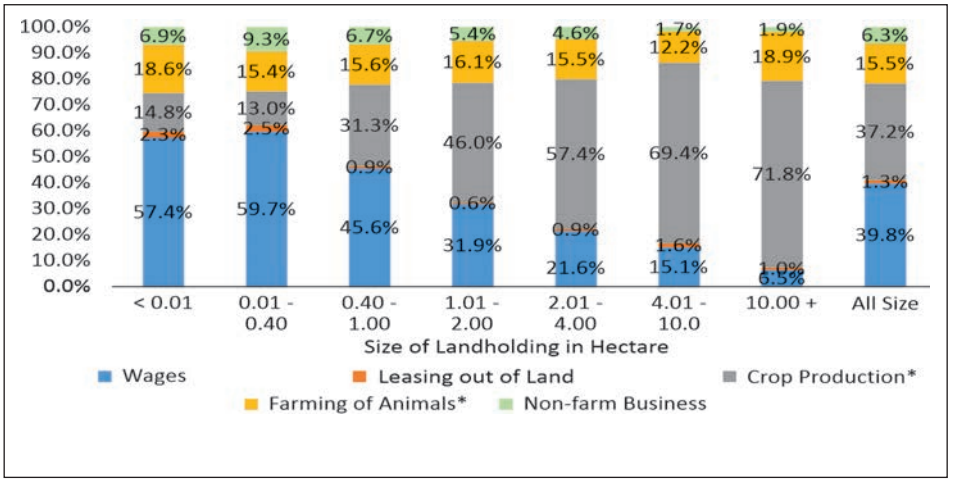
Exhibit 3.1: Category-wise Farmers' Land Holding and Animal Holding



Source: Basic Animal Husbandry Statistics, DAHD, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India

In India, nearly 95% of the milk producers hold on an average 1 to 5 milch animals per household. Dairy products obtained from the livestock forms a substantial part of the farmers' total income, especially in case of farmers with small landholdings. Livestock's contribution to the total income of the rural households was estimated at 15.5%, but the contribution was much higher at 18.6% of the total income in the case of farmers with less than 0.01 hectare of land (Exhibit 3.2).

Exhibit 3.2: Source of Income for Rural Households in India Based on Size of Landholding



*Note: * only out-of-pocket expenses were considered for working out net receipt*
Source: Situation Assessment of Agricultural Households and Land and Holdings of Households in Rural India, 2019, NSS 77th round

PRODUCTION AND DEMAND SCENARIO OF DAIRY PRODUCTS IN INDIA

India is among the largest producers and consumers of dairy products. The milk obtained from milch animals in India are usually consumed directly and/ or processed into ice cream, cheese, butter, condensed milk, and yogurt. These products form an integral part of the country's nutrient security as they offer various crucial nutrients, such as calcium, proteins, zinc, magnesium, vitamin D, and B12.

The Gross Value Added (GVA) of the livestock sector (at constant 2011-12 Price) has witnessed an increase in absolute terms as well as in terms of percentage share in the overall GVA in the recent years. The livestock sector contributed 4.4% of the total GVA of India during 2019-20, as compared to 4.0% in 2011-12[36]. The share of livestock in the GVA for the agriculture and allied activities has also increased from 21.8% in 2011-12 to 29.3% in 2019-20 (Table 3.2). More than two-third of the GVA of the livestock sector is derived from dairy.

Table 3.2: Share of Livestock Sector in GVA (Value in ₹ Billion)

Year	Value of GVA of Livestock	% Share of Total GVA	Share in GVA of Agri and Allied Sector (%)
2011-12	3273.3	4.0	21.8
2012-13	3443.7	4.0	22.6
2013-14	3635.6	4.0	22.6
2014-15	3904.5	4.0	24.3
2015-16	4196.4	4.0	26.0
2016-17	4615.7	4.1	26.7
2017-18	4978.3	4.1	27.1
2018-19	5399.5	4.2	28.6
2019-20	5777.2	4.4	29.3

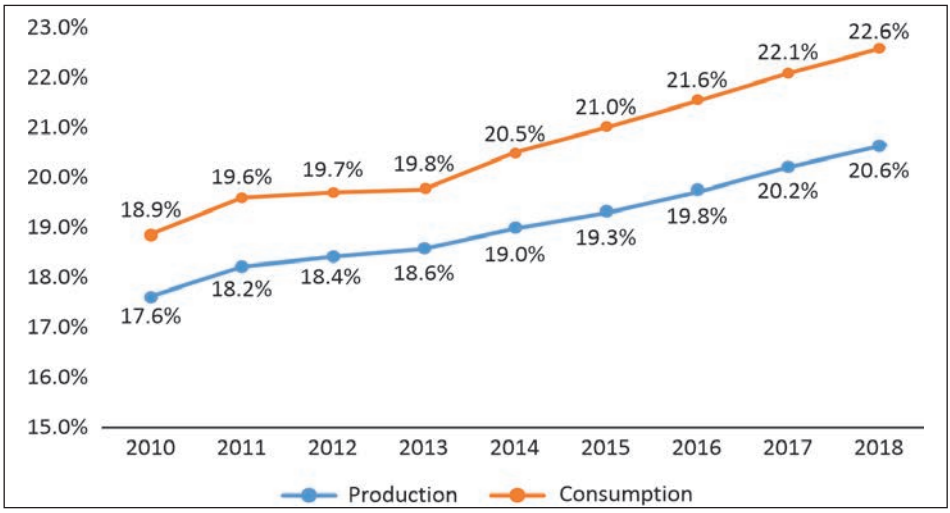
Note: GVA at Constant (2011-12) Price

Source: National Accounts Statistics-2021, MoSPI, Exim Bank Research

[36] CSO

In the global consumption of dairy products, India's share was estimated at 22.6% during 2018[37] while the share of India in the global production of dairy products was estimated at a relatively lower 20.6% during the same period. India's share in the global production and consumption of dairy products has been increasing over time. While India's share in the global production of dairy products increased from 17.6% in 2010 to 20.6% in 2018, the share in global consumption of dairy products witnessed an increase from 18.9% in 2010 to 22.6% in 2018 (Exhibit 3.3). Rising consumerism due to increasing income levels and socioeconomic developments, coupled with awareness about health foods, have been the key drivers for growth in consumption of dairy products. Most of the production in the dairy sector is utilized for catering to the large and rising domestic demand, and as a result exports of dairy products from India have been low.

Exhibit 3.3: India's Share in Global Production and Consumption of Dairy Products

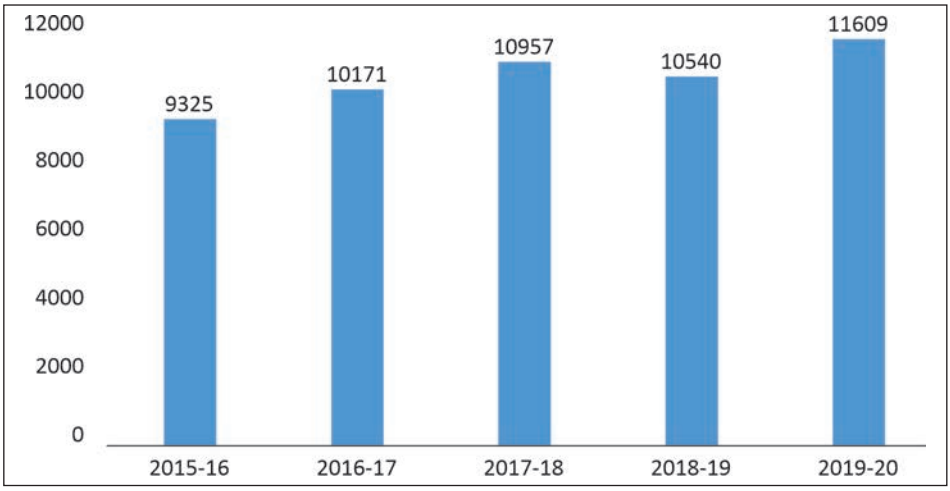


Source: Indian Council of Food and Agriculture

Market size of India's dairy sector was estimated at ₹ 11,609 billion during 2019-20, witnessing a y-o-y increase of 10.1%. The market size of dairy products in India recorded a CAGR of 5.6% during 2015-16 to 2019-20 (Exhibit 3.4).

[37] Indian Council of Food and Agriculture (ICFA)

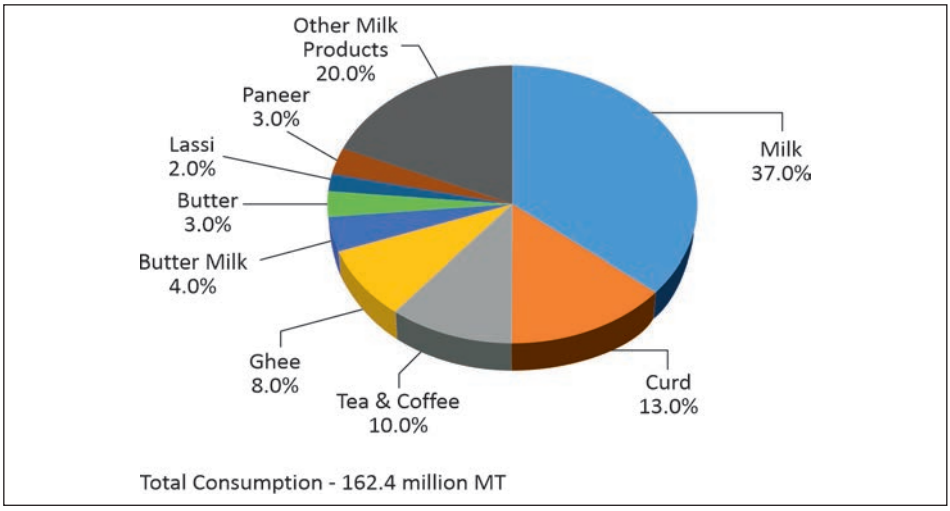
Exhibit 3.4: Dairy Market Size in India (in ₹ Billion)



Source: Care Ratings, CMIE Industry Outlook

Liquid milk has the largest share in household consumption of dairy products in India, with an estimated share of 37% in 2019. Liquid milk was followed by curd with an estimated share of 13% in household dairy consumption in India. Other major products in the consumption basket of dairy products include tea and coffee (10%), ghee (8%), and butter milk (4%) (Exhibit 3.5).

Exhibit 3.5: Product-wise Share in Total Household Consumption (2019)



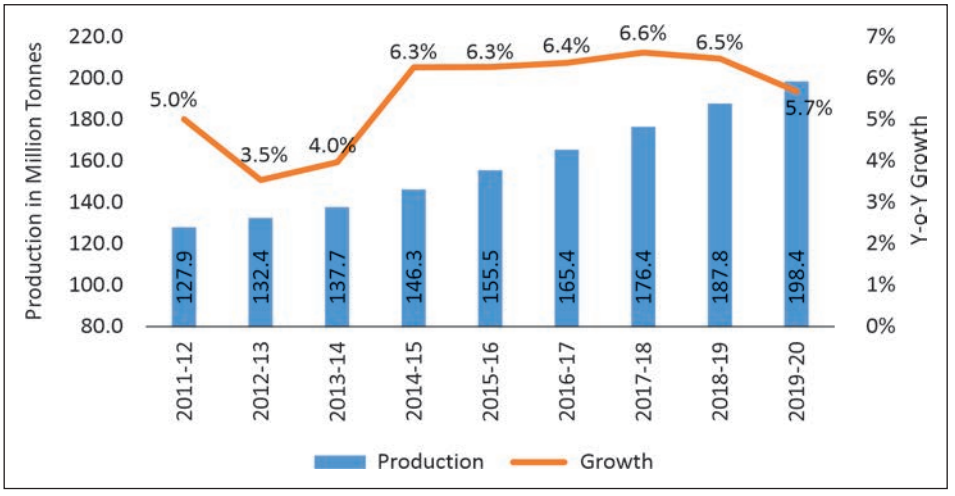
Source: Study of Demand of Milk and Milk Products in India, NDDB (2019)

SCENARIO OF MILK PRODUCTION

India is the largest producer of milk globally and accounts for nearly half of all the dairy farms in the world. Due to its lower cost of production, India enjoys a comparative advantage in milk production[38]. However, due to the high cost of conversion of milk into dairy products, India lags behind many countries in production of other dairy products. Lack of scale in production and processing acts as hindrance for the growth of the dairy sector in India.

Milk production in India was estimated at 198.4 million tonnes during 2019-20, registering a y-o-y increase of 5.7%. Growth has been stable over the past decade, as the milk production in India increased from 127.9 million tonnes in 2011-12 to 198.4 million tonnes in 2019-20 (Exhibit 3.6), registering a CAGR of 5.6% during 2011-12 to 2019-20. Due to the consistent increase in milk production, India overtook the European Union to become the largest milk and dairy products producer in 2014, and has maintained its position thereafter[39].

Exhibit 3.6: Milk Production in India



Source: Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India, Exim Bank Research

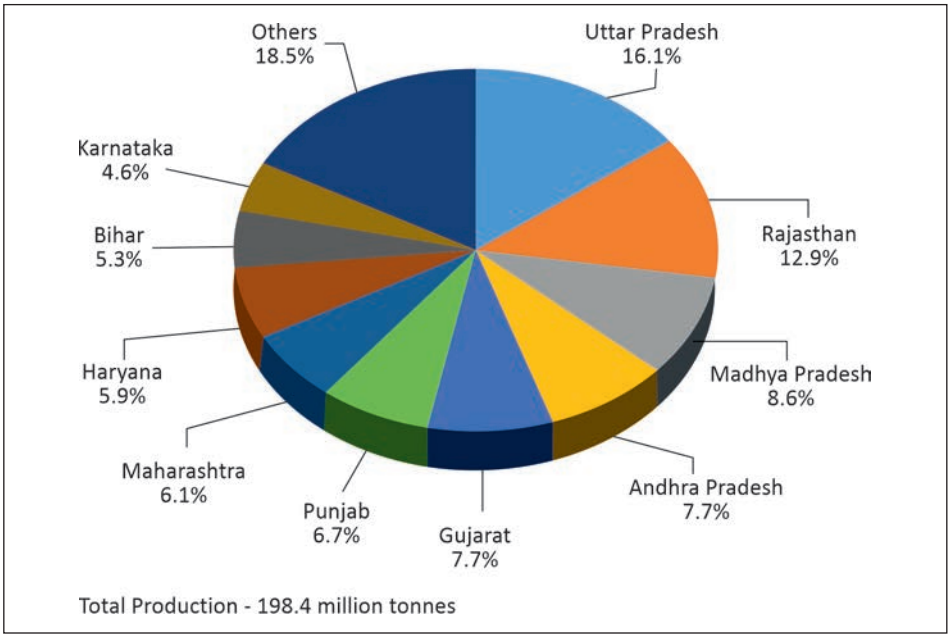
[38] ICFA

[39] OECD-FAO Agricultural Outlook

Uttar Pradesh is the leading milk producing state in India with an estimated production of 31.9 million tonnes in 2019-20, accounting for 16.1% of the total milk production in India during the year. Rajasthan was the second largest milk producing state with an estimated milk production of 25.6 million tonnes and a share of 12.9% in India's total milk production in 2019-20. Other major milk producing states in India during 2019-20 included Madhya Pradesh (share of 8.6%), Andhra Pradesh (7.7%), Gujarat (7.7%), and Punjab (6.7%) (Exhibit 3.7).

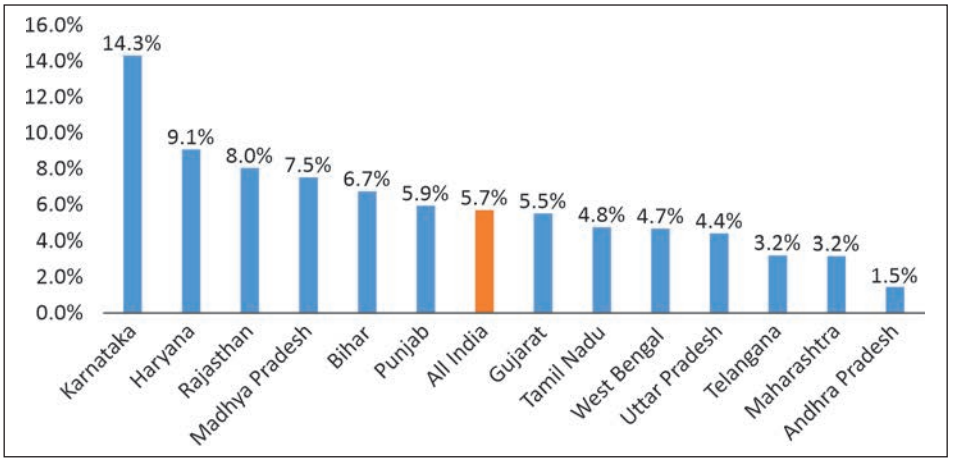
The growth in milk production varied across states during 2019-20, with growth in some states far outpacing the all-India growth of 5.7%. Karnataka witnessed the highest growth in milk production, estimated at 14.3%, followed by Haryana with an estimated growth of 9.1%. Rajasthan, Madhya Pradesh, Bihar, and Punjab also witnessed a higher growth rate than the all-India average. States like Gujarat, Tamil Nadu, West Bengal, Uttar Pradesh, Telangana, Maharashtra and Andhra Pradesh also witnessed growth, but the growth rate was below the all-India level (Exhibit 3.8).

Exhibit 3.7: Major Milk Producing States in India (2019-20)



Source: Lok Sabha Unstarred Question No. 3458, dated 10.08.2021, Exim Bank Research

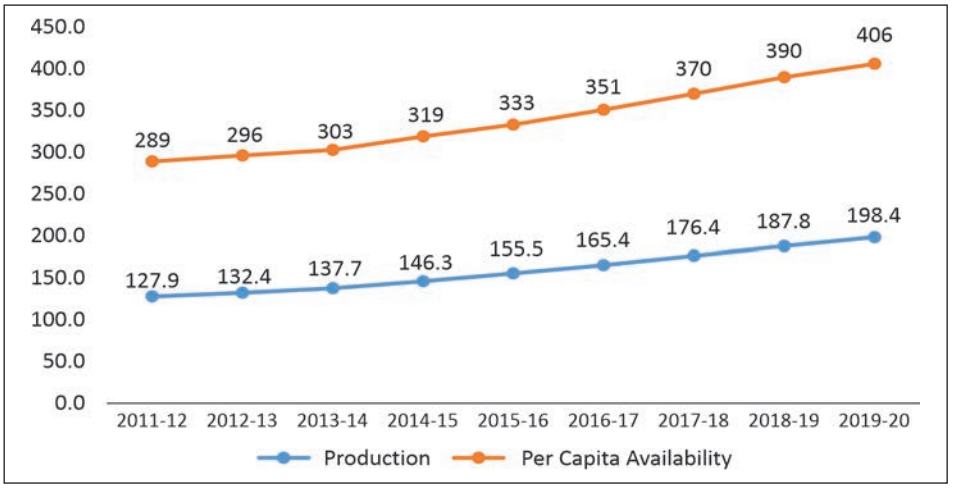
Exhibit 3.8: State-wise Annual Growth of Milk Production (2019-20)



Source: Lok Sabha Unstarred Question No. 3458, dated 10.08.2021, Exim Bank Research

The per capita availability of milk in India has also been increasing in line with the rising milk production. The per capita milk availability was estimated at 406 grams/day during 2019-20, up from the 2018-19 level of 390 grams/day (Exhibit 3.9). The per capita milk availability recorded a CAGR of 4.3% during 2011-12 to 2019-20.

Exhibit 3.9: Milk Production and Per-Capita Availability of Milk

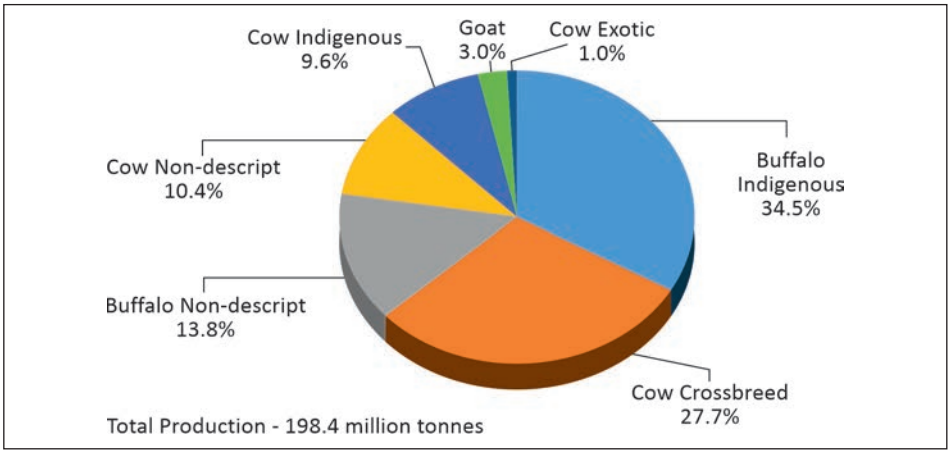


Note- Production in million tonnes and per capita availability in grams/day
Source: Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India, Exim Bank Research

In India, various species of cattle contribute to milk production, including crossbreed cows, indigenous cows, indigenous buffaloes, non-descript buffaloes and goats, among others. Indigenous buffalo has the largest share in India's milk production, with an estimated share of 34.5% in total milk production in 2019-20. It was followed by crossbred cows with an estimated share of 27.7% in the total milk production. Other major contributors to the milk production include non-descript buffaloes (share of 13.8%), non-descript cows (10.4%), and indigenous cows (9.6%) (Exhibit 3.10).

Between the two Livestock Censuses (2012 and 2019) in India, the relative share of cows' milk in India's total milk production grew by 3 percentage points to reach nearly 48% due to an increase in milk production from exotic and crossbred cows.

Exhibit 3.10: Species-wise Milk Production (2019-20)



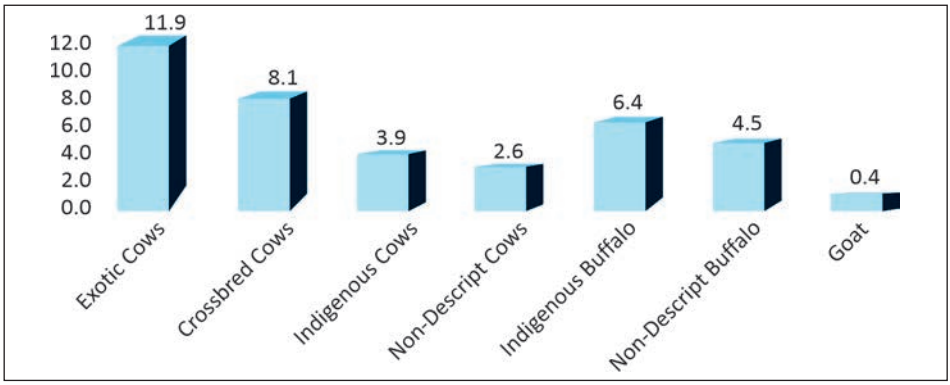
Source: Basic Animal Husbandry Statistics 2020, Exim Bank Research

The average yield rate of the species vary, with the yield rate for exotic cows in India estimated at 11.9 kg/day during 2019-20, while that of crossbred cows estimated at 8.1 kg/day. The average yield rate for indigenous buffalo and non-descript buffalo was estimated at 6.4 kg/day and 4.5 kg/day, respectively (Exhibit 3.11).

The average yield of crossbred/exotic cows are different from non-descript/ indigenous cows in India. The yield was estimated at 8.2 kg/day for crossbred/exotic, while the yield was estimated at 3.08 kg/day for non-

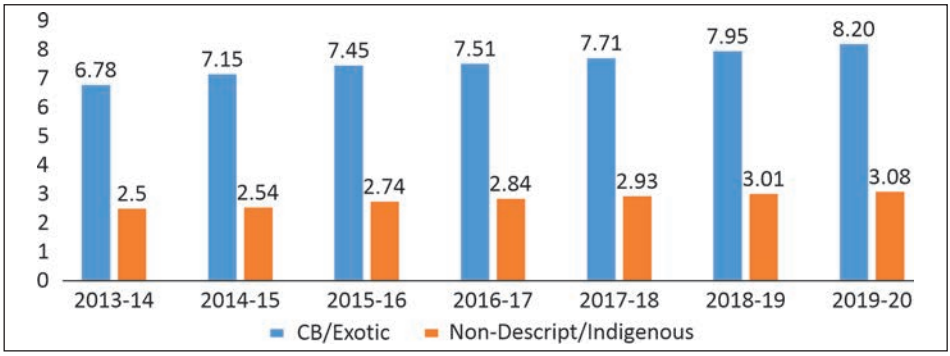
descript/indigenous during 2019-20. The yield for both types have witnessed a consistent increase overtime (Exhibit 3.12).

Exhibit 3.11: Species-wise Average Yield Rate of Milk (kg/day) (2019-20)



Source: Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India.

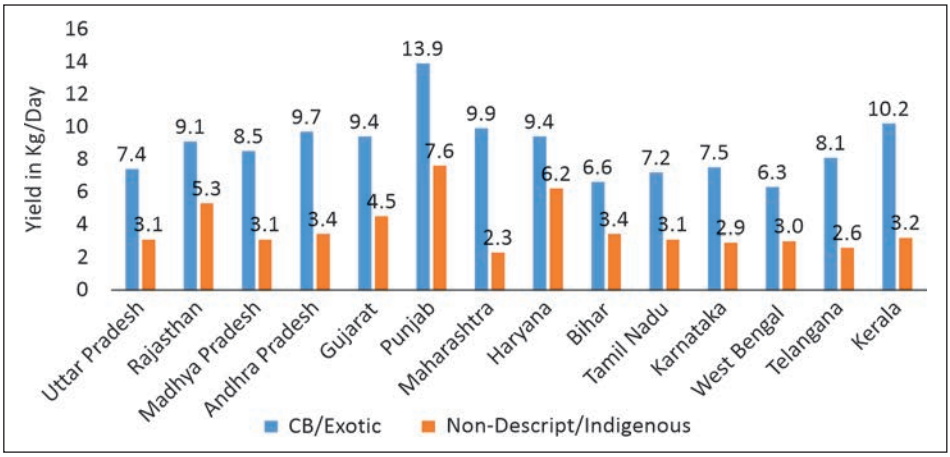
Exhibit 3.12: Average Yield of Milk as per Type of Cow (kg/day)



Source: Basic Animal Husbandry Statistics 2020

There is a notable difference in state-wise yield of different varieties of cows. While the yield of crossbred/exotic cows was the highest in Punjab, at an estimated 13.9 kg/day, it was the lowest in West Bengal at an estimated 6.3 kg/day. In fact, the yield of crossbred/exotic cows in West Bengal was even lower than the yield of non-descript/indigenous cows in Punjab, indicative of the fact that breed alone is an insufficient predictor of productivity levels, and other factors such as feed and animal nutrition are also important for yield improvements. For the non-descript/indigenous cows, the yield was the highest in Punjab, estimated at 7.6 kg/day, while it was the lowest in Maharashtra at 2.3 kg/day (Exhibit 3.13).

Exhibit 3.13: State-wise Average Yield of Milk as per Species of Cows (2019-20)



Source: Basic Animal Husbandry Statistics 2020

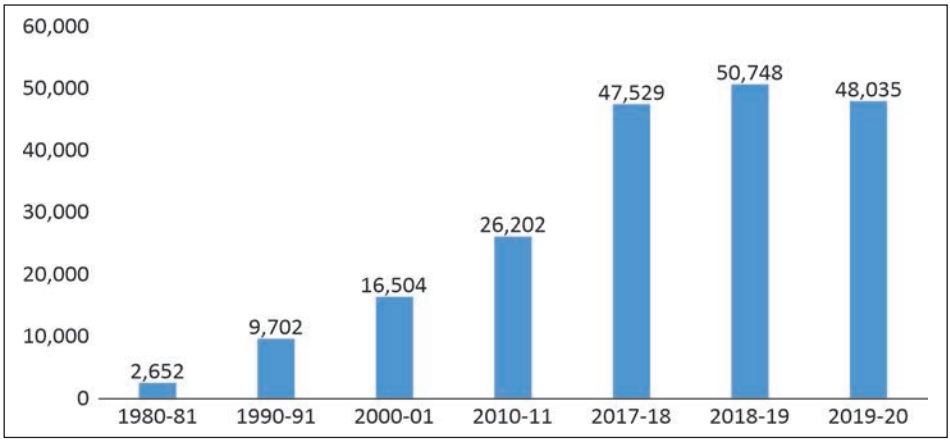
MILK PROCUREMENT

In India, about 48% of the milk is consumed at the producer level or sold to non-producers in rural India[40]. The rest of the milk production is available for sale in the organised and unorganised market. The organised sector comprises the Government, Producers Owned Institution (Milk Cooperatives and Producer Companies) and private players, which provide fair and transparent system of milk collection round-the-year at the village level. The unorganized market consists of local milkman and contractors, which are characterized by non-uniformity in milk procurement and prices. The possibility of milk adulteration is reported to be often higher in the unorganized segment compared to the organized sector.

With growth in demand and increase in the organized sector participation in dairy, milk procurement has been increasing overtime. The milk procurement by dairy cooperatives was estimated at 48,035 thousand kg/day during 2019-20[41], witnessing a decrease of 5.3% from the previous year's value of 50,748 thousand kg/day (Exhibit 3.14). Besides this blip in 2019-20, there has been strong upward movement in milk procurement across India, with the overall milk procurement registering a CAGR of 7.0% during 2010-11 to 2019-20.

[40] Dairy India Overview, A Pack Prepared for Dairy Australia by Beanstalk, December 2020
[41] NDDB

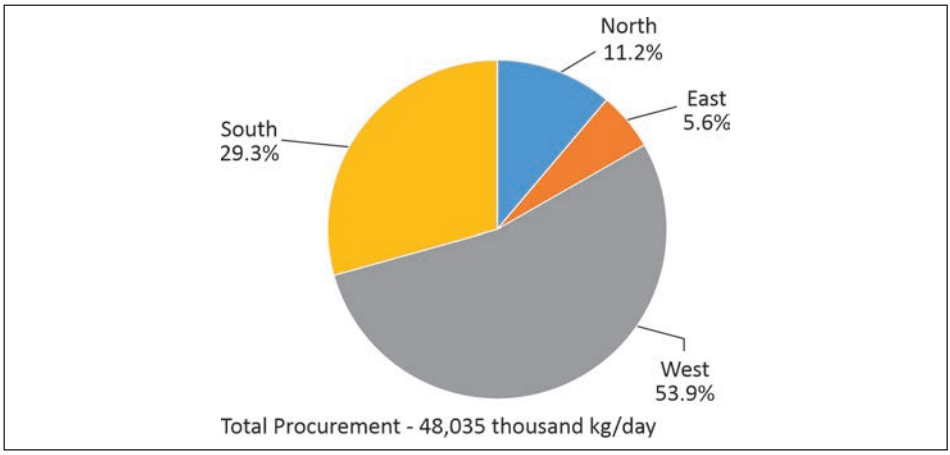
Exhibit 3.14: Procurement Volume of Milk Across India (Thousand kg/day)



Source: National Dairy Development Board, Exim Bank Research

There is region-wise disparity in milk procurement in India. The milk procurement was highest in the western region of India, with an estimated procurement of 25,914 thousand kg/day, accounting for a share of 53.9% in the overall milk procurement of India. The eastern region has the lowest milk procurement with an estimated milk procurement of 2,669 thousand kg/day, and a share of 5.6% in the overall milk procurement during 2019-20 (Exhibit 3.15). Presence of stronger cooperatives in the western region, especially in Gujarat, is a major reason behind the skewed share of the region in milk procurement.

Exhibit 3.15: Region-wise Milk Procurement in India (2019-20)



Source: National Dairy Development Board, Exim Bank Research

Gujarat was the cradle of the White Revolution in India (Box 1), and the Gujarat Cooperative Milk Marketing Federation has served as a model for emulation by cooperatives in India and other countries. It maintains its position as the largest dairy cooperative in terms of milk procurement. In 2019-20, largest amount of milk procurement was undertaken in the state of Gujarat, with an estimated procurement of 21,570 thousand kg/day, and a share of 44.9% in the overall milk procurement in India during the year. The second largest state for milk procurement was Karnataka with an estimated procurement of 7,441 thousand kg/day and a share of 15.5% in the overall milk procurement in 2019-20. Other major states in terms of milk procurement during 2019-20 included Tamil Nadu (share of 7.1% in overall milk procurement), Maharashtra (6.9%), and Rajasthan (5.6%) (Exhibit 3.16).

Box 1: White Revolution

The National Dairy Development Board in India designed a dairy development programme in 1969 to lay the foundation for a viable, self-supportive national dairy industry. The programme sought to link rural milk production to urban milk marketing through cooperatives. In July 1970, with technical assistance from the United Nations Development Programme (UNDP) and the Food and Agriculture Organization (FAO), the programme was launched as Operation Flood (OF).

Operation Flood-I sought to establish 18 "Anands" linked to the four urban markets – Mumbai, Delhi, Kolkata and Chennai. Funds were generated from gifted commodities received from the United Nation's World Food Programme – 126,000 tonnes of skimmed milk powder and 42,000 tonnes of butter oil over the project period. The commodities were recombined as liquid milk and sold in the cities at prevailing market price, which went towards building the cooperative dairies under the programme, while capturing the urban market for rurally produced milk.

To route the gifted commodities and funds under OF, the Government of India set up the Indian Dairy Corporation (IDC) in 1970 which was later merged with NDDB in 1987, by an Act of Parliament (the NDDB Act 1987). By focusing on producers with small resource bases – animal and

land holdings in potential milksheds, Operation Flood strived to generate a flood of milk in the rural areas and create a flow into the cities. This flow was sustained by linking milk production to its marketing through modern processing facilities. The major advantage of taking milk and not cattle from villages into cities was the convenient, economic and scientific management of the milk animals in milksheds through improved breeding, feeding and health care practices.

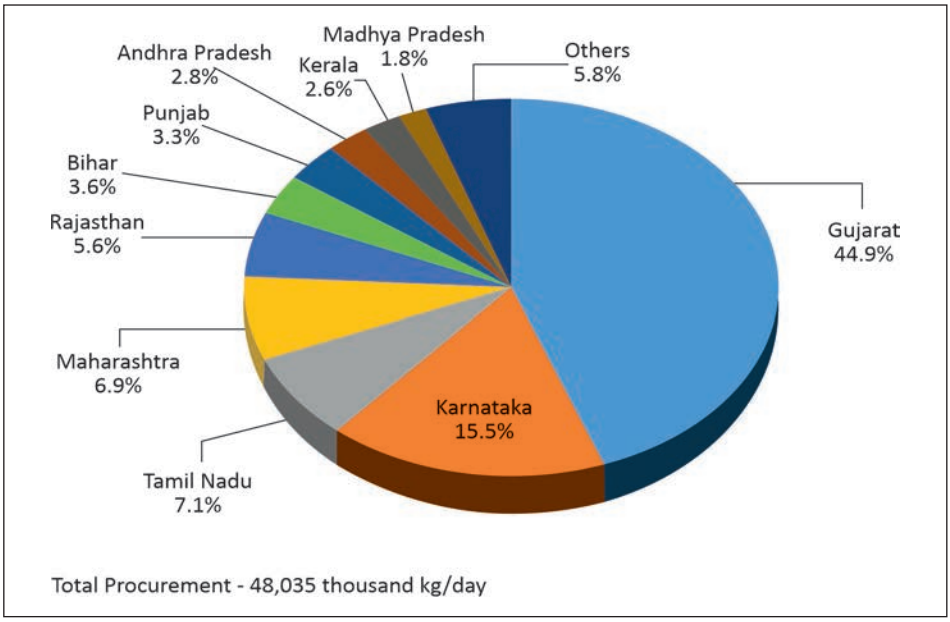
OF-II was also undertaken to establish a modern and self-sustaining dairy industry, building on the foundation of OF-I to meet the nation's needs in milk and milk products. For OF-II, donated commodities were received directly from the European Economic Community (EEC) – 186,000 tonnes of skimmed milk powder and 76,000 tonnes of butter oil. Financially supported by money generated from the sale of these commodities as recombined milk, a soft loan of US$ 150 million from the World Bank and the internal resources of the Indian Dairy Corporation, OF-II covered 150 milksheds. To link these milksheds to the city market and ensure a year-round sustained milk supply, the National Milk Grid with storage and long-distance transport facilities was created.

The Third Phase of Operation Flood focused on consolidating the milk procurement, processing and marketing infrastructure created under OF-I and OF-II. OF-III was funded from the internal resources of NDDB as well as through a World Bank loan/credit of US$ 365 million and proceeds from the sales of EEC gifted dairy commodities.

Operation Flood has led to the White Revolution in India and has made the country self-sufficient in milk and milk products through modernization of the dairy industry. More importantly, being a small-producer oriented programme, it has impacted positively the income, employment and nutrition status of milk producing households. The rural families targeted under this programme were ones with small resource base – both animal and land holdings. Over 70% of the families possessed only two milch animals or less; 21% families were landless and 66% were small and marginal farmers owning less than four hectares of land.

Source: Amul Dairy

Exhibit 3.16: State-wise Milk Procurement in India (2019-20)



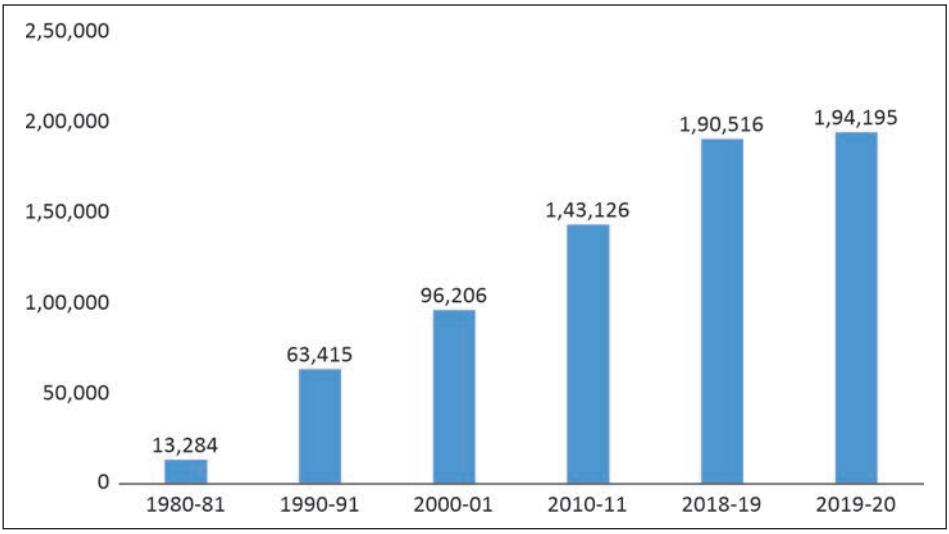
Source: National Dairy Development Board, Exim Bank Research

Most of the dairy co-operatives in India are based on the principle of maximization of farmer profit and productivity through cooperative effort. This pattern, known as the Anand Pattern, consists of an integrated cooperative structure that procures, processes, and markets produce. The Anand Pattern succeeds because it involves people in their own development through co-operatives where the professionals are accountable to leaders elected by producers. The institutional infrastructure—village co-operatives, dairy and cattle feed plants, and state and national marketing—is owned and controlled by farmers.

With increasing demand of dairy products and market opportunities in Indian dairy sector, the number of dairy cooperatives in India have increased. The dairy cooperatives have grown from 13,284 in 1980-81 to 1,94,195 in 2019-20[42] (Exhibit 3.17), recording a CAGR of 7.1% during this period.

[42] NDDB Annual Report 2018-19

Exhibit 3.17: Number of Dairy Cooperatives in India



Source: National Dairy Development Board, Exim Bank Research

A sizable proportion of the dairy cooperatives are situated in the northern part of the country with an estimated share of 35.1% in the total dairy cooperatives in India. It was followed by Western India with an estimated share of 26.7% in the total number of dairy cooperatives. Eastern India had the lowest share in number of dairy cooperatives (Exhibit 3.18). Although northern region has the highest share in terms of number of cooperatives, its share is significantly low in terms of amount of milk procurement, as compared to western region. Western region accounted for 53.9% of milk procurement as compared to 11.2% of milk procurement by northern region during 2019-20. In the Western region, the success story of the Amul brand continues to reap benefits for dairy farmers (Box 2).

Box 2: The Amul Branding

Anand Milk Union Limited, popularly known as Amul is a cooperative society based in Anand, Gujarat in India. The company was started with the motive of providing welfare to the farmers and in the process, it went on to establish itself as one of the most successful brands in India. The Amul Model is a three-tiered structure:

- Amul acts as a direct link between milk producers and consumers that removes the middlemen and helps offer products at affordable prices.
- Farmers (milk producers) control procurement, processing, and marketing.
- Run by Professional Management.

The strategies followed by Amul includes:

Umbrella Branding Strategy of Amul

Amul markets all of its products under a single name. Be it milk, cheese, any other dairy product, or even non-dairy items like rusks/biscuits, all of them lead to advertising, leading to advertising cost of less than one percent of revenue. Leveraging the "Idea of India", the tagline-led (Amul-The Taste of India) positioning of this brand has ensured that the brand remains contemporary, topical, and relevant. Every time Amul launches a new product, the embedded positioning helps the Brand to Indianize every product idea.

Diverse Product Portfolio

Amul's variety of products cater to a large audience. Comprehensive product portfolio, rooted in items-of-daily usage, makes Amul a market leading brand. Amul has products for every season and everyone. Be it demand for products like ice-cream or cold milk in summers or be it demand for butter and cheese in winters, Amul dominates the market equally in all the market segments. Another pillar of product strategy is integration within dairy segments, either forward or backward. And each integration provides a potent and scale-able product idea.

Winning Product Pricing

Wherever Amul had stringent competition, it always acknowledged the same and had a competitive pricing strategy or a one-on-one offer. Amul's philosophy is to source at the highest possible price and sell at the lowest possible price. This is entirely different from procurement-cum-pricing policy of other brands. A cooperative business model gives Amul the freedom to continue to thrive, despite working against the regular flow.

Distribution Strategy of Amul

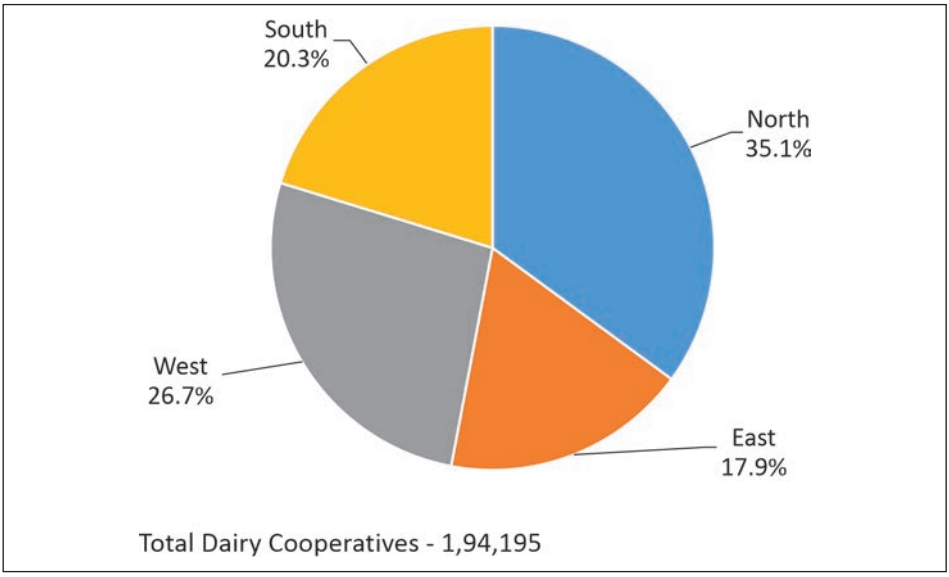
Due to such a comprehensive product portfolio, the entire distribution cost gets apportioned, thus affording them to have the maximum reach, with lucrative ROI for their distributor partners. This is the virtuous circle that continues to give Amul a competitive advantage. Such is the impact of this virtuous circle that Amul launched 33 new Products in the 1st Quarter of FY 21 inspite of the most stringent lockdown in the world.

Advertising Strategy of Amul

Amul has a 2-pronged strategy on advertising: product-specific (ice-cream, milk, cheese, etc.) and topical, which is a more significant attempt to nurture the umbrella brand. The idea is to keep the brand relevant by relating itself with specific incidents. The topical ads are the most talked-about and have always been a collector's delight.

Source: The Strategy Story

Exhibit 3.18: Regional Distribution of Dairy Cooperatives (2019-20)



Source: National Dairy Development Board, Exim Bank Research

SCENARIO OF PRODUCTION OF OTHER DAIRY PRODUCTS

The production of other dairy products exhibited a mixed trend, with intermittent periods of growth and decline across all major categories except ice cream. Ice cream production in India has been continuously increasing since 2013-14, registering a CAGR of 5.3% during 2012-13 to 2019-20.

Table 3.3: Production Trend across Major Dairy Products

Year	Milk Powder		Ghee		Butter		Ice Cream	
	Production (thousand tonnes)	Growth	Production (thousand tonnes)	Growth	Production (thousand tonnes)	Growth	Production (mn. litres)	Growth
2012-13	209.3	8.4%	163.7	3.6%	128.3	24.3%	140.1	-3.9%
2013-14	180.9	-13.6%	167.5	2.4%	109.5	-14.7%	140.9	0.6%
2014-15	211.4	16.9%	161.7	-3.5%	133.1	21.5%	150.4	6.7%
2015-16	229.1	8.4%	184.6	14.1%	127.5	-4.2%	164.5	9.4%
2016-17	207.1	-9.6%	186.6	1.1%	106.8	-16.3%	170.3	3.6%
2017-18	244.7	18.1%	171.1	-8.3%	130.3	22.0%	184.8	8.5%
2018-19	262.1	7.1%	169.4	-1.0%	131.1	0.6%	196.3	6.2%
2019-20	218.4	-16.7%	169.8	0.2%	97.5	-25.6%	201.7	2.8%

Source: CMIE Industry Outlook, Exim Bank Research

Ghee production witnessed a slight increase of 0.2% during 2019-20, after two consecutive years of decline. The production of milk powder and butter witnessed double-digit decline of 16.7% and 25.6%, respectively, in 2019-20 (Table 3.3). Typically, the milk powder stock is built up during the flush season (October-February) and is used during the lean milk production (March-September) season. During 2019-20, the flush season was delayed due to a delay in the withdrawal of the rainy season that led to waterlogged fields in many parts of the country[43]. This late onset of the flush season was a key factor for decline in the production of milk powder during 2019-20.

TRADE OF DAIRY PRODUCTS

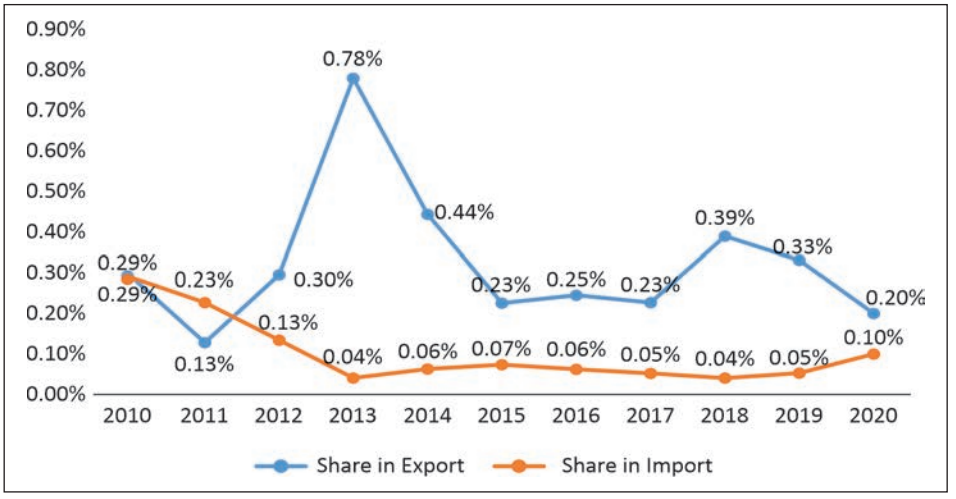
India has very low exportable surplus. As a result, India's share in the global exports of dairy products was only 0.20% during 2020. India's share in the

[43] CMIE Industry Outlook

global dairy exports was highest during 2013 at 0.78%. Thereafter, the share has remained in the range of 0.20%-0.44%. The increase in India's share in global exports of dairy during 2013 was due to increase in the exports of skimmed milk powder. In 2013, export of skimmed milk powder increased to US$ 456.0 million from US$ 98.1 million in 2012. In February 2011, the Government of India had imposed a ban on exports of a few milk products including skimmed milk powder, which was lifted in June 2012 for skimmed milk powder. Because of the ban on exports, skimmed milk powder was not exported and a large inventory was built up. Upon lifting of the ban, the exports of excess inventory led to a significant spike in dairy exports during 2013. India's share in global dairy imports has witnessed a decrease from an estimated 0.29% in 2010 to 0.10% in 2020 (Exhibit 3.19).

India has been a net exporter of dairy products since 2012-13. The trade surplus reached a peak of US$ 342.8 million during 2018-19, as exports of dairy products increased to US$ 376.2 million during the year and imports reduced to US$ 33.5 million. Thereafter, the exports moderated substantially in 2019-20, before once again registering double-digit growth rate in 2020-21.

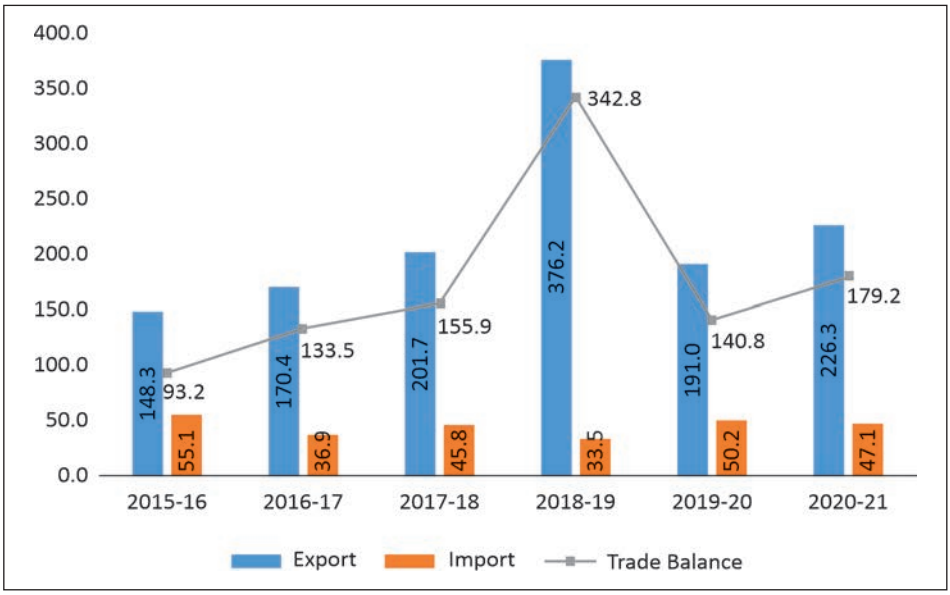
Exhibit 3.19: India's Share in Global Trade of Dairy Products



Source: ITC Trade Map, Exim Bank Research

India's exports of dairy products were estimated at US$ 226.3 million during 2020-21, witnessing an increase of 18.5% from the previous year's value of US$ 191.0 million (Exhibit 3.20). Imports of dairy products by India were estimated at US$ 47.1 million in 2020-21, recording a decrease of 6.1% as compared to the previous year. As a result, the trade surplus in dairy products increased to US$ 179.2 million in 2020-21, registering a growth of 27.2%.

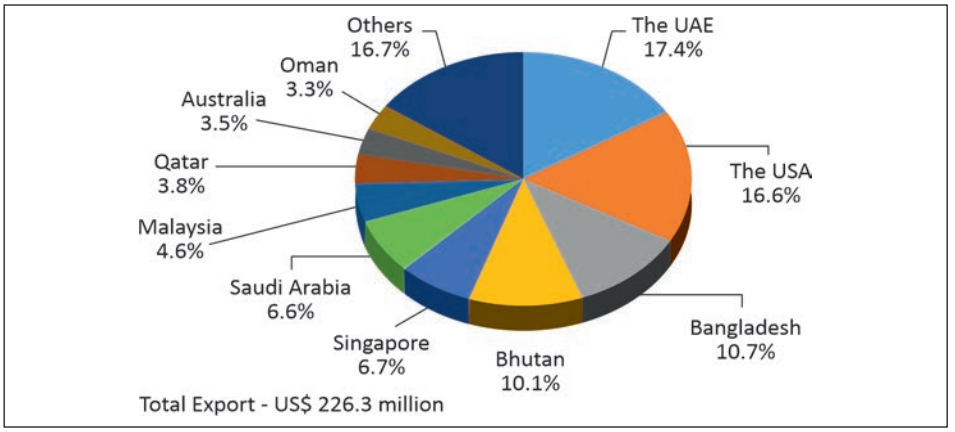
Exhibit 3.20: Trade of Dairy Products by India (in US$ Million)



Source: DGCIS, Exim Bank Research

The UAE was the largest destination for India's exports of dairy products with an estimated export of US$ 39.4 million during 2020-21, accounting for a share of 17.4% in India's dairy exports. The UAE's share in India's exports of dairy products has increased from 11.7% in 2014-15 to 17.4% in 2020-21. The USA was the second largest destination for India's dairy exports, with estimated exports of US$ 37.6 million in 2020-21, constituting a share of 16.6% in the overall dairy exports from India. Other major export destinations for India's dairy products during 2020-21 included Bangladesh (10.7%), Bhutan (10.1%), Singapore (6.7%), and Saudi Arabia (6.6%) (Exhibit 3.21).

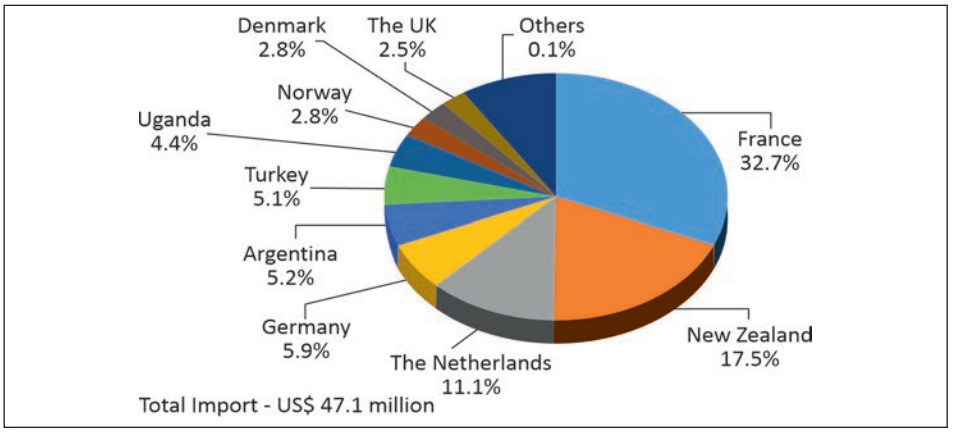
Exhibit 3.21: Major Export Destinations for India's Dairy Products (2020-21)



Source: DGCIS, Exim Bank Research

For India's dairy imports, the major source was France with estimated imports of US$ 15.4 million in 2020-21, accounting for a share of 32.7% in the total dairy imports by India. France has remained a major source for India's dairy imports and its share has increased from 14.5% in 2015-16 to 32.7% in 2020-21. New Zealand was the second largest source for imports of dairy product by India, with estimated imports of US$ 8.2 million during 2020-21, and a share of 17.5% in India's dairy import during the year. Other major import sources include the Netherlands (share of 11.1%), Germany (5.9%), Argentina (5.2%), and Turkey (5.1%) (Exhibit 3.22).

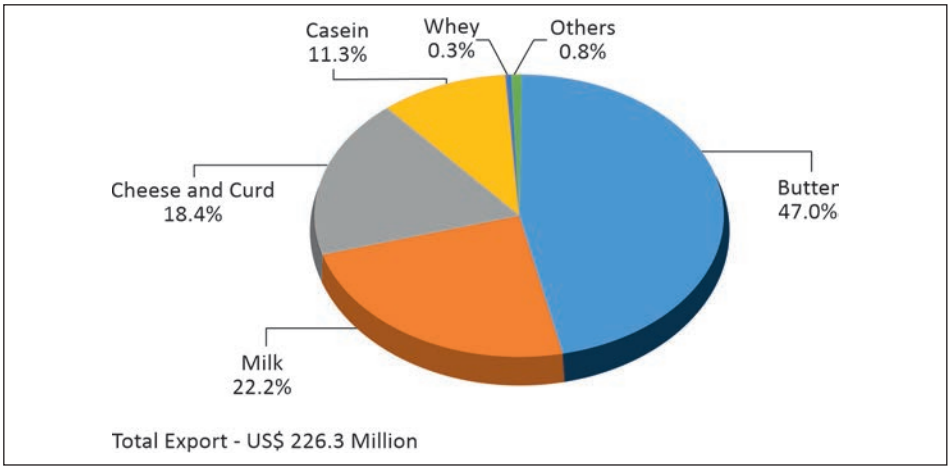
Exhibit 3.22: Major Source for India's Imports of Dairy Products (2020-21)



Source: DGCIS, Exim Bank Research

Exports of butter constituted the largest share in India's exports of dairy product during 2020-21, with an estimated share of 47.0% in India's dairy exports. Milk was the other leading constituent of India's exports of dairy product with an estimated share of 22.2% in 2020-21 (Exhibit 3.23).

Exhibit 3.23: Product-wise Dairy Exports from India (2020-21)



Source: DGCIS, Exim Bank Research

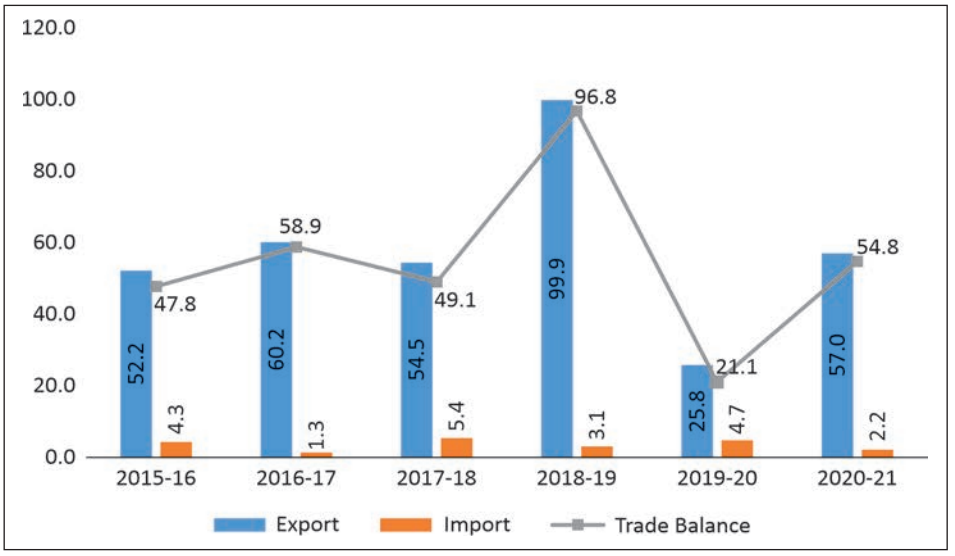
Milk

India is a net exporter of milk with the trade surplus during 2020-21 estimated at US$ 54.8 million. Exports of milk from India were estimated at US$ 57.0 million during 2020-21, witnessing an increase of 120.6% as compared to the previous year. Despite the increase, the value of exports remained below the 2018-19 level (Exhibit 3.24). Imports of milk by India were estimated at US$ 2.2 million during 2020-21, witnessing a decrease of 53.5% from the previous year's value of US$ 4.7 million.

The milk deficit in neighboring countries is effectively being tapped by Indian companies. These countries account for majority of milk exports from India. In 2020-21, Bangladesh was the leading destination for milk exports from India, with the value of milk exports to the country estimated at US$ 22.3 million during 2020-21, constituting a share of 39.2% in India's total milk exports during the year. Other major destinations for India's milk exports

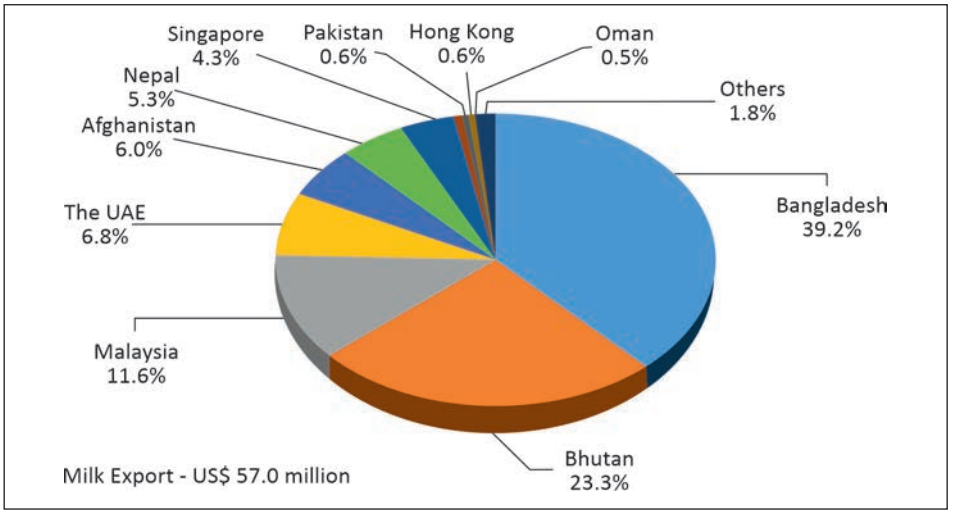
include Bhutan (share of 23.3%), Malaysia (11.6%), the UAE (6.8%), and Afghanistan (6.0%) (Exhibit 3.25).

Exhibit 3.24: India's Trade of Milk (in US$ Million)



Source: DGCIS, Exim Bank Research

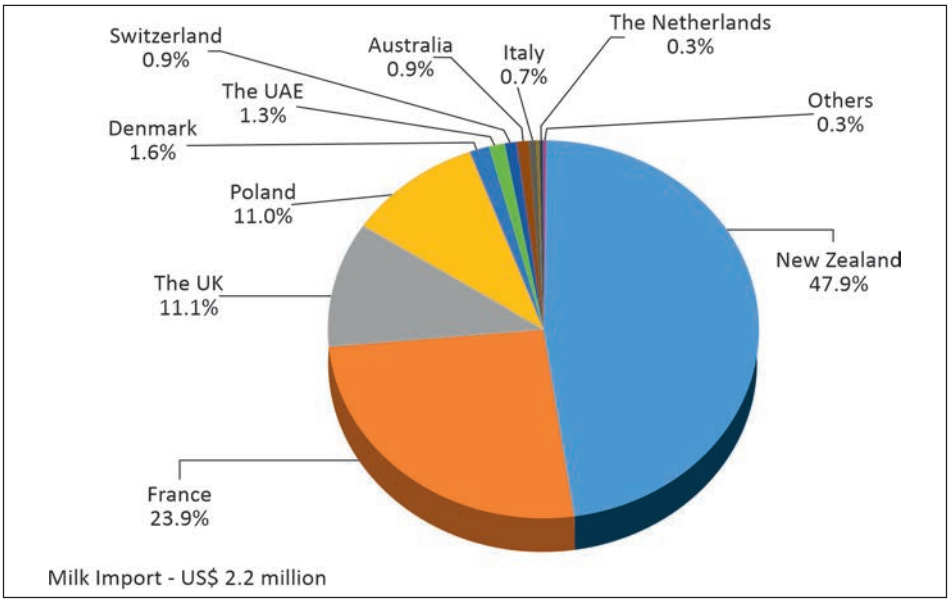
Exhibit 3.25: India's Major Export Destinations for Milk (2020-21)



Source: DGCIS, Exim Bank Research

New Zealand was the largest source of milk imports by India, with estimated imports of US$ 1.1 million during 2020-21, and a share of 47.9% in India's overall imports of milk during the year. Other major sources of imports include France (share of 23.9% in imports), the UK (11.1%), and Poland (11.0%) (Exhibit 3.26).

Exhibit 3.26: India's Major Import Sources for Milk (2020-21)



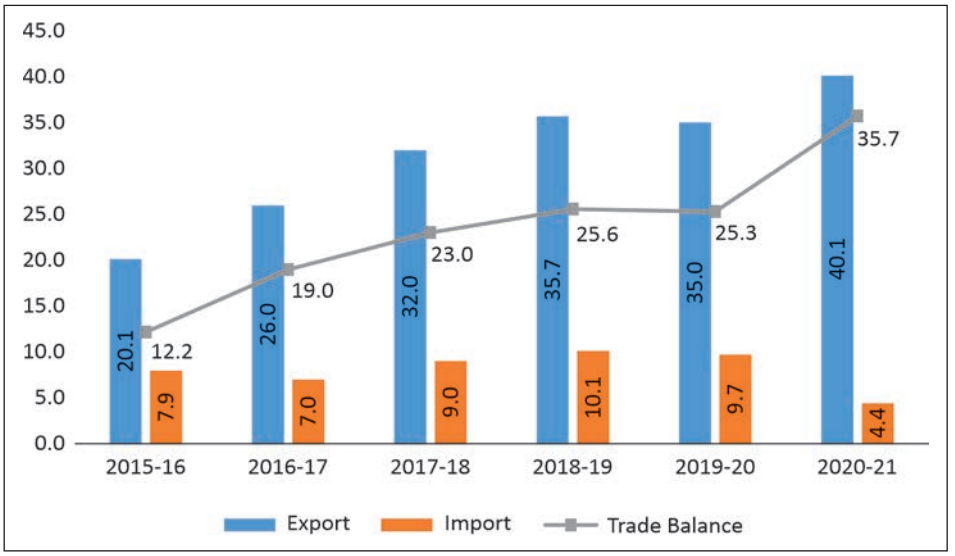
Source: DGCIS, Exim Bank Research

Cheese and Curd

The exports of cheese and curd from India were estimated at US$ 40.1 million during 2020-21, recording an increase of 14.6% from the previous year's value of US$ 35.0 million. Exports of cheese and curd witnessed an increasing trend during 2014-15 to 2018-19, before witnessing a slight dip in 2019-20, and recovering thereafter in 2020-21. Imports of cheese and curd by India have been low, as compared to the exports, resulting in a positive trade balance in this category as well. The imports of cheese and curd by India were estimated at US$ 4.4 million during 2020-21, witnessing a decrease of 54.6% as compared to the previous year. As a result of the concurrent

increase in exports and decrease in imports, trade surplus in cheese and curd shot up to US$ 35.7 million during 2020-21 (Exhibit 3.27).

Exhibit 3.27: India's Cheese and Curd Trade (in US$ Million)

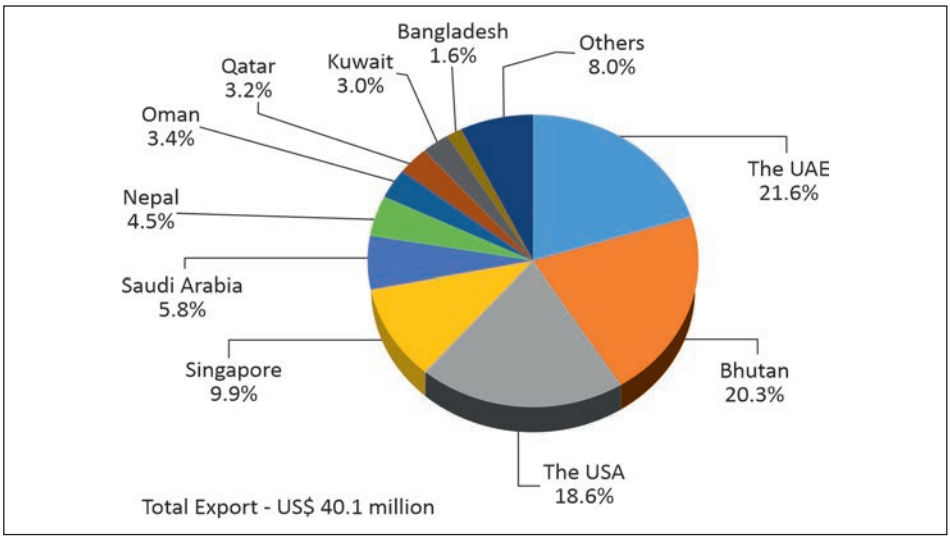


Source: DGCIS, Exim Bank Research

The UAE was the largest destination for India's cheese and curd exports, with estimated exports of US$ 8.7 million during 2020-21, accounting for 21.6% of India's cheese and curd exports during the year. Bhutan was the second largest export destination with estimated exports of US$ 8.1 million and a share of 20.3% in India's cheese and curd export during 2020-21. Other major destinations for India's cheese and curd exports were the USA (share of 18.6% in exports), Singapore (9.9%), Saudi Arabia (5.8%), and Nepal (4.5%) (Exhibit 3.28).

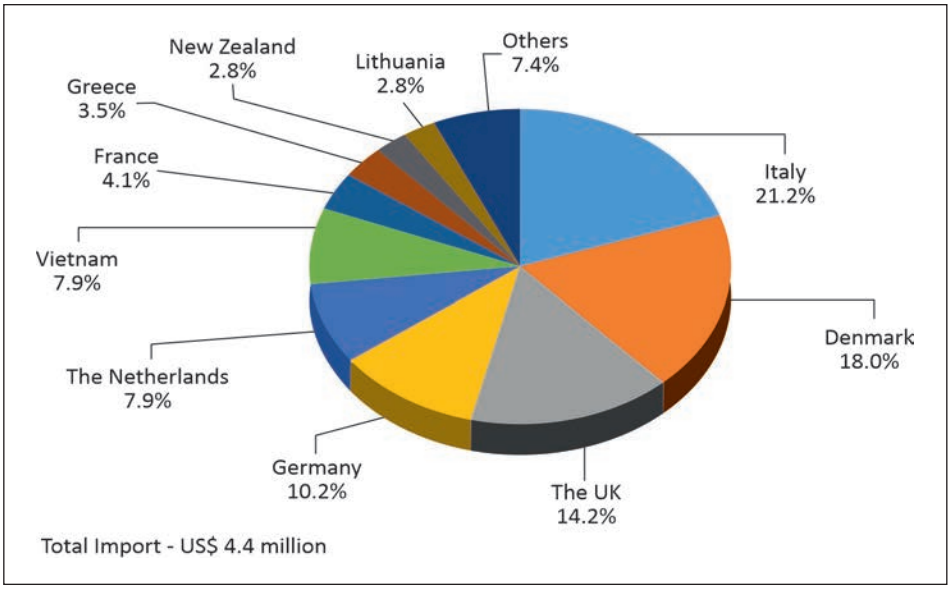
Italy was the major source for India's cheese and curd imports with estimated imports of US$ 0.9 million and a share of 21.2% in the overall cheese and curd imports by India during 2020-21. Denmark was the second largest import source with a share of 18.0% in India's cheese and curd imports during 2020-21. Other major import sources included the UK (share of 14.2% in imports), Germany (10.2%), the Netherlands (7.9%), and Vietnam (7.9%) (Exhibit 3.29).

Exhibit 3.28: India's Major Export Destinations for Cheese and Curd (2020-21)



Source: DGCIS, Exim Bank Research

Exhibit 3.29: India's Major Import Sources for Cheese and Curd (2020-21)

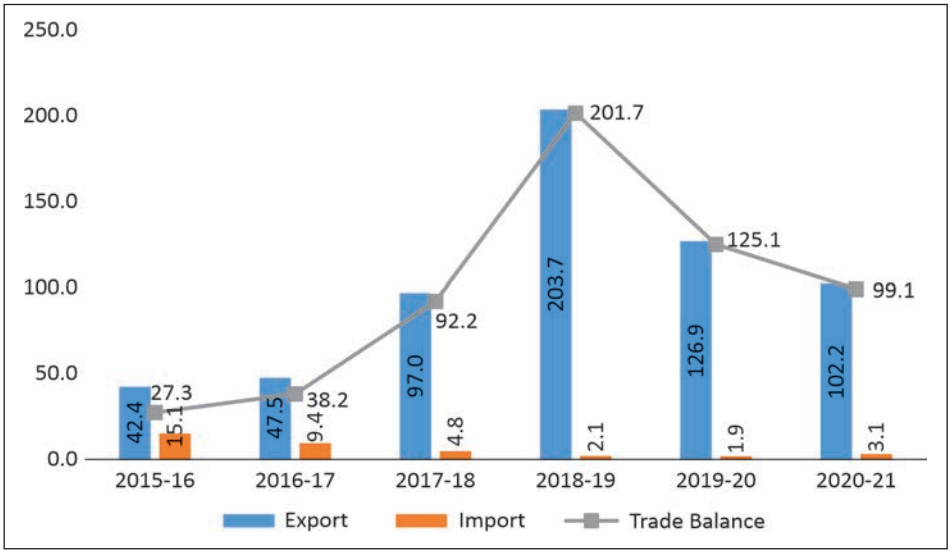


Source: DGCIS, Exim Bank Research

Butter

India is a net exporter of butter, with estimated trade surplus of US$ 99.1 million during 2020-21. Exports of butter from India were estimated at US$ 102.2 million in 2020-21, witnessing a decline of 19.5% from the previous year's value. High levels of exports were recorded in this category during 2018-19, estimated at around US$ 203.7 million. Thereafter, there has been a significant moderation in the following two years. India's imports of butter have been minimal during the past few years (Exhibit 3.30).

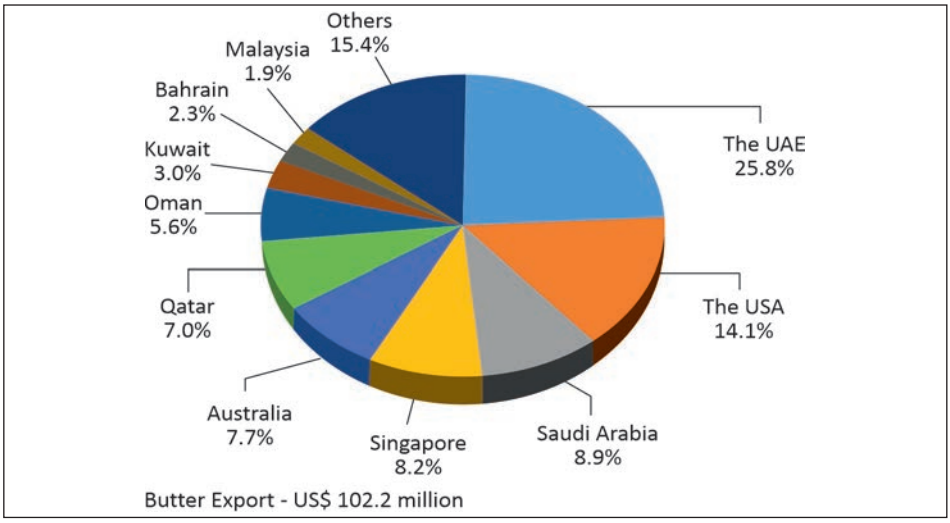
Exhibit 3.30: India's Trade in Butter (in US$ Million)



Source: DGCIS, Exim Bank Research

The UAE was the largest destination for India's exports of butter during 2020-21, with estimated exports of US$ 26.3 million, accounting for a share of 25.8% in the overall butter exports from India. It was followed by the USA with estimated exports of US$ 14.4 million from India during 2020-21, a share of 14.1% in India's butter export during the year. Other major destinations for butter exports from India are Saudi Arabia (share of 8.9% in exports), Singapore (8.2%), Australia (7.7%), and Qatar (7.0%) (Exhibit 3.31).

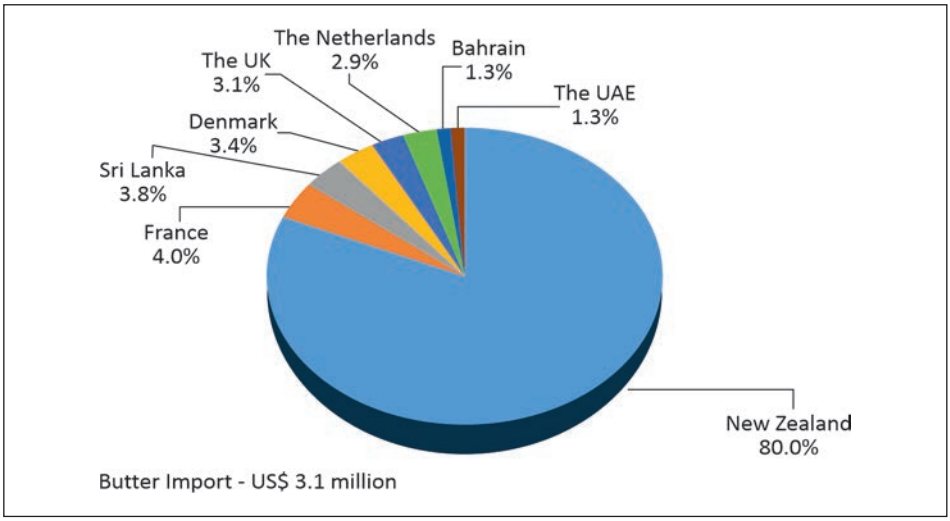
Exhibit 3.31: India's Major Export Destinations for Butter (2020-21)



Source: DGCIS, Exim Bank Research

For India's butter imports, New Zealand was the largest import source, accounting for 80.0% of the butter imported by India during 2020-21. Other major import sources included France (share of 4.0% in imports), Sri Lanka (3.8%), and Denmark (3.4%) (Exhibit 3.32).

Exhibit 3.32: India's Major Import Sources for Butter (2020-21)

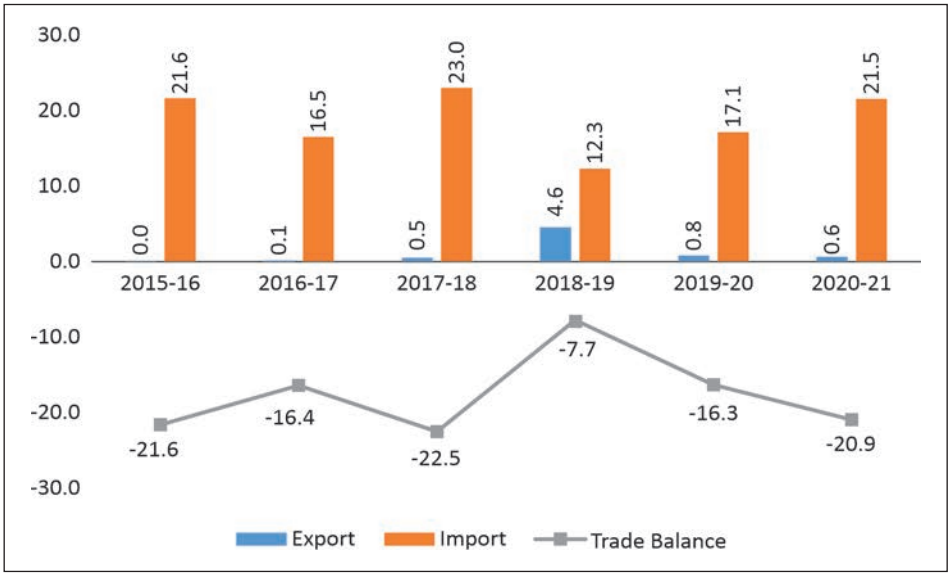


Source: DGCIS, Exim Bank Research

Whey

Exports of whey from India were estimated at US$ 0.6 million in 2020-21, witnessing a decrease of 24.5% from the previous year's value. India is a net importer of whey with estimated imports of US$ 21.5 million and a trade deficit of US$ 20.9 million during 2020-21 (Exhibit 3.33). Imports of whey by India increased by 25.8% during 2020-21, as compared to the previous year. This is the only category of dairy products where India runs a trade deficit. There is substantial scope for bolstering exports from this segment and neutralizing this deficit.

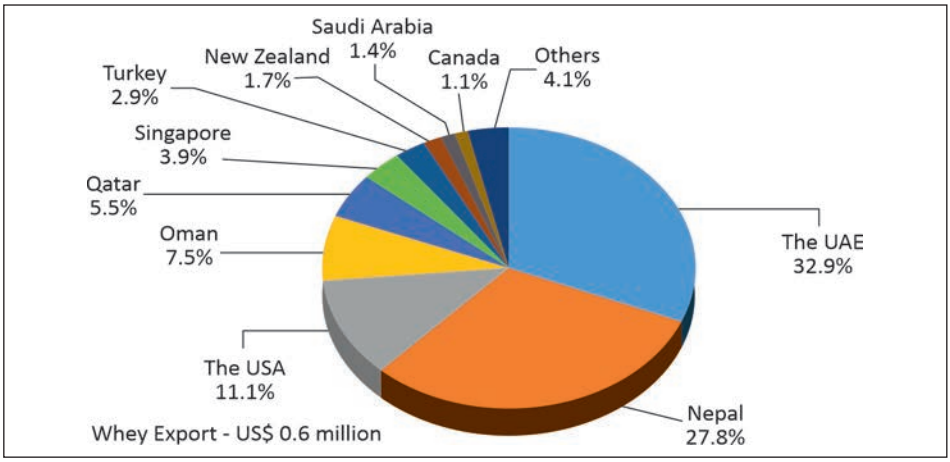
Exhibit 3.33: India's Trade in Whey (in US$ Million)



Source: DGCIS, Exim Bank Research

The UAE was the largest destination for India's whey exports with estimated exports of US$ 0.2 million, and a share of 32.9% in the overall whey exports by India during 2020-21. Other major export destinations were Nepal (share of 27.8% in exports), the USA (11.1%), Oman (7.5%), and Qatar (5.5%) (Exhibit 3.34).

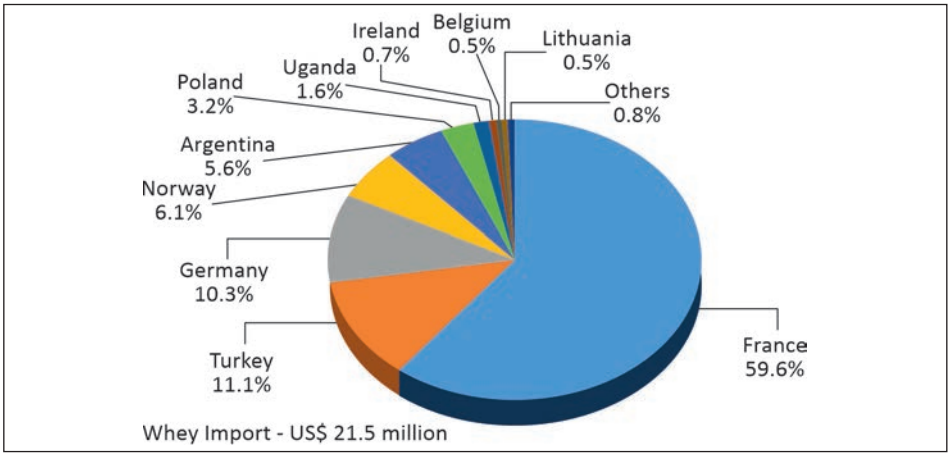
Exhibit 3.34: India's Major Export Destinations for Whey (2020-21)



Source: DGCIS, Exim Bank Research

For whey imports, France was the largest source for India, with estimated imports of US$ 12.9 million from the country during 2020-21, a share of 59.6% in the total whey imports by India. France was followed by Turkey with estimated imports of US$ 2.4 million by India during 2020-21 and a share of 11.1% in India's whey imports. Other major sources for whey imports by India included Germany (share of 10.3% in imports), Norway (6.1%), Argentina (5.6%), and Poland (3.2%) (Exhibit 3.35).

Exhibit 3.35: India's Major Import Sources for Whey (2020-21)

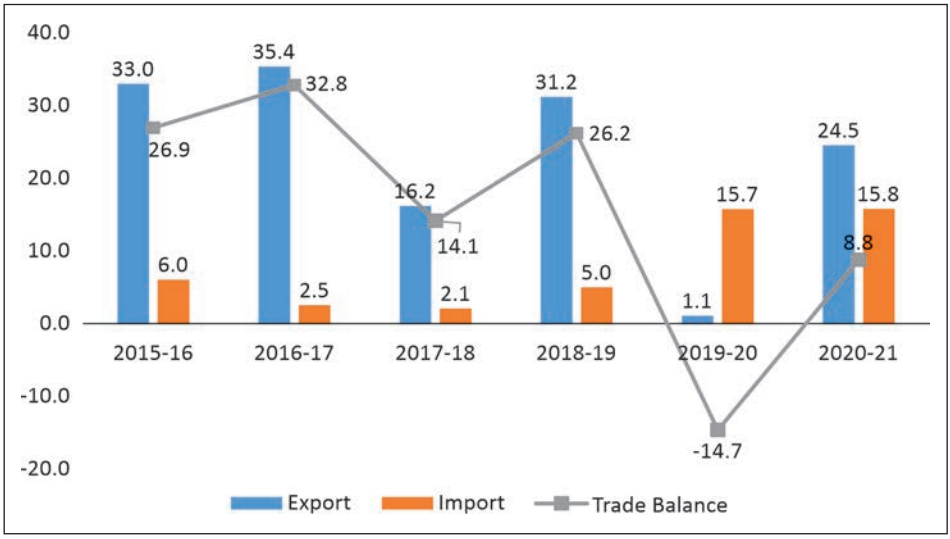


Source: DGCIS, Exim Bank Research

Casein

The exports of casein from India have been fluctuating in the recent past. The exports of casein from India were estimated at US$ 31.2 million during 2018-19 but plunged to US$ 1.1 million in 2019-20. The exports picked up thereafter in 2020-21, with estimated exports of US$ 24.5 million (Exhibit 3.36). The imports of casein by India were estimated at US$ 15.8 million during 2020-21, witnessing a slight increase of 0.6% as compared to the previous year. During 2020-21, India recorded a trade surplus of US$ 8.8 million in casein, a significant improvement over the trade deficit of (-) US$ 14.7 million during 2019-20 (Exhibit 3.36).

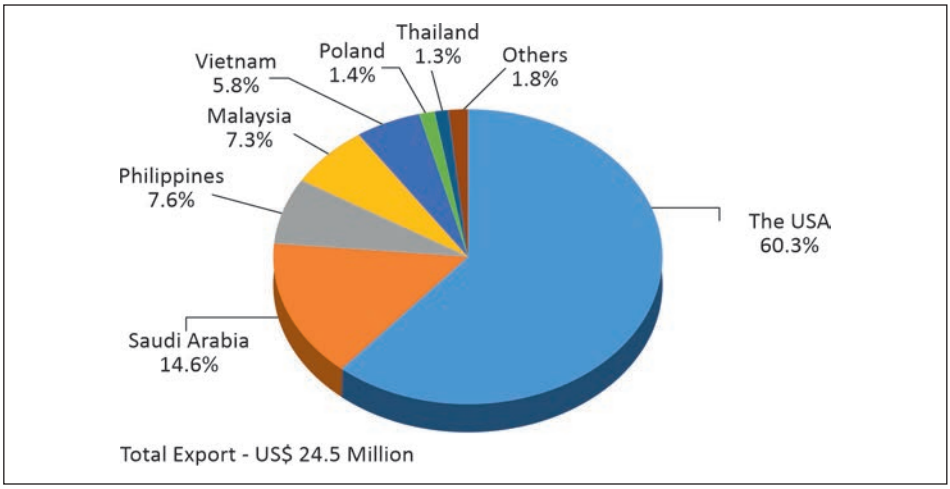
Exhibit 3.36: India's Casein Trade (in US$ Million)



Source: DGCIS, Exim Bank Research

The USA was the largest destination for India's casein exports, with estimated exports of US$ 14.8 million during 2020-21, a share of 60.3% in India's casein exports during the year. Saudi Arabia was the second largest export destination with an estimated export of US$ 3.6 million and a share of 14.6% in India's casein export during 2020-21. Other major destinations for India's casein exports included Philippines (share of 7.6% in exports), Malaysia (7.3%), Vietnam (5.8%), and Poland (1.4%) (Exhibit 3.37).

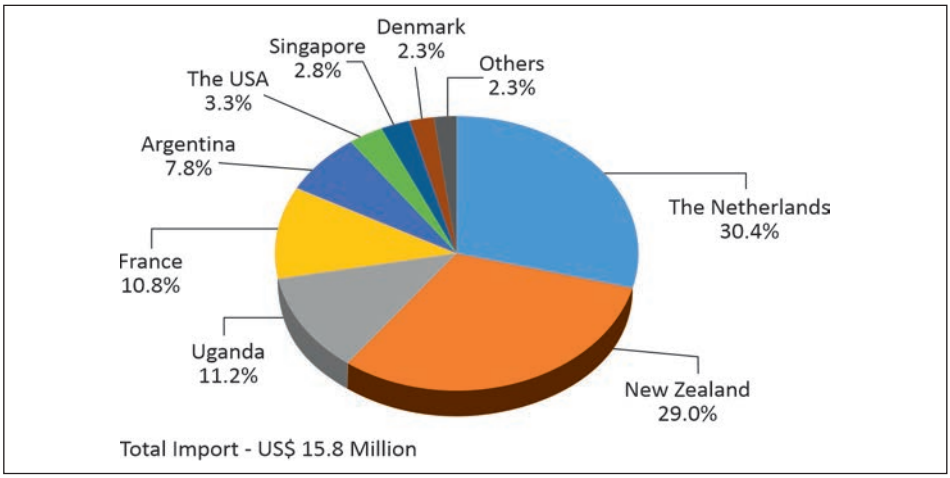
Exhibit 3.37: Major Destinations for India's Casein Exports (2020-21)



Source: DGCIS, Exim Bank Research

The Netherlands was the major source for India's casein imports with estimated imports of US$ 4.8 million and a share of 30.4% in India's overall casein imports during 2020-21. New Zealand was the second largest import source with a share of 29.0% in India's casein import during 2020-21. Other major import sources included Uganda (share of 11.2% in 2020-21), France (10.8%), Argentina (7.8%), and the USA (3.3%) (Exhibit 3.38).

Exhibit 3.38: India's Major Import Sources for Casein (2020-21)



Source: DGCIS, Exim Bank Research

IMPACT OF COVID-19 PANDEMIC ON INDIA'S DAIRY SECTOR

The COVID-19 pandemic and associated restrictions led to a downturn in economic activities and affected several sectors. While the overall agricultural sector remained relatively resilient to the dampening effect of the pandemic, the Indian dairy sector was adversely impacted. With the economic lockdown in place globally and in India, and restrictions on trade and commerce, the demand for dairy products reduced significantly both domestically and in key export destinations. The closure of food services, such as hotels, restaurants and other catering services, severely impacted the demand for dairy products. There was an estimated reduction of 25%-30% in demand, which resulted in sharp decline in prices of liquid milk. With lack of alternative channels for sale of liquid milk and inadequate processing facilities, many producers resorted to dumping of their produce. The dairy sector faced multi-dimensional losses not only in production and marketing but also in processing of liquid milk into milk products.

Compound cattle feed is a crucial input for milk production and the lockdown due to the COVID-19 pandemic also impacted the feed production. Reduced cattle feed production was largely due to irregular supply of feed raw materials and packing ingredients.

Despite the dip in demand, there was an increase in milk procurement, mainly by the milk cooperatives to provide income to the farmers, resulting in a decrease in procurement prices. The surplus milk sourced by the cooperatives were mainly used in manufacturing skimmed milk powder (SMP) and white butter.

Prior to the outbreak of the pandemic, the Indian dairy industry was reportedly faced with a shortage of liquid milk. Consequently, private dairy companies were planning to import SMP from countries such as New Zealand to make up for the shortfall. The global SMP prices, which had sky-rocketed to ₹ 340 per kg prior to the COVID-19 outbreak, crashed to ₹ 230 per kg during March 2020, due to dip in demand in the global markets following the pandemic.

The exports of dairy products from India also witnessed a decrease during the peak period of the COVID-19 pandemic. The exports of dairy products decreased by 7.1% during Apr-Oct 2020-21, as compared to the corresponding period of the previous year. However, the exports of dairy products recovered subsequently, and the overall dairy export increased by 18.5% during 2020-21 as compared to the previous year.

In order to mitigate the impact of COVID-19 on the dairy sector and give a fillip to the sector, the Government of India, as a part of its economic stimulus, approved setting up of the Animal Husbandry Infrastructure Development Fund (AHIDF) worth ₹ 15,000 crore. Although the fund proposes to cover other animal products, such as poultry and meat, AHIDF is primarily intended to incentivize investment in the establishment of infrastructure for dairy and meat processing, and value addition in infrastructure, as well as establishment of animal feed plants in the private sector.

CONCLUSION

There was a severe demand shock to the dairy sector, due to pandemic driven lockdowns, globally and domestically, and the closure of food services and hospitality sector. However, household consumption and demand for dairy products have improved with the easing of lockdown norms and increase in economic activities. According to India Ratings and Research, milk production in India is projected to increase to 208 million tonnes in 2020-21 from 198 million tonnes (approx.) in 2019-20[44]. With the increase in milk production, the per capita availability is projected to rise to 428 gm/day in 2020-21 from 406 gm/day in 2019-20. However, considering the estimated growth in population and urbanization over the next four decades, India needs to produce an estimated 600 million tonnes of milk per year to meet its domestic demand, which means that the milk production needs to grow at a CAGR of 3.2% over the next forty years[45]. There is clearly a need to bolster the production of dairy products in the country. This would also be essential for generating exportable surplus in the dairy sector and thereby augmenting rural incomes.

[44] India Ratings and Research

[45] CARE Ratings

4. CHALLENGES AND STRATEGIES

Despite being among the largest producers of milk in the world, India's dairy exports have remained at low levels. There has also been a slump in the growth of the dairy sector in the recent years, which has further compounded the challenges for exports from the sector. Some of the key challenges faced by the dairy sector, and strategies for alleviating these challenges have been discussed in the chapter. Strategies for improving export competitiveness and unleashing the export potential in the sector have also been discussed.

INCREASING MILK PRODUCTIVITY THROUGH BREEDING POLICIES AND GENETIC IMPROVEMENT

In comparison to other countries, the dairy sector in India is marked by low productivity. As per FAO estimates, the yield for cow milk in India was estimated at 16,981 hg/an[46] during 2019. While the yield for cow milk in India has increased overtime, it remains lower compared to other countries like New Zealand, the USA, Poland, and Australia. A comparative analysis of a few key milk producing and exporting countries—the USA, Poland, Australia and New Zealand, reveals that these countries have higher yield than India and also have a higher rank in global dairy exports as compared to India (Table 4.1). The low milk productivity in India leads to lower exportable surplus in the country.

Productivity in livestock and dairy depends on multiple factors such as breed, feed, climate and technology. India needs to focus on these aspects to enhance the productivity in milk production. There are also systemic shortfalls in cattle nutrition and genetics, which need to be improved for boosting productivity. Crossbreeding, herd management and enabling favourable

[46] Hg/An is hectogram per animal and is used to measure the yield for milk

species composition will be the key strategies going forward for maximising milk production.

Table 4.1: Productivity Comparison across Countries (2019)

Country	Rank in Dairy Exports	Yield (Hg/An)	Rank in Milk Production[47]	Rank in Livestock[48]
The USA	5	105904	2	9
Poland	10	66929	14	76
Australia	13	49866	26	10
New Zealand	1	44855	10	26
India	36	16981	1	1

Source: FAO, ITC Trade Map, Exim Bank Research

Streamlining Cattle and Buffalo Breeding Policies

Many states in India have their own cattle breeding policies, although the provisions of the policies across the states differ from each other. The Government of India has laid down broad guidelines of breeding policy for bovines but these guidelines are very limited in scope. Considering the significance of these breeding policies in improvement of yields, a detailed cattle and buffalo breeding policy guidelines could be framed by the Government of India, keeping in view the production traits, economic performance and draftability of breeds of animals, agro-climatic factors, existing infrastructure, and support systems. These guidelines could be taken as a benchmark for drafting state-level policies for cattle breeding.

Institutions like the National Dairy Development Board (NDDB) or Niti Aayog could also undertake state-wise comparison of cattle and breeding policies to promote competitive federalism among states. The parameters for benchmarking the policies could include provisions for establishment and/or strengthening of breeding service organizations; strengthening infrastructure pertaining to breeding facilities; integration of conservation programmes with breed improvement and development programmes; establishment of data bank to carry out activities on animal identification and performance

[47] Milk production from buffalo, camel, cow, goat, and sheep

[48] Includes live animal stocks of buffaloes, cattle, camel, goats and sheeps

linked progeny testing programme; support for advanced techniques such as Multiple Ovulation and Embryo Transfer (MOET); support for delivery of animal breeding, health, marketing and extension services at the doorstep, among others[49]. This benchmarking would allow states to converge on an efficient and effective breeding policy for cattle and buffalo.

Genetic Improvements

The Government of India has taken several steps for genetic improvement of dairy cattle and buffalo. One of the important measures was the National Dairy Support Project (NDSP) by the World Bank, which was undertaken in association with the NDDB during 2012 to 2019, with the objective of increasing the productivity of milch animals and improving market access of milk producers in project areas. Genetic improvements as part of the NDSP led to annual increases in production yield in the range of 38 litres to 66 litres, depending on the breed. The NDSP also provided genetic evaluations beyond milk production, e.g., fat, protein and other functional traits like fertility, calving ease, feet and legs, and mammary system.

However, there is need for further efforts towards genetic improvements. There is need for genomic selection to increase the rate of genetic gain[50], particularly for traits with low heritability, such as fertility and longevity. The most rapid and effective approach to genetically improve the largest chunk of non-descript zebu cattle population would be through crossbreeding with exotic dairy cattle breeds. Crossbreeding of indigenous cattle with exotic species effectively combines the environmental resilience of the former with the production potential of the latter. Past experience of crossbreeding in India with exotic breeds like Holstein, Brown Swiss and Jersey helped improve productivity of non-descript cattle, leading to enhancement in milk production by 5 to 8 times. Cross-breeding has also helped several countries gain their current stature in milk production and exports. Brazil, for example, imported Indian Gir cows in the 1940s, and cross-bred it with Holstein, to

[49] Sreenivas D (2013) Breeding policy strategies for genetic improvement of cattle and buffaloes in India, Vet World 6(7): 455-460, doi:10.5455/vetworld.2013.455-460

[50] "genetic gain," is defined as the improvement in average genetic value in a population or the improvement in average phenotypic value due to selection within a population over cycles of breeding.

create the hybrid 'Girolando'. The Girolando cow breed has a higher milk yield per lactation as compared to the Indian Gir cow breed. For Girolando cows in Brazil, the milk lactation yield is estimated at 4233 kg[51], while the milk lactation yield for Gir cows in India is estimated at 2110 kg[52], a difference of around 100%. Clearly, crossbreeding can have a significant impact on the productivity of cattle.

There is also a shortage of progeny testing and evaluation programmes, which has been inhibiting genetic progress among the country's livestock. Non-descript cattle can be genetically improved by grading up using high genetic merit pedigreed and progeny tested bulls of well-known indigenous cattle breeds like Sahiwal, Tharparkar, Red Sindhi, Gir, Deoni, Hariana, Ongole, Kankrey, etc. Breed-specific networking of organized farms and farmer's herds should be developed to form a large associated test mate population for undertaking large scale progeny testing of breeding bulls[53]. Such initiatives are essential as India's indigenous cows and buffaloes have much better yields in countries such as Brazil (Box 3). If adequately leveraged through progeny testing and evaluation programmes, the productivity in India can be significantly enhanced.

Box 3: White Revolution in Brazil: Role of Indian Cows and Buffaloes

Brazil is among the largest producers of milk in the world. The Gir cow breed from India has played an instrumental role in changing the fortunes of the Brazilian dairy industry. During 1960, Maharaja of Bhavnagar, Gujarat, gifted a Gir cattle pair to Celso Garcia Cid, an icon in the history of Brazilian entrepreneurs. The Gir breed originated from India, more specifically from the hills and forest of Kathiawar including Junagadh, Bhavnagar, Rajkot, and Amreli districts of Gujarat. The Gir breed is well adapted to tropical climate, with high tolerance to heat stress and resistance to various tropical diseases, which led to wide acceptance of the breed in Brazil after its importation.

[51] Genetic trend estimates for milk yield production and fertility traits of the Girolando cattle in Brazil, Livestock Science Journal (2016)

[52] Animal Genetic Resources Portal, Indian Council of Agricultural Research (ICAR)

[53] Sreenivas D (2013) Breeding policy strategies for genetic improvement of cattle and buffaloes in India, Vet World 6(7): 455-460, doi:10.5455/vetworld.2013.455-460

The bull gifted to Brazil was named `Krishna'. When Krishna was brought to Brazil in 1960, it started a genetic revolution that made Gir one of the most valued breeds in the bovine embryo market and spawned a mixed breed. It is estimated that 80% of Brazilian Gir cattle carry genes from the `Krishna' bull that is now referred to as `Gyr'. The Gyr was subsequently crossbred with Holstein, a Dutch variety, to create the hybrid 'Girolando'. Brazil now has about 40 lakh Gir cattle and a healthy, well-cared-for Gir cow is capable of yielding an average of 30 to 40 litres of milk a day in Brazil, with the possibility of yield going up to 60 to 70 litres. As against this, the yield of an indigenous cow, which includes Gir, in India is 3.9 litres per day.

Brazil has emerged as the world's biggest supplier of improved cattle embryos and semen, and the Gir breed of Indian origin is now rated among the best dairy breeds in the world. The demand is particularly high from African and Southeast Asian countries.

Murrah buffaloes, with their distinctive tightly curled horns and massive and stocky build, are also famous around the world for their high milk yields. Since the 1960s, Murrah bulls have been taken from India to Brazil and several East Asian countries to help in efforts to improve their native breeds and increase milk yields. Brazil has greatly benefited from the Murrah breed and they still continue to import doses of semen of the Murrah buffalo breed, for improving the genetic quality of different indigenous breeds of Brazil.

India needs to focus more on progeny testing and genetic improvement programmes, so that the productivity of indigenous breeds can be improved. Such programmes, along with use of Indian breeds of cows and buffalo, have been crucial for the success of Brazilian diary industry. The Brazilian Dairy Gir National Breeding Program began in 1985, and the use of genetically-tested bulls since 1993 (year when the first genetic evaluation result was made available) has led to marked improvement in milk yield.

Sources: Braziliancattle.com, UNESP Institutional Repository

Apart from conserving as well as genetically improving indigenous breeds on account of their superior performance in other regions of the world, the presence of higher frequency of A2 protein in milk of indigenous cow breeds is another reason for conserving the indigenous breed (Box 4).

Emerging developments in the area of molecular genetics is also opening up the possibility of identifying and using DNA level variation and major genes for genetic improvement of livestock. Going forward, this should also be a focus area for livestock genetic improvement programmes.

Box 4: Return to Desi Cow Movement

There are thirty-seven recognized breeds of cattle in India, in addition to a large number of non-descript cattle. Quality of the indigenous breeds in India has suffered as upkeep of the animals has become increasingly uneconomical. Their utility has also decreased with greater mechanization of agriculture. As rearing of indigenous breeds become uneconomical, the cows are let loose and left to wander, which leads to the problem of indiscriminate breeding and loss of genetic purity. Moreover, the White Revolution and advent of crossbreds – indigenous cows inseminated with foreign breeds like Holstein Friesian, Jersey and Brown Swiss – has added to farmers' indifference to rearing native cattle such as Tharparkar, Gir, Kankrej, Red Sindhi and Sahiwal.

These trends have contributed to a lower growth in population of indigenous breeds. There are 4.85 crore desi (native) milch cows in the country as per the 20th Livestock Census in 2019, which is less than 1% higher than the 4.81 crore population recorded in the last census in 2012. On the other hand, the milch population of exotic and crossbred cattle — including varieties such as Jersey or Holsteins which have much higher milk yields — saw a whopping growth of 32% over the last livestock census, growing from 1.9 crore to 2.5 crore animals.

While crossbred cows in India have typically higher yield, the local breeds have merits over exotic breeds viz: better disease resistance than exotic breeds, better suitable for low input management system, better survival in local environment, and suitable for draught work. Moreover, indigenous

breeds have also exhibited superior yield performance in countries like Brazil which had undertaken breeding programmes for genetic gains in superior traits. The Indian indigenous cow breeds also have a higher frequency of A2 protein. A few studies suggest that A1 beta-casein and the peptide BCM-7 may be linked to diabetes, heart disease, autism, and SIDS, although the results remain inconclusive. Notwithstanding the reliability of claims that A2 milk are a healthier choice, there has been an increase in the demand for A2 milk, globally. Indian exporters, highlighting the higher frequency of A2 protein in milk from indigenous cow breeds, can tap the emerging market for A2 milk. Clearly, there is a need for indigenous breeds of cattle to be conserved, genetically improved and proliferated.

Conservation of Indigenous Breeds:

Various schemes are being implemented by the Government of India with the aim of promoting indigenous cattle and buffalo rearing. Rashtriya Gokul Mission is one such scheme which has been implemented for development and conservation of indigenous bovine breeds. The mission was initiated in December 2014 with an approved allocation of ₹ 2,025 crore. Integrated indigenous cattle development centres- Gokul Grams are being established under the Rashtriya Gokul Mission with the aim of conservation and development of indigenous bovine breeds in a scientific and holistic manner.

Source: Livestock Census (Department of Animal Husbandry and Dairying), A1 versus A2 Milk- Impact on Human Health (International Journal of Livestock Research, January 2018)

IMPROVEMENT IN AVAILABILITY OF FEED AND FODDER

Livestock raising in India is critically plagued by shortage of adequate and quality feed and fodder. According to estimates, India lost 31% or 5.65 million hectares (mha) of grassland area in a decade (2005-2015). India also lost around 19% of its common lands during the same period, with the area decreasing to 73.02 mha in 2015 from around 90.5 mha in 2005[54]. Common pasture resources in the country are in an advanced state of denudation and degradation and are incapable of supporting meaningful livestock population.

[54] Data presented by Government of India to the United Nations Convention to Combat Desertification (UNCCD) during the 14th Conference of Parties (COP), September 2019

According to the data from the National Institute of Animal Nutrition and Physiology, during the period 2015-20, availability of dry fodder and concentrate is estimated to have witnessed only a marginal growth, while the availability of green fodder has seen a decline (Table 4.2). This has led to a yawning gap between the demand and availability of fodder in the country, particularly during the lean periods and crisis situations. The scarcity of fodder leads to increase in the cost of feed, which in turn affects prices of dairy products and the margins of the small and marginal dairy farmers. Improvement in availability of fodder and feed is therefore important for improving price competitiveness of dairy products.

Improvement in the availability of fodder and feed would also be important from the point of increasing milk production and productivity. Increasing milk production would necessarily entail replacement of smaller livestock breeds with larger ones. These larger indigenous and cross-bred cattle would have higher energy requirements, which further accentuates the need for adequate availability of feed, and better feed management.

Table 4.2: Feed and Fodder Estimate in India
(Dry Matter in Million Tonnes)

Type of Fodder	Parameters	2012	2015	2020*	2025*
Dry Fodder	Requirement	480	491	530	550
	Availability	375	387	408	433
	Deficit (%)	-22	-21	-23	-23
Green Fodder	Requirement	820	840	880	1000
	Availability	614	619	596	600
	Deficit (%)	-25	-26	-32	-40
Concentrate	Requirement	82	87	96	105
	Availability	55	58	61	65
	Deficit (%)	-33	-34	-36	-38

**forecast*
Source: National Institute of Animal Nutrition and Physiology (NIANP)

Dedicated Institution for Bolstering Availability of Animal Feed

There is need for establishment of a multi-stakeholder, institutional framework for regular assessment of the availability and production of various types of fodder and feed, associated policy planning to improve production, and follow-on identification of the gaps in implementation. In this regard, there is a need for establishing a designated agency for effective policy formulation, research, and planning. The agency could provide precise data and policy advocacy on fodder crop production, productivity, and adoption of improved varieties and technology[55].

Price Deficiency Payment

Forage and fodder crops are largely non-commercial in nature, and the market for these crops also remains unorganized and small. Lack of any government support like the minimum support price (MSP) is rendering forage production a low priority agricultural activity.

The feed industries typically use maize, soybean, wheat and rice bran. To address the shortage of concentrates, Niti Ayog has recommended "Price Deficiency Payment" for the farmers cultivating maize, soybean and other crops for concentrates. This should be prioritised so as to increase availability of raw material for the feed industries. Under Price Deficiency Payment, farmers are compensated for the difference between the MSPs for select crops and their actual market prices. This is anticipated to enable meeting the requirement of concentrates for livestock rearing and attract feed manufacturing units in areas where production has been traditionally weak.

Promotion of Use of Silage

There is also a need for alternatives to green and dry fodder. One option could be good quality silage, which is a fermented fodder with high moisture content. Corn silage has the advantage of consistent quality, higher yields and more energy content as compared to other forage. It can be stored for two years, which ensures availability during dry-season as well. The Government should work in collaboration with seed companies to provide high quality

[55] Indian Grassland and Fodder Research Institute (IGFRI) – Vision Document 2030

silage suitable seeds to farmers and incentivize farmers to undertake mechanized silage preparation. Some state governments have taken steps to promote the use of silage, which could be adopted by other states as well. For example, Punjab government has launched a scheme to provide 40% subsidy to the farmers on the Silage Baler-cum-Wrapper machines through the Punjab Dairy Development Board to promote the dairy farming sector in the state.

Silvi-pastoral and Horti-pastoral Model for Improving Availability of Forage

Adopting Silvi-pastoral and Horti-pastoral models can also help in substantially enhancing the availability of forage for the livestock. Silvi-pastoral systems are defined as growing of ideal combination of grasses, legumes and trees for producing highly nutritious top fodder and forage, fuel wood, timber, while optimising land productivity and conserving plants, soil and nutrients etc., on sustainable basis. About 29 million ha area in the country falls under the category of open forests with less than 0.4 canopy density. This substantial land area can be utilized for growing fodder on the partially shaded ground without affecting standing trees. Similar development is also possible in the area under horticulture orchards. While the forest department can undertake silvi-pastoral plantations through the Joint Forest Management Committees, the horti-pastoral activities can be initiated by incentivizing the farmers who are owners of the orchards[56].

Popularizing New and Improved Varieties of Fodder Seeds

There is a need to disseminate the benefits of using high-yield, quality fodder seeds and growing combination of crops among the farmers through front line demonstrations (FLD) and minikits[57]. FLDs are a unique approach to provide a direct interface between researcher and farmers as the scientists are directly involved in planning, execution and monitoring of the demonstrations for the technologies developed by them and get direct feedback from the farmers' field about the crops production in general and technology being demonstrated

[56] Advisory on Measures to be taken for Increasing Availability of Fodder to Mitigate the Effect of Natural Calamities, DAHD (Issued on 01.05.2018)

[57] Ibid.

in particular. It helps popularize the new and improved varieties and bring synergy among planners, researchers, farmers, and industry.

Attracting Investment from Global Feed Companies

Global feed companies can also be encouraged to invest in the domestic market. India is a growing market for animal protein and the low penetration of commercial feed offers substantial opportunities for the global firms. Global companies could introduce commercial feed formulations that suit local climate and maximise genetic potential of local breeds on the back of their R&D expense. The scope of the existing PLI scheme for food processing could be expanded to include animal feed in order to encourage more global animal feed companies to set up manufacturing units in the country.

DISEASE MANAGEMENT

There are several diseases that could compromise the profitability of dairy business and also dairy driven food security. These include Foot and Mouth Disease (FMD), Haemorrhagic Septicaemia (HS), Black Quarter (BQ), infertility, and parasitism. To counter these diseases, India has a Livestock Health and Disease Control Programme and has also launched a vaccination programme (Box 5). While the progress made so far under the program has been encouraging, in order to elevate the animal health delivery mechanisms in the country to international standards, focus should be on upgrading the infrastructure both in terms of number of veterinary institutions - hospitals, colleges, diagnostic laboratories and vaccine production units, and enhancing quality of delivery of services, that may include providing affordable services at the farmer's doorstep, especially for the large animals.

Box 5: India's Livestock Vaccination Programme

In order to boost dairy exports, India started the largest cattle vaccination drive to immunize livestock against the foot and mouth disease - one of the world's most economically important viral diseases of livestock. The Government of India has launched a scheme 'National Animal Disease Control Programme for FMD and Brucellosis' with a financial outlay of

₹ 13,343.00 crore for five years (2019-20 to 2023-24), with the aim of vaccinating 100% cattle, buffalo, sheep, goat and pig population for FMD and 100% bovine female calves of 4-8 months of age for brucellosis. This programme is expected to prevent loss of ₹ 50,000 crore to the Government exchequer and also to increase the economic output of farmers.

Sources: Ministry of Fisheries, Animal Husbandry & Dairying, Government of India

The Government of India's veterinary machinery needs to reorient itself to focus more on preventive health care and control, containment and eventual eradication of economically important diseases. This will require skill development and infrastructure building in epidemiology with emphasis on surveillance, monitoring, risk analysis, statistical analysis, and disease forecasting. A network of adequately trained veterinarians is also needed to raise awareness about diseases among the livestock farmers across the country.

Documentation and reporting are the other key areas that requires urgent attention. Lack of proper information precludes the policy makers to formulate effective policies. To bridge the information gap, the Information Network for Animal Productivity and Health (INAPH) has been developed by the NDDB in collaboration with Infosys. The INAPH is a comprehensive software, which captures all the parameters and activities on dairy management. The database can be used to estimate the incidences of various diseases and also track the movement of animals across the country. This repository of information is envisaged to facilitate policy makers to formulate appropriate disease control strategies required in various regions of the country. As of March 2021, 14.62 crore animals have been ear tagged and registered on INAPH in the country[58], which is only 27% of the livestock population of the country. There would be a need for concerted efforts at all levels of governance to enhance the reach of INAPH and ensure the success of the program in disease identification and management.

[58] Lok Sabha unstarred question no. 3285 answered on 16th march, 2021

The challenge of veterinary infrastructure and manpower is more acutely felt in some states. Livestock units per veterinary institution are high in some of the poorest states such as Jharkhand, Bihar, Madhya Pradesh and Chhattisgarh. High income states such as Punjab and Haryana, on the other hand, have relatively better infrastructure and less number of livestock units per veterinary institution[59]. Despite the efforts by the Government of India, delivery of veterinary services is reported to be generally inadequate in several states, with limited supplies of medicines, equipment, and requisite skills. There is potential for improved animal health and welfare policy development and implementation of services in the veterinary domain through public-private partnership, especially in underserviced area. One such initiative was taken in Jharkhand by the Jharkhand State Livelihood Promotions Society (JSLPS) under the aegis of the Rural Development Department, Government of Jharkhand. The JSLPS collaborated with Hester Biosciences Limited and GALVmed to create a sustainable supply chain of appropriate and affordable veterinary vaccines (thermo-tolerant ND vaccine-100 dose pack, PPR vaccine-25, 50 and 100 dose pack) and medicines in the state of Jharkhand in India. Under this partnership, 751 women service providers were trained. They vaccinated 76,000 goats against PPR. Hester Biosciences Ltd is now partnering independently with JSLPS to serve more areas of Jharkhand. The initial effort and resources showed the community and the unorganized farmers the importance of veterinary vaccines and medicines. Once the smallholder farmers are convinced of the results in terms of better animal health and thereby a monetary rise in earnings, the greater volume of business is expected to sustain the system. PPP models in veterinary services have also been successful in several other countries (Box 6). There is a need for preparing a toolkit for PPP in veterinary services in India and encouraging the adoption of these models by government institutions.

[59] Pratap & Negi, Digvijay. (2012). Livestock for higher, sustainable and inclusive agricultural growth. Economic and Political Weekly. 47. 89-99.

Box 6: International Experiences in PPP in Veterinary Domain

Mali

For more than 20 years, Mali has maintained the Sanitary Mandate, by which private veterinarians are allowed to conduct activities delegated by the government veterinary services, such as vaccinations against PPR (Peste des Petits Ruminants) or CBPP (Contagious Bovine Pleuropneumonia). In 2016, 544 professionals (including 157 mandated private veterinarians and their support staff) worked alongside 362 public veterinarians, thereby improving vaccination coverage of the country's livestock population, and resulting in better animal health and food security. This is of critical importance in a country where livestock constitutes the main means of subsistence for over 30% of the population.

Tunisia

Subcontracting of prophylactic programs to the private sector was launched in 2006 in Tunisia. At the beginning, there were 10 private veterinarians in six pilot governorates. Today, it involves 260 mandated veterinarians. Vaccination coverage against notifiable diseases, listed according to the program of the Tunisian National Vaccination Campaign, has steadily increased, as well as disease reporting. Furthermore, the duration of vaccination campaign has been shortened by half: 60 days with the private sector against 120 days for the public sector alone.

Australia

Animal Health Australia (AHA) is a partnership between multiple levels of government, livestock industries and other stakeholders. Set up as a not-for-profit public company, the AHA is responsible for protecting animal health and the sustainability of the Australian livestock industry. Among others, the partnership provides agreed Emergency Animal Disease (EAD) response strategies, EAD response training to members, as well as services in the areas of biosecurity, traceability, surveillance and animal welfare standards. The collaboration minimises the risk of EAD occurrence and provides the ability to respond quickly and effectively to an EAD incident should one occur.

Paraguay

The collaboration between the Veterinary Services of Paraguay (SENACSA) and cattle producers through the Foundation of Animal Health Services (FUNDASSA) was initiated in 2003 to strengthen vaccination, certification and registration within the national program for eradication of FMD and control, prevention and eradication of brucellosis. FUNDASSA coordinates, co-develops and implements strategies with the official authorization of SENACSA. This PPP has allowed Paraguay to reach FMD-free status with vaccination and opened export markets. Today, livestock contributes 12% to the GDP and employs 17% of the active population. The country also exports meat, offal and meat by-products.

Indonesia

The national information system, ISIKHNAS provides a reporting facility that connects farmers or district animal health workers with local officials to report illnesses in livestock so they can receive treatment immediately and reduce losses. With registration of more than 3 million private producers, ISIKHNAS allows the Indonesian government to conduct surveillance of animal diseases on a large territory that they would otherwise have difficulties to cover, hence allowing better decision making. In turn, farmers and private veterinarians benefit from improved health services.

Source: The OIE PPP Handbook: Guidelines for Public-Private Partnerships in the Veterinary Domain

QUALITY ADHERENCE IN THE VALUE CHAIN

Poor quality of milk is often cited as one of the prime reasons for lack of competitiveness of Indian dairy sector in international dairy trade. Food safety remains a major challenge since a large part of India's total milk production is handled and marketed by small vendors having limited exposure to efficient handling of milk. These small vendors also lack the capital or incentives to comply with regulations, which increases their cost of production.

In the National Milk Safety and Quality Survey 2018, conducted by the FSSAI, 48.2% of the samples (out of 6432 samples) were categorized non-compliant

as per the FSSAI standards (in terms of quality and safety). Further, the non-compliant samples were grouped into two categories— samples that were sub-standard without any safety issues (those samples that failed in terms of quality parameters - fat, SNF[60], sugar, maltodextrin) and sub-standard with safety issues. As per the findings of the survey, 41.2% of the samples were non-compliant with only quality issues, 5.0% samples were non-compliant with safety issues and 2.1% samples were non-compliant with both quality and safety issues. The report further reveals that main contaminants found in milk samples were aflatoxin-M1, antibiotics and pesticides, such as hydrogen peroxide, detergents and urea. Among the states, Telangana reported to have highest level of adulteration in milk; Tamil Nadu, Delhi and Kerala recorded the highest levels of aflatoxin M1 in milk samples; and Madhya Pradesh, Maharashtra and Uttar Pradesh were the top three states with highest levels of antibiotics residues.

Poor quality of milk production in India is attributed mainly to unhygienic and poor condition of animal farms and dairies, and polluted water and feed. Indiscriminate use of antibiotics and chemical drugs by the farmers to increase the production of milk is another crucial factor for contamination of milk.

Quality Upgradation in Value Chains

Dairy supply chain comprises a number of stages or business, which are interlinked sequentially and or parallelly. Thus, quality and safety of dairy products depend upon the entire supply chain as the product quality at every stage depends upon product and processes quality at preceding or intermediary stages. For quality upgradation therefore there is a need for upgradation and integration of the entire value chain for dairy products. Upgradation of the dairy value chain would entail greater use of technology, skill development and better management. The value chains also need to be better integrated for meeting quality requirements, as also for better traceability of dairy products.

[60] Solids-not-fat which refers to total solids content in the entire residue left after complete evaporation of water from milk. This includes fat protein, lactose and mineral matter.

Organized sector, which is better placed to implement the quality check points in their value chains, should be instructed to overhaul their processes. Large processing plants in the organized sector should have their own milk collection and chilling centres for procurement of milk in the rural areas, equipped with milk testing facilities. Hazard Analysis and Critical Control Points (HACCP) should also be mandatorily implemented by the organized sector. Real time information systems should also be implemented throughout the supply chain.

In this direction, the Scheme of Testing and Inspection to be adopted by dairy processing plants, issued by the FSSAI is a commendable step for strengthening the internal controls in the dairy processing units. However, the scheme focuses entirely on self-monitoring, without any mention of consequences or penalties that firms would face in the case of failure to comply. The punitive measures also need to be defined for effective implementation of the scheme.

Another important initiative of the GOI for enhancing quality adherence in the value chain is the AHIDF, which was announced as part of the Atmanirbhar Bharat Abhiyan stimulus package. The Fund should be utilized by the processing units for quality upgradations.

Focus on SCC Content of Milk

Harmonisation of quality parameters with international standards would be the most critical factor for enhancing exports of dairy products. Developed countries such as the USA and the EU use somatic cell counts (SCC) in milk for quality parameter and pay more premiums for the milk having low SCCs. In India, on the other hand, milk quality and pricing are still based on the fat percentage in milk. There were no legal regulatory standards for SCC in milk production, until recently. In 2020, the NDRI has set the SCC limit for murrah buffalo milk at 1 lakh/ml and 1-1.5 lakh/ml for indigenous cattle milk. However, this limit is more stringent as compared to international standards. The EU, New Zealand and Australia have an SCC limit of 4 lakh cells/ml, while the USA has a very high threshold of 7.5 lakh cells/ml. Even the SCC count in India, as estimated by researchers from time to time, indicates that the

value could realistically be in the range of 2 lakh ≥ to 4 lakh cells/ml[61]. Hence, there is a need to revisit these limits and bring them more in line with the international standard, which can also help improve the acceptance of these limits amid the dairy farmers and processing units.

Table 4.3: International Standard for SCC

Countries	SCC LIMIT (Cells/mL)
The European Union	400,000
New Zealand	400,000
Switzerland	350,000
Australia	400,000
The USA	750,000

Source: Alan L. Kelly, Gabriel Leitner, Uzi Merin (2018). Milk Quality and Udder Health: Test Methods and Standards, Reference Module in Food Science, Elsevier, 2018

Bacterial and somatic cell monitoring, as also screening for antibiotics, should be a critical part of the dairy value chain in India. Regular monitoring is possible through Flow Cyclometry based instruments like BacSomatic, which can perform about 15-40 samples per hour. Low cost rapid testing kits are also available, which can be provided by the Government or private processing companies at the village level for regular screening. Animal owners also need to be sensitized about the applicability and dosages of antibiotic, and ways to undertake regular qualitative assessment of milk. Regulations are also needed to make mandatory testing as a basis for setting milk price. Through regulations, India could move towards pricing based on a system of fat, SNF and SCC, which would induce more farmers and processors to focus on SCC content of milk.

PROMOTION OF BUFFALO MILK

The preferred dairy animal in India is buffalo, unlike the majority of the world market, which is dominated by cow milk. Foreign buyers are not always sure

[61] P.V. Jadhav, S.B. Tarate, M. Bhuvana, D.N. Das and B.R. Shome (2016). Somatic cell count as a monitoring system for hygienic milk production in India: A review, Asian J. Dairy & Food Res, 35 (4) 2016 : 270-277

of suitability of buffalo milk for human consumption, and insist upon dairy products manufactured from cow milk. This is in spite of the significant advantages of buffalo milk as compared to cow milk in terms of physico-chemical, compositional, sensory, nutritional, health aspects, processing and product manufacture etc. B.G.Mane and M.K.Chatli (2015) highlight these advantages of buffalo milk (Box 7).

Box 7: Advantages of Buffalo Milk over Cow Milk

- Buffalo milk has about 11.42% higher protein than cow milk.
- Buffalo milk is also superior to cow milk in terms of important minerals, namely calcium, iron, and phosphorus, which are higher by 92%, 37.7% and 118%, respectively.
- Unlike the cow milk, which is pale cream yellow in colour, and cow milk fat, which is golden yellow in colour, buffalo milk is also distinctively whiter. UHT-processed buffalo milk and cream are also intrinsically whiter and more viscous than their cow milk counterparts, because of conversion of greater levels of calcium and phosphorus into the colloidal form. Buffalo milk is, therefore, more aptly suitable for the production of tea and coffee whiteners.
- Buffalo milk also has very high fat content and the fat to protein ratio is about 2:1.
- Buffalo milk also has high casein to protein ratio (81-84%) compared to cow milk (78%).
- Buffalo milk also has higher calorific value of 117 Calories/100g as compared to cow milk (89 Calories/100g), which is entirely due to the higher fat, lactose, and protein contents in the former.
- The total cholesterol content is significantly higher in cow ghee (330mg/100g) than in buffalo ghee (278mg/100g).
- Buffalo milk also contains high levels of the natural antioxidant tocopherol.
- Buffalo milk is a suitable alternative for people with allergy to cow milk.

Source: B.G.Mane and M.K.Chatli (2015), Buffalo Milk: Saviour of Farmers and Consumers for Livelihood and Providing Nutrition, Agricultural Rural Development, 2015 (Volume 2) Pages 05-11

Buffalo milk is better suited for the manufacture of fat rich dairy products as compared to cow milk due to its higher fat content, bigger size of globule and higher proportion of solid fat, which leads to higher yield, lesser loss of fat in butter milk or skim milk, easier preparation of cream or butter and better texture. Higher levels of proteins and fat render buffalo milk a more economical alternative to cow milk for the production of casein, caseinates, whey protein concentrates and a wide range of fat-rich dairy products[62]. Due to several beneficial aspects of buffalo milk, it is also considered more suitable for infant feeding formulations as compared to cow milk. Clearly, buffalo milk has significant advantages from the perspective of value-added products.

Other countries are already capitalizing on the opportunities arising from buffalo milk-based products. Italy, for example, enjoys legal protection for its *mozzarella di bufala*, with a protected designation of origin[63] for this product. Buffalo mozzarella is considered to be of higher quality than cattle's, and is sold at a premium. While other countries have leveraged their buffalo population to create high value products, India with the largest buffalo population and germplasm diversity of 12 recognized buffalo population groups, has been unable to make a mark in the international market.

An essential first step for export orientation of buffalo milk and milk based products would be separate collection of buffalo milk. Most of the private and cooperative dairies do not even have separate collection systems for cow and buffalo milk[64]. This limits the export prospects of dairy products from the country. Separate collection of cow and buffalo milk from predominantly small-sized dairy farms in India is a huge challenge and requires substantial investment in infrastructure and procurement system.

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[62] B.G.Mane and M.K.Chatli (2015), Buffalo Milk: Saviour of Farmers and Consumers for Livelihood and Providing Nutrition, Agricultural Rural Development, 2015 (Volume 2) Pages 05-11

[63] Protected designation of origin identifies products that are produced, processed and prepared in a specific geographical area, using the recognized know-how of local producers and ingredients from the region concerned.

[64] USDA. Gains Report.

Technology will be an indispensable tool for effective separation of milk from cows and buffaloes at the collection point. Automatic Milk Collection System (AMCS) are already automating the entire milk collection process, making it efficient, transparent and less time consuming. Adoption of AMCS is also being supported through various schemes of the Central and State Government. Focus should be reoriented towards adoption of AMCSs which serve as complete solutions, with capacity for capturing weight, measuring fat and SNF level and also checking the type of milk (cow milk or buffalo milk). Existing schemes should be restructured to incentivise AMCSs with capacity for checking the type of milk as well and having built-in mechanisms to ensure milk from cows and buffaloes are not mixed. For example, borrowers setting up AMCSs with such differentiation capabilities can receive up to 80% of the cost as funding under the Dairy Processing and Infrastructure Development Fund (DPIDF) scheme, while those without such differentiation could receive a lower financing of 60-70% of the cost. At times, State Governments meet the borrower's contribution in financing received under the DPIDF. Here as well, the State Governments could ensure that such support is provided only for advanced AMCSs with capacity for differentiation between the type of milks.

ENHANCING PRICE COMPETITIVENESS OF DAIRY PRODUCTS

Milk collection in India is dominated by unorganised private players. The collected milk is predominantly sold to the dairy cooperatives or private entities for onward processing, packaging, and distribution. Liquid milk prices at farm gate are primarily set by the dairy cooperatives, which act as benchmarks for the unorganised private players for procuring milk in the region. The dairy cooperatives consider factors such as increases in costs of feed, fodder and other inputs when revising farm gate milk prices. Under current price setting mechanism, procurement prices remain sticky even in case of supply glut and while cooperatives are compensated by state government through subsidies, such support is not available to private dairies. Moreover such practices are also detrimental to competition and consumer welfare in the dairy sector (for details see Box 8).

Box 8: Cooperative led Pricing in India: Boon or Bane?

The purchasing prices of milk sold by cooperatives are usually decided at a meeting of the board of directors of the milk union or federation. The milk prices paid to the members are set depending on the quality of the milk, which is indicated by the SNF and fat content. The milk prices charged by cooperatives are liable to change according to shifts in demand and supply as well as inflation, but cooperatives ensure that prices remain remunerative for dairy farmers. The cooperatives ensure fair pricing, regular payments as well as offtake for dairy farmers. Dairy cooperatives are obliged to purchase all the milk brought to the dairy cooperatives by their members if the quality is satisfactory. In areas where dairy cooperatives procure milk, private dairy companies are compelled to purchase raw milk at prices in similar range as that of dairy cooperatives. In this context, cooperatives are a boon to farmers as they are protected from large volatility in prices.

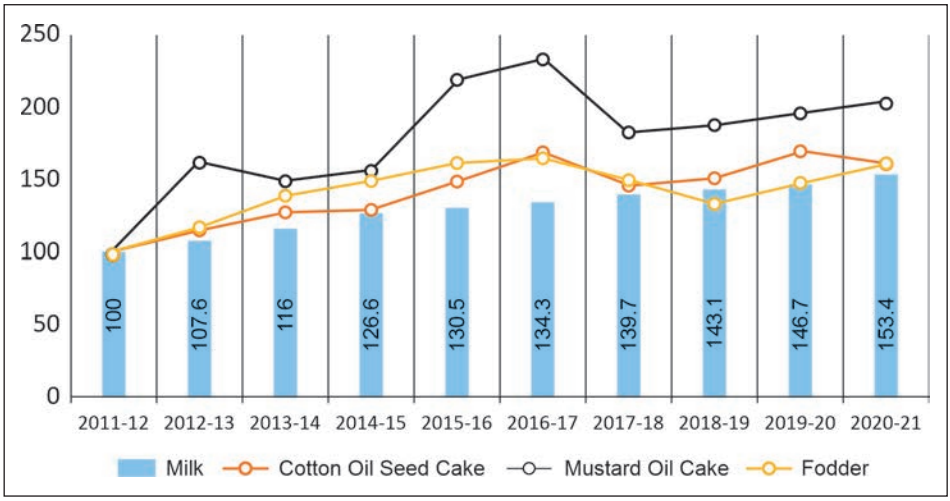
In the absence of strong cooperative structures, private companies and middlemen in the unorganized sector can change their purchasing prices drastically in response to the market situation. They can also change their purchase quantities and decline to buy milk supplied by farmers when market demand is weak.

While better pricing, regular payments and assured offtakes are advantages of the cooperative led pricing for farmers, it can also leave supply gut in the market. In response to market dynamics, if prices are not commensurately reduced, it can result in excessive supply of milk and accumulation of large quantity of Skimmed Milk Powder. In case of supply glut, when dairy prices are depressed and procurement prices remain sticky, turnover of dairy cooperatives is affected. While dairy cooperatives may be supported by state governments under such market situations, these market practices also have repercussions on viable business models of private dairy companies. Export orientation of companies and cooperatives is also affected as the pricing and supply situation are not in consonance with the international demand trends, and companies/cooperatives are only willing to export when international prices are sufficiently high as compared to domestic prices.

Source: ICRA, Republic of India Data Collection and Confirmation Study on Dairy Sector (JICA)

Over the past several years, India has witnessed erratic rainfall distribution driving up the fodder prices, decline in productivity of cattle and buffalo, and wastage of raw milk due to poor storage and lack of adequate reefer facilities. This has led to an escalation of farmgate prices. Recent data further indicates that while the retail prices of liquid milk has risen, cost of production have increased at a much faster pace. From 2011 to 2018, cost of the inputs such as fodder, mustard, and cottonseed oil cake witnessed CAGRs of 10%, 4%, and 24%, respectively[65], while WPI for milk prices registered a CAGR of 5.3% during 2011-12 to 2018-19.

Exhibit 4.1: Rising Feed Costs and Milk Prices (WPI Base Year 2011-12) in India



Source: Ministry of Commerce and Industry, Government of India

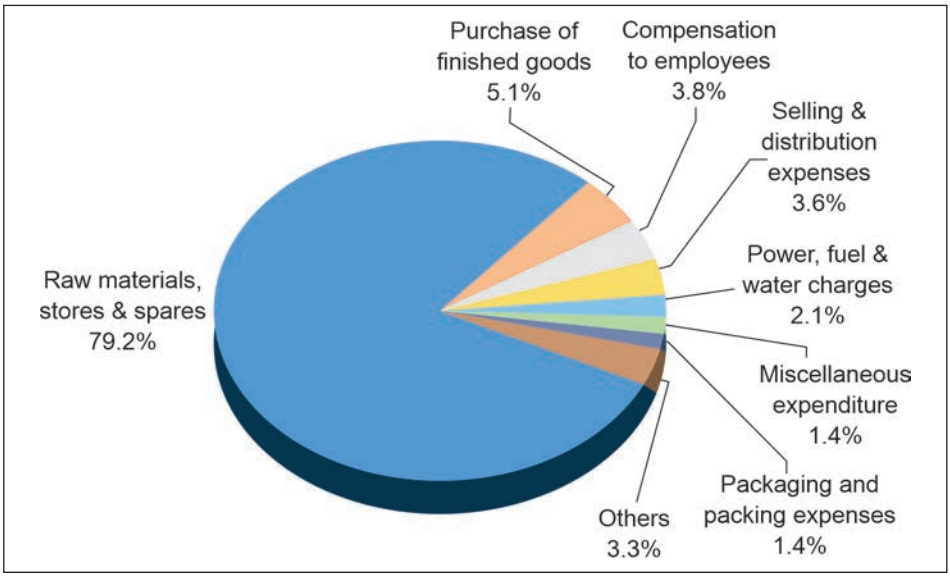
The increase in milk prices is a cause of concern for the Indian dairy products industry as raw materials dominate the overall operating cost for the industry. According to data for a sample set of companies from CMIE Prowess, raw materials constituted about 79.2% of the operating cost[66] of the industry in

[65] GAIN Report, USDA, February 2020

[66] Operating cost as % of sales and CIS

2019-20[67] (Exhibit 4.2). The cost of raw materials as percentage of operating cost is in fact higher in dairy products industry as compared to the overall food and agro products industry for which the share is 62.8%. The high domestic prices also affects export competitiveness of dairy products from the country. Clearly, reducing the milk prices either through efficiency gains or through government support would be important for the sector.

Exhibit 4.2: Operating Expenses Breakup in Dairy Products Industry (2019-20)



Source: CMIE Industry Outlook, Exim Bank Research

Price improvements could accrue from efficiency gains in the production process, measures for which have been discussed in this chapter. These measures need to be complemented by subsidy support to the sector, as available in other major milk producing and exporting countries.

The dairy sector in the EU is heavily supported by various subsidy and financial assistance programmes, which enhance exportability of the dairy products. As per the latest estimates, subsidies provided by the EU to dairy sector (milk,

[67] Based on a sample of 96 companies in dairy industry in India with data for most of the companies available till March 2020 (CMIE Industry Outlook)

skimmed milk powder, and butter) was estimated at 4.8 billion euros during 2016-17[68]. Within dairy, maximum subsidy support in the EU is provided to the segment of butter, which is one of the major export items from India in the dairy sector. It may be noted that these subsidies have helped establish the EU as one of the major suppliers of dairy products in the international market, with the share of the bloc in global exports ranging from 56%-86% in the dairy items receiving subsidy support (Table 4.4). Besides subsidies, there are other direct support provided by the governments, such as buffer stocking storage support and market access support. There is a need to provide adequate subsidy support to the dairy industry in India in order to compete with the heavily subsidised dairy industry of other countries.

Table 4.4: Dairy Products Receiving High Product-specific Subsidies in the EU, along with Global Export Market Share of the EU

Products	Value of Subsidies by the EU (Euro Million)				Share in Global Exports (2016)
	2009-10	2014-15	2015-16	2016-17	
Butter	2723.0	2850.4	2976.6	3075.9	57.4%
Skimmed Milk Powder	953.5	1476.4	1558.5	1549.3	56.4%
Milk	671.9	183.3	593.9	210.4	85.8%

Source: Biswajit Dhar (2021). Interrogating the Food and Agriculture Subsidy Regime of the WTO

Some form of price support can be considered by the Government for the dairy industry. A price support mechanism for the dairy sector would be important from the point of livelihood as well, as the sector in India is dominated by farmers with small herd size, who are more prone to market fluctuations. Several state governments have provided need-based price support to the industry, which has greatly benefitted the industry, especially during the times of crisis. For example, in light of the pandemic, the Gujarat Government provided an assistance of ₹ 150 crore to milk cooperatives in the state to help them export milk powder. The Government provided ₹ 50 for every kilogram of milk powder exported by the cooperatives. The move was taken as national and international prices of milk powder had fallen and due

[68] Biswajit Dhar (2021). Interrogating the Food and Agriculture Subsidy Regime of the WTO

to this, the Amul Federation and its union had a stock of more than 90,000 metric tons of milk powder worth ₹ 1,850 crore. Similarly, the Karnataka Government also provides wide array of incentives to dairy farmers in the state (Box 9). Similar support can be considered by other state governments or the Government of India, with due consideration to the WTO compatibility of the schemes, as linkages with the quantum of exports can make these support mechanisms liable to contestations at the WTO.

Box 9: Direct Support by State Governments for Dairy Farmers: Case of Karnataka

Karnataka Milk Federation has 27 dairy processing plants with a capacity of 92.50 lakh liters/ day. To encourage dairy farmers, the Government of Karnataka extends incentive at ₹ 5 per litre of milk. During 2020-21, the allocated budget for the incentive scheme was ₹ 125000 lakhs. An amount of ₹ 62500 lakhs has been released and ₹ 57108 lakhs has been spent up to the end of November 2020.

In the wake of Covid-19 pandemic, the Karnataka government also announced zero-interest loans of up to ₹ 2 lakh to farmers who are willing to take up dairying and fisheries. The loans would be extended through the cooperative banks in the state. With this, Karnataka became the first state to introduce interest free loan in dairy and fisheries.

The Pashu Bhagya of the Karnataka government also provides back ended subsidy of 50% to farmers belonging to Scheduled Caste and Scheduled Tribes and 25% to other small and marginal farmers in loans for establishing cattle, sheep, goat, pig, poultry units, up to a maximum loan amount of ₹ 1.20 lakh from commercial banks.

Source: Economic Survey of Karnataka, 2020-21

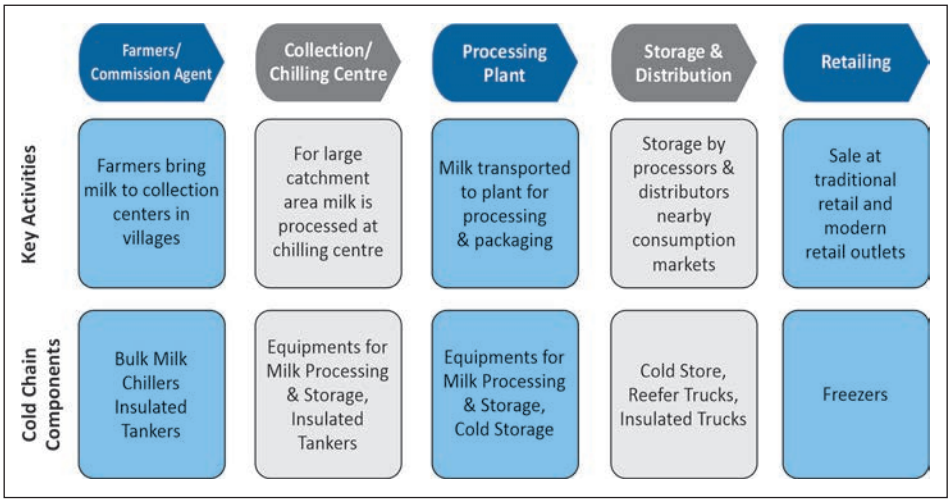
Alternatively, the Government could consider enhancing the scope of PM Kisan to include dairy farmers. Under PM Kisan, income support of ₹ 6,000 per year is given to small and marginal farmer families having combined land holding of upto 2 hectares. However, this does not include landless labours

who are engaged in dairy farming. Including dairy farmers under the ambit of PM Kisan could be considered by the Government of India. As direct income support is considered Green Box subsidy under the WTO, providing direct income support to dairy farmers could encourage dairy production, while complying with the WTO guidelines.

ENHANCING COLD STORAGE FACILITIES

In the current supply chain of dairy in India, cold storage plays a major role. Milk is collected by the Village Service Provider at the village level milk collection centres. From there, milk is transported to milk chilling centres, from where the milk is further transported to milk processing plants, after chilling the milk below 4 degrees.

Exhibit 4.3: Supply Chain of Indian Dairy Industry with Scope of Cold Chain Components

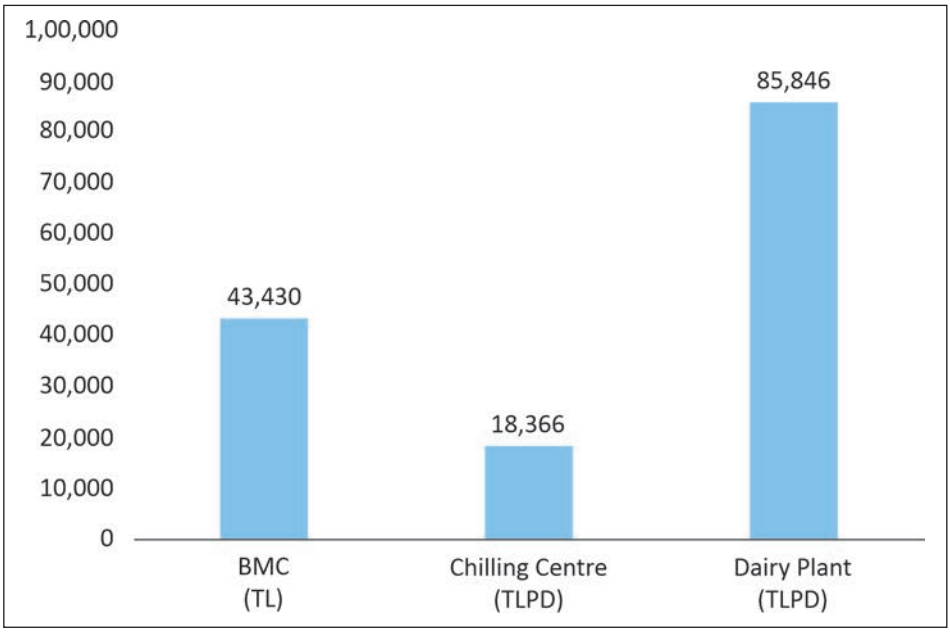


Source: Yes Bank, Cold Chain Opportunities in India (2018)

The entire supply chain of dairy sector requires robust cold storage facility, including chilling plants, bulk coolers, reefer transportation and precision hi-tech temperature controls, due to the perishable nature of the commodity. As of 2019-20, the dairy cooperative in India had 43,430 thousand litres of capacity in bulk milk chillers (BMC), and 18,366 thousand litres per day (TLPD)

of chilling centre capacity. The cold chain capacity is grossly inadequate given that the cooperatives procure on an average 508 lakh kgs of milk every day.

Exhibit 4.4: Dairy Cooperatives Cold Chain Infrastructure (2019-20)



Note: TL – Thousand Litres, TLPD – Thousand Litres Per Day

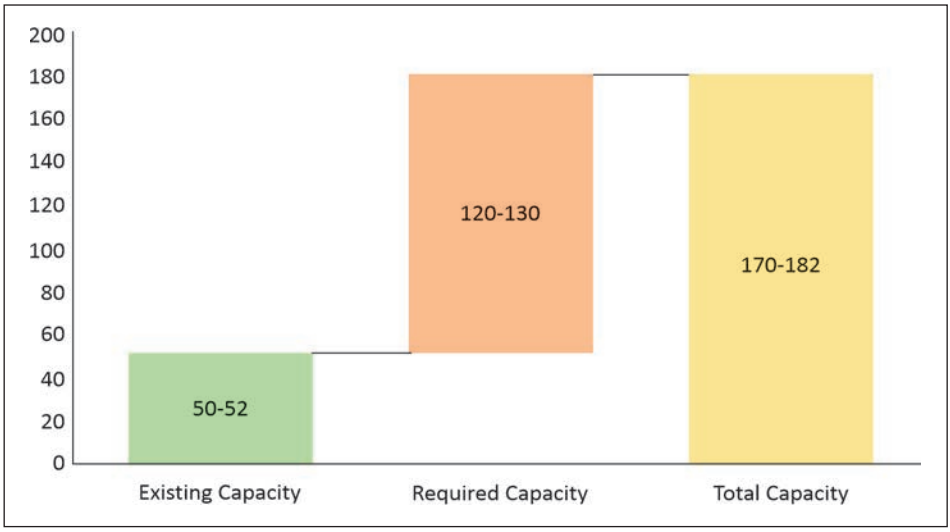
Source: National Dairy Development Board

According to industry estimates, a substantial amount of milk production is wasted in India due to inadequate cold chain infrastructure[69]. There is an estimated infrastructure gap of 120-130 MMT in the chilling infrastructure in India (Exhibit 4.5). According to estimates, there is requirement to the tunes of ₹ 19,000-20,000 crore[70] for meeting the gap in chilling infrastructure. Lack of trained personnel, outdated technology and inconsistent power supply further compounds the challenges associated with the cold chain infrastructure in dairying.

[69] ASSOCHAM and MRSS India (2017). FMCG Sector growth and Logistic Innovation- One more feather in the Make in India initiative

[70] Source: Dr J.V. Parekh, Prospects of Exporting Dairy Machinery and Equipment, Dairy Times (October-November 2020)

Exhibit 4.5: Chilling Capacity Requirement in India (in MMT)



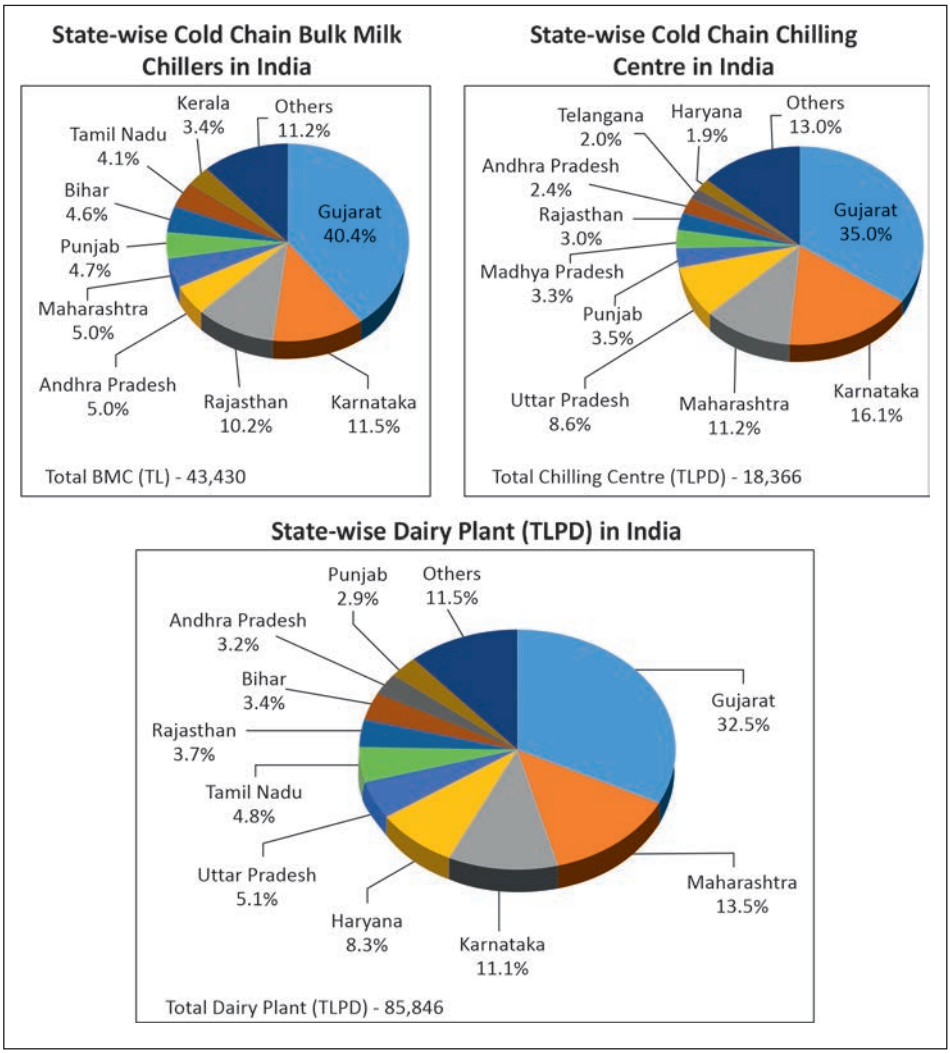
Source: Dairy India Overview (December 2020), Dairy Australia

Addressing the Uneven Distribution of Cold Storage through State Participation

The near-quadrupling of milk procurement by dairy cooperatives in Gujarat is also attributed to the increase in the power supply in the state, helping the village level cooperatives to set up bulk milk chillers. Before the BMCs were in place, the collected milk had to reach the dairy plant before the temperature starts soaring in the morning. This meant that the procurement had to start by 6 in the morning. The sheer need to hurry through the process, moreover, limited the number of animals that could be milked. With BMCs, the milk is chilled at source and remains fresh, which gives farmers the flexibility to deliver the milk to dairy plant. Currently, an estimated 80% of the milk procured by Gujarat Cooperatives comes through BMCs. However, there is an uneven distribution of cold storage facilities across the country. Around 73% of BMCs of dairy cooperatives in India are concentrated in five states, which are Gujarat, Karnataka, Rajasthan, Andhra Pradesh, and Maharashtra. The share of these five states in India's total milk production stood at 39.0% during 2019-20. Uttar Pradesh and Madhya Pradesh, which are the largest and third largest milk producing states in India in 2019-20, respectively, had a combined share of 24.7% in India's milk production, but had a combined

share of only 4.1% in the total BMCs of dairy cooperatives in India, and a share of only 11.9% in the cold chain chilling centres of dairy cooperatives in India. Lack of appropriate cold storage facilities in the top milk producing states leads to wastage of milk, which in turn reduces the exportable surplus from the country.

Exhibit 4.6: State-wise Dairy Cooperatives Cold Chain Infrastructure (2019-20)



Source: National Dairy Development Board

The Government of India, under the Scheme for Integrated Cold Chain and Value Addition Infrastructure of Pradhan Mantri Kisan SAMPADA Yojana, provides support for creating cold chain infrastructure. Since 2008, 353 cold chain projects have been approved under the scheme, out of which 230 have been completed and 123 are ongoing. Out of the total 353 approved projects, 24.4% of the projects were for cold storage in the dairy sector[71], indicative of the substantial allocation under the scheme for dairy. However, some top milk producing states have availed relatively less funding for cold chain storage. For instance, Madhya Pradesh has a total of 12 approved projects under the scheme, out of which only 1 is for dairy sector. Bihar (which is among top ten milk producers in India) has only 2 projects for the dairy sector. Clearly, the state governments need to encourage more cooperatives and dairy processors to avail financing under the facility. Encouragement can be given by the state governments through part-financing the borrower's contribution.

The funds announced by the GOI as part of the Atmanirbhar Bharat stimulus package could also be leveraged by the cooperatives and processors for strengthening the cold storage network. The Government of India has approved the AHIDF, under which Individual entrepreneurs, private companies, MSMEs, Farmer Producer Organizations and Section 8 companies are incentivized to establish dairy processing and value addition infrastructure. In addition, the Government of India has also announced National Agriculture Infra Financing Facility (Agriculture Infrastructure Fund), wherein financing of ₹ 1,00,000 crore will be provided for funding Agriculture Infrastructure Projects at farm gate and aggregation points (Primary Agricultural Cooperative Societies, Farmers Producer Organizations, Agriculture entrepreneurs, Start-ups, etc.). Projects relating to cold chains are eligible under the scheme[72]. State governments should disseminate information about the funds, and encourage more cooperatives and processors to strengthen the cold chain infrastructure across their value chains.

[71] Consolidated list of state-wise approved cold chain projects (as on 30.06.2021), MOFPI

[72] Scheme Guidelines for Central Sector Scheme of Financing Facility under Agriculture Infrastructure Fund, Ministry of Agriculture and Farmers Welfare

Use of Renewable Energy for Reliable Power in the Facilities

The cold storage facilities require steady power supply for maintaining the temperature, and intermittent power supply in some areas impacts the operations of the cold storages. The power cost also accounts for a substantial part of the overall cost of the cold storage facilities in the dairy industry. A shift towards renewable source of energy, particularly solar in this case, could be beneficial for operation of the cold storage facilities (see box 10). Use of renewable energy sources would not only lead to reliable power supply to the facilities, but also encourage setting up of bulk milk chillers and small storage facilities in remote areas as well.

Box 10: Innovative Technology Solutions in Dairy Sector

The amalgamation of technology with India's traditional agriculture sector is truly revolutionizing the sector. Several dairy technology companies are engaged in finding innovative solutions for reducing wastage and optimizing value chains.

Ecozen Solutions

Incorporated in 2010, Ecozen Solutions Private Limited (ESPL) is a technology company enabling the Farm-to-Fork value chain for perishables with 3 core offerings – Ecotron, Ecofrost and Eco-Connect, which work across the production, management, and marketing of perishable agriculture commodities, respectively.

Ecozen Solution's product Ecofrost is a portable solar-powered on-farm cold room for pre-cooling and staging of perishables with IoT based cooling solutions to enable better post-harvest management. It charges itself completely with just 5-6 hours of grid power and it operates using grid or alternative power supply from a generator set. In cloudy situation, the solar cold storage room automatically switches to the available alternative power supply. With no requirement of either a chemical battery or diesel, Ecofrost has a low maintenance cost. This product is one of its kind in the industry and is expected to help expand the reach of perishable products in export markets. ESPL has approximately 200 solar cold room units and has more than 50% share in the solar cold room market in India.

Akshayakalpa

Bengaluru-based start-up Akshayakalpa procures milk from over 160 farmers across the districts of Channarayapatna, Tiptur, Arasikere and Chikkanayakanahalli in Karnataka and helps farmers set up smart dairy farms through financial and technical support. Akshayakalpa aims at providing zero antibiotics, zero growth hormones injected organic milk to consumers, by means of technological intervention. Akshayakalpa has a network of 200 satellite farms that are run by farmer families, and technological support is provided to the farms in the entire process from milking to marketing.

The entire process is automated right from the milking machines to the collection in sealed containers and there is no human contact with the milk at any stage. At every farm, dairy equipment is installed to ensure that the organic milk is untouched by hand. The start-up also ensures adequate cold chain network for storage and transportation of the milk. The udders of cows are disinfected and washed before and after every milking. The milking system is also equipped with sensors to generate data regarding body temperature of cow, the quantity of milk and infections, if any, and all data is transmitted live to a central server. A hi-tech Lactoscan ultrasonic milk analyzer is used for instantaneous testing of the milk from each and every cow. Farm-level testing is used for evaluations like alcohol test for milk stability, antibiotic test, fat and tests to detect SNF (Solids Not Fat – like casein, protein, etc.), added water, temperature, pH values and density. Organoleptic tests that record the taste, appearance and smell, are also performed.

The data is recorded live and goes online, and the entire operation can be monitored from any remote location. In addition, there is an identical second level of testing at the plant to eliminate even the slightest chance of contamination. BMCs have been installed in the larger farms. BMCs ensure that the milk is chilled to 4 degree Celsius so that bacterial growth is retarded and chances of spoilage are low. The temperature continues to be maintained in the insulated vans that transport the milk to the plant. At the BMC, a vial of milk from each cow individually passes through several tests using the Lactoscan milk analyzer, before adding it to the pool. Milk that does not comply with the set standards in any way, is immediately discarded. Extension officers are present at every collection session for checking every sample.

Source: Ecozensolutions.com, Akshayakalpa.org

Support for Use of Technology in Storage Infrastructure

IT enabled services could also be leveraged for efficient usage of cold chain infrastructure. There are multiple start-ups which are working towards leveraging the use of technology to improve dairy supply chain parameters. Stellapps is one such start-up which has applied technologies like Internet of Things (IoT), Data Analytics and Big Data to optimize the dairy supply chain. The technology developed by Stellapps enables IoT-based, real-time management of cold chain with enhanced reporting and improved monitoring through web and mobile app portals which are applicable to BMCs, silos, cold rooms, deep freezeers, etc. The real time availability of information helps in taking timely action, thus preventing loss across the value chain. It may be noted that India Exim Bank has supported Stellapps through its financing programs since its formative years, thereby partnering the company in revolutionizing the dairy value chain (Box 11). Across-the-board support to such start-ups will be critical for further bolstering the storage infrastructure in the dairy sector through the use of technology.

Box 11: India Exim Bank's Support to Dairy Technology Company, Stellapps

Stellapps is India's first dairy technology solutions company building automation tools integrated with cloud, mobility, and data analytics for dairy farms, cooperatives and private dairies. As an end-to-end initiative, Stellapps provides dairy farm optimization and monitoring services, with special focus on small and medium herd size farms (5 to 25 cows). Stellapps has developed innovative applications and state-of-the-art mechanization tools which leverage Internet of Things (IoT), Big Data, Cloud, Mobility, and Data Analytics to improve various stages of the supply chain, including milk production, milk procurement, cold chain, animal insurance, and farmer payments.

At the inception stage, Stellapps was not able to muster the requisite support for upscaling its activities. Taking cognizance of the significant impact of the enterprise on the livelihood of dairy farmers and its potential in promoting rural entrepreneurship and supporting employment, India Exim Bank provided financial support to Stellapps under its Grassroots Initiative and Development Programme, for meeting its working capital requirements. India Exim Bank remains an important partner for Stellapps

in its growth journey. Within a short span of less than 5 years, Stellapps has installed world's largest community milking parlour in Chikkaballapur district of Karnataka where 200 cows are milked per day.

Promotion of such technologies in the dairy sector would help improve the scalability and quality of dairy operations. It would also make globally competitive smallholder dairy farming a reality in India.

Source: India Exim Bank

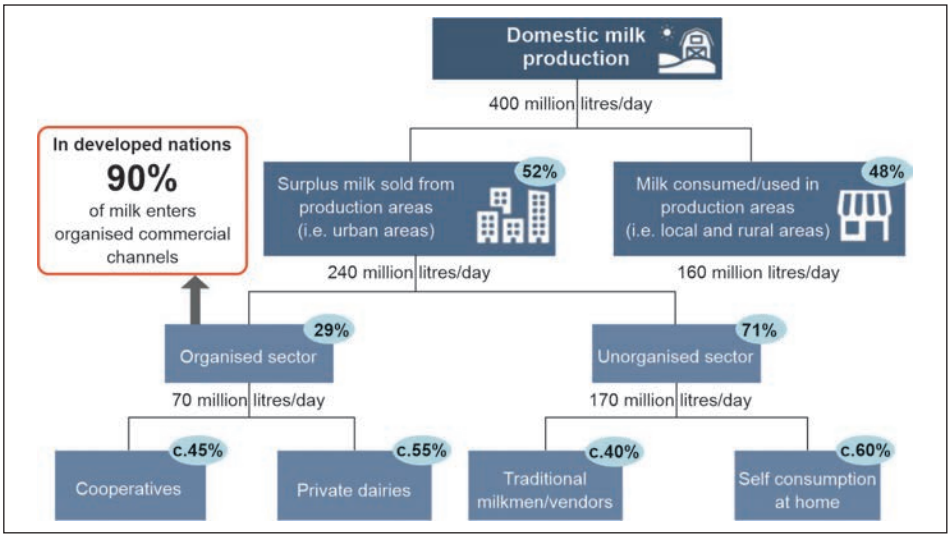
STRENGTHENING THE PROCESSING FACILITIES

Presently, the total milk processing capacity in India is reported to be 66 million litres/day in the dairy cooperatives (operating at 65% capacity), 73 million litres/day in private sector companies, and 2.5 million litres/day in producer companies[73]. Processing capacity in India stood at mere 2% of the total production in 2018, compared to 21% in the USA, 24% in the Netherlands, 43% in New Zealand and 48% in Germany. Clearly, there is a need for bolstering the processing facilities in the country to compete with the major dairy producing countries in the world.

Of the total milk production in India, an estimated 48% is either consumed at the producer level or sold to small outlets in the rural area. The remaining 52% is reported to be processed and made available for sale to consumers in urban areas. Of this 52%, currently about 29% of the milk sales are handled by the organized sector, which include the cooperatives and the private sector having wide procurement and distribution networks at the village level; the remaining 71% is handled by the unorganized sector (Exhibit 4.7). As compared to this, nearly 90% of the milk in developed nation moves through organized commercial channels. Therefore, relatively low volumes of milk passes through the organized sector in India, which is capable of processing the milk into value added products.

[73] Indian Dairy Vision-2022

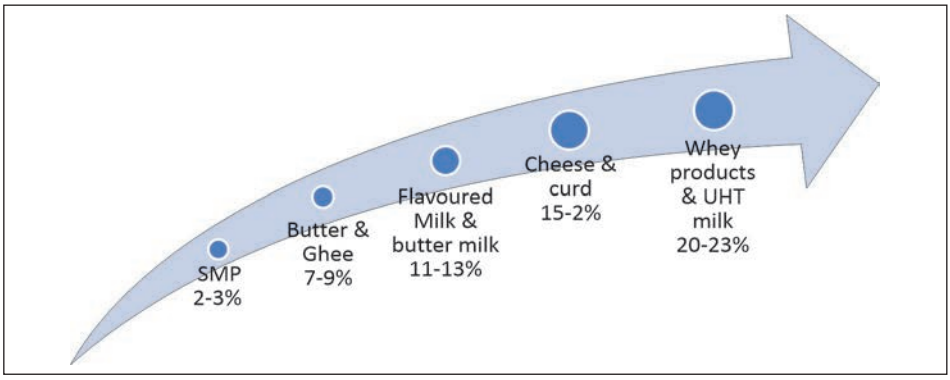
Exhibit 4.7: Milk Processing and Distribution in India



Source: Dairy India Overview, A Pack Prepared for Dairy Australia by Beanstalk, December 2020

An estimated 70% of processed milk in India is sold as fluid milk and only the remainder is used in manufacture of value-added milk and milk products[74]. As value added products fetch significant price margins in the market (Exhibit 4.8), it is important to focus on these products for improving the prospects in the dairy industry.

Exhibit 4.8: Average Margins for Value Added Products across Categories



Source: Care Ratings

[74] Dairy and Products Annual, USDA

The Government has taken several steps recently to improve the dairy processing capacity in the country. The Centre announced a ₹ 1 billion interest subvention scheme on working capital in order to help milk co-operatives and farmer-owned milk producer companies struggling with excess milk supply following restricted procurement by private dairies amid the nation-wide lockdown over COVID-19. The scheme is aimed at helping dairies convert the surplus quantity of milk into high shelf-value products such as milk powder, white butter and ghee, among others[75]. Apart from this, the Government has also announced a PLI scheme for food processing industry which includes some dairy categories such as mozzarella cheese. These measures have provided a much-needed boost to the dairy processing industry.

While these Government initiatives would be crucial for strengthening the dairy processing industry, they need to be complemented by awareness programmes about the potential for non-conventional products in the dairy sector, especially for the small dairy cooperatives and producers, who may not be familiar with the international demand trends. For example, while Indian dairy cooperatives and producers are familiar with the production of paneer, whey that is produced as a by-product is thrown away. This not only impacts India's export potential for whey powder, but ends up making the country an importer of these products. Clearly, there is a need for creating awareness about the emerging areas of growth in dairy processing, and bringing variety to the existing product range.

Since the COVID-19 pandemic, there is also a growing focus on immunity boosting properties of various Indian spices and ayurvedic ingredients. Dairy processors can consider mixing of botanicals or Ayurvedic ingredients into milk for added functionality and health benefits. This would diversify the range of processed products, while also improving the margins.

The traditional milk sweets (*mithai*) could also be popularized in the international markets. The Government of India has undertaken several food promotion campaigns in the past, including the 'Incredible Tiffin' initiative. Other countries have also popularized their food items through similar

[75] Care Ratings

campaigns. In Korea, for example, a group of young Koreans undertook a promotional campaign for a well-known Korean dish, Bibimbap. Known as the "Bibimbap Backpackers", this group travelled to over 20 cities in 15 countries on a 255-day trip to cook bibimbap. The campaign started in 2011 and was mostly paid for by the Ministry of Agriculture, Government of Korea, and a major Bibimbap chain. They served over 9,000 bowls of bibimbap at 100 events at universities and other places, and received substantial domestic and international media coverage. Similar project was undertaken by a group of Turkish volunteers, who started the "Turkish Coffee Truck" initiative to promote Turkish coffee culture across the USA. In 2012, a group of volunteers travelled to five cities in the USA to spark interest in coffee from Turkey. Similar programme could be sponsored by the Indian government for *mithai*. Use of sugar-free alternatives and focus on quality and hygiene aspects in such initiatives could also help in dissipating the negative perception about Indian food being greasy and unhealthy.

The Indian traditional milk sweets also need to be taken up for industrial production, which would allow uniformity in texture, taste, safety and packaging. The production facilities would need to ensure uniform quality of raw materials, which would require strict sourcing requirements for industrial units. Moreover, some parts of the value chain need to be automated. For example, use of rolling pin by artisans for making sweets may lead to difference in the size, necessitating machine rolled products for maintaining uniform product parameters. Machinery fabricators must work with product manufacturers to design proper machines for use in these processing units. The Government could create synergies between the dairy machinery industry players and the processors/cooperatives through setting up of a dedicated Centre of Excellence for such value-added dairy products.

There is also a need to track the demand trends of dairy products that are gaining salience in the international markets. A case in point is Ghee. Ghee is a type of clarified butter fat that has been produced and utilized in India since antiquity. It has a fairly stable shelf life because of low moisture content and also has high levels of natural antioxidants. There has been an increase in the demand of Ghee in the overseas markets as they are suitable for low carb, high fat diets like keto and paleo that are gaining popularity. Such

demand trends, especially in products where India has strong competence, need to be effectively tapped.

SKILL DEVELOPMENT

The dairy industry is witnessing greater application of new science and management practices across the entire value chain. Companies are increasingly opting for cost reduction through labour saving mechanisation, process automation and application of information technology in systems management. These developments are increasing the need for skill development in the industry. Further, the industrial requirement for quality and risk management in the export products and conformity with the SPS standards demand skilled and competent work force.

At present, there is a lack of programmes for skill development in the field of dairy farming and management. Although the government has taken steps towards skill development and dairy business development with programmes like National Skill Development Mission, Dairy Entrepreneurship Development Scheme under the Start-up India, National Programme for Bovine Breeding and Dairy Development, among others, the outcome of these schemes in terms of skill development and employability in the dairy sector has not seen encouraging results. Also, there is a lack of awareness among the stakeholders regarding the scientific/technological developments in R&D institutions and organizations[76], leading to a major chasm between the knowledge creation in the institutions and the application at the ground level.

Going forward, the success of the dairy industry would critically depend on the availability of manpower in the areas of food engineering, food packaging, quality assessment, among others. A close interaction between the dairy industry and educational institutions would be necessary to contribute to further development of dairy businesses in India.

Greater foreign investments can also contribute to the development of skills in the dairy industry. Foreign investments are often accompanied by

[76] Entrepreneurship Opportunity in Dairy Sector, India Farming (January 2020 Issue), ICAR

efforts from the foreign companies to improve the technical know-how and upgrade the skills of local farmers and employees. A case in point is the Dairy Farming Institute in China, which has been set up by Nestle. The institute was set up as part of an MOU signed by Nestle with Shuangcheng Municipal Government in 2012 to jointly develop modern dairy farming practices in the region. As part of the agreement, a total of RMB 2.5 billion (US$ 400 million) was proposed to be invested in the milk district over a period of five years through a partnership between Nestle, the local government, investors and farmers. The Dairy Farming Institute sprawls over an area of 600,000 square metres, and houses three training farms of different capacities, aimed at different target classes. The first training farm provides guidance to farmers working alone or on small farms to professionally manage their farms. The other two training farms provide training to larger farm owners to help them ramp up operations or move to state-of-the-art farms. In India as well, state governments can forge such agreements with leading global dairy firms to enhance their footprint locally, while also meeting the training and skill development needs of the industry. Such models can especially be adopted in states with weak dairy cooperatives, where the business model needs an overhaul.

LACK OF CREDIT AVAILABILITY

Low or non-availability of credit is cited as one of the major constraints for the development of livestock sector activities. According to estimates, the share of animal husbandry and dairying in the total agricultural credit has hardly ever exceeded 5%, despite their rising contribution to the agricultural gross domestic product[77].

A large part of India's dairy sector is in the unorganized sector and access to formal credit mechanism is poor for the small and marginal producers. Commercial banks are not favourably disposed to providing credit to livestock farmers. The cooperative credit system is also substantially weak, as the cooperatives usually do not finance dairy activities; it is the person managing

[77] Birthal, P.S., and D.S. Negi. 2012. Livestock for higher, sustainable and inclusive growth. Economic and Political Weekly 47 (26 & 27): 89–99

the cooperative milk collection centre who advances the loans[78]. Further, research also indicates that the organizational structure of dairy cooperatives also hinder their access to external financial resources[79]. As a result, there is excessive dependence of livestock farmers on informal sources.

High dependence on informal credit from the private traders and agents of private companies inhibits growth of small and marginal livestock farmers due to the high interest rates on the borrowings. These borrowings are often not linked to dairy activities. Further, the borrowings are often tied to buy back arrangements by the private lenders, which is non-remunerative for the dairy farmers. Lack of credit also acts as a roadblock in the creation and development of small cooperatives in the dairy sector.

Efforts are needed to augment institutional credit to the dairy farming activities. One initiative in this direction by the Government is the extension of Kisan Credit Card (KCC) to livestock and dairy farmers from 2018 onwards. However, the KCC for dairy farmers has not been able to gain much traction as banks are hesitant to provide the KCC loans in the absence of collateral. Undertaking by the milk cooperatives that the farmers supply milk to them is insufficient collateral for the Banks. Lack of collateral is therefore hindering the access to finance for dairy farmers in spite of their inclusion in the KCC scheme.

Pratap S. Birthal et. al. (2016) note that value chain with its product market orientation can serve as collateral for financing dairy farmers. The value chain actors especially the lead firms or the governments should facilitate smallholder farmers' access to credit from financial institutions by use of contracts as collateral or guarantee. For the financial institutions, financing through a value chain is an important means of reducing the transaction costs and lending risks associated with asymmetric information on their potential

[78] Pratap S. Birthal et. al (2016). 'Formal versus Informal: Efficiency, Inclusiveness, and Financing of Dairy Value Chains in India', IFPRI Discussion Paper 01513

[79] Grau, A., Hockmann, H., and Levkovych, I. "Dairy Cooperatives at the Crossroads." British Food Journal 117, no. 10 (2015): 2515-31.

borrowers[80]. In some developing countries such as China, some provincial governments facilitate financing of smallholder farmers associated with value chains through tripartite agreement among lead firms, commercial banks and farmers using 'contracts as collateral'[81]. As the banks are not comfortable in extending KCC loans to dairy farmers on the back of an undertaking by the milk cooperatives that the farmers supply milk to them, the state governments need to provide the necessary guarantee as in the case of the Chinese model. Alternatively, other financing models could be invented, viz., the banks extending credit to the cooperatives, which in turn could extend credit to the farmers.

TECHNOLOGY PENETRATION AND R&D

Technological intervention in the dairy sector is considerably low due to the predominantly unorganised structure of the sector. Farmgate technology in Indian dairy sector is also significantly backward with hand milking being the dominant form of milking practised across the county. Even in the organised segment, the spending on research and development is substantially low. The estimated expenditure on Research and Development (R&D) in the dairy products industry was estimated at ₹ 185.8 million in 2018-19[82], which is 0.02% of sales of the industry.

While technology penetration in the dairy industry is relatively less, over the last five years, several start-ups have mushroomed in this space. These start-ups aim to increase dairy productivity and reduce wastage. These start-ups have the necessary technology to revolutionize the industry, but do not have the reach which benefits the cooperative societies. Therefore, there is a need to create synergises between start-ups and cooperative societies to ensure that the technology solutions are leveraged effectively.

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[80] Pratap S. Birthal et. al (2016). 'Formal versus Informal: Efficiency, Inclusiveness, and Financing of Dairy Value Chains in India', IFPRI Discussion Paper 01513

[81] Chen, K., P.K. Joshi, E. Cheng and P.S. Birthal. 2015. "Innovations in Financing of Agri-food Value Chains in China and India: Lessons and Policies for Inclusive Financing." China Agricultural Economic Review 7 (4):1–27.

[82] CMIE Industry Outlook (a count of 98 companies)

Table 4.5: Research and Development Expenditure in Dairy Products Industry

Year	Sales (₹ million)	R&D Expenditure (₹ million)	R&D as % of Sales
2010-11	2,35,418.4	26.8	0.01%
2011-12	2,65,346.9	24.9	0.01%
2012-13	2,40,977.5	26.6	0.01%
2013-14	4,80,903.6	7.3	0.00%
2014-15	7,01,114.5	95.5	0.01%
2015-16	8,25,464.3	339.7	0.04%
2016-17	8,20,151.2	278.8	0.03%
2017-18	8,58,113.7	198.3	0.02%
2018-19	8,59,940.2	185.8	0.02%

Source: CMIE Industry Outlook, Exim Bank Research

There is also a large reservoir of technologies which is available with R&D institutions, but most of the technologies have not been validated for up-scaling, consumer acceptance and marketing potential under field conditions. The effective utilization of these resources can be undertaken in a PPP mode, with the Government bearing the risk of failure of the projects, the R&D institutions providing the technical know-how and the private sector providing the required capital. Such PPP models will especially be crucial for the adoption of precision farming in Indian dairy. Precision dairy farming (PDF) can be defined as information and technology-based farm management system to identify, analyse and manage variability within farm management for optimum farm performance, profitability and sustainability. PDF technologies could help the dairy farmers by increasing efficiency, reducing cost, improving product quality, minimizing adverse environmental impacts (Box 12) and improving animal health. However, despite the growing demand, adoption rates of most commercially available PDF technologies are limited. Research indicates that this is due to uncertainty regarding investment in PDF technologies[83] due to the lack of information on the added economic value

[83] Borchers M R and Bewley J M. 2015. An assessment of producer precision dairy farming technology use, prepurchase considerations, and usefulness. Journal of Dairy Science 98: 4189-4205.

when the PDF technologies are implemented on the farm. Lack of validated research results concerning the effects of application, high capital input and high costs have ultimately led to lack of success stories, and demonstrated effects[84]. Therefore, there is a need for exploration of the feasibility of these technologies, especially for small holders in India, through a PPP mode of project implementation in pilot projects. The Government could share a major chunk of the associated risk of commercialisation in these projects, upon vetting of the projects by the NDRI.

Box 12: Impact of Dairy Industry on Environment

Fresh and processed dairy products are important sources of critical nutrients such as calcium, protein, and vitamin D. However, their production relies on large amounts of natural resources (i.e. freshwater and arable land) and other inputs (i.e. energy, crops and other materials), resulting in direct and indirect greenhouse gas (GHG) emissions and other environmental impact. This sector emitted 1.7 million tonnes of carbon dioxide emissions (CO2e), which represents around 3.4% of the total related anthropogenic CO2e emissions. This is an increase of 18% as compared to the emissions in 2005. The increase can be largely attributed to higher consumer demand. During 2005-2015, the emission intensities per litre of milk were reduced by 11% on account of production efficiency improvements. Without these improvements, the emissions from the dairy sector would have increased up to 38%.

Among the different GHGs emissions from the sector, methane (CH4) is the main polluting gas, representing up to 63.3% of the total carbon footprint of an average dairy product, followed by nitrous oxide (up to 24.5%) and carbon dioxide (up to 12.2%). Besides, global warming, water use and water eutrophication have also been reported as relevant environmental impacts along the dairy value chains.

Direct CH4 emissions from cow enteric fermentation (fermentation that takes place in the digestive systems of animals) is the main contributor to

[84] Prakashkumar Rathod and Sreenath Dixit. 2020. Precision Dairy Farming: Opportunities and Challenges for India. The Indian journal of animal sciences 90(08):1083-1094. August 2020

the carbon footprint of dairy farms, with relative contributions varying from 35% to 59% of the total GHG emissions from this stage. Feed production, which includes both off-farm feed production (i.e. concentrated feed) and on-farm feed production (i.e. roughage), is another relevant contributor to global warming at the dairy farm stage. Feed production is responsible for approximately 25–30% of the carbon footprint of dairy farms. Manure management, which includes collection, handling and storage of manure, is another contributor to the GHG emissions, making up roughly 9–15% of the dairy farm's carbon footprint. Going forward, the challenge of the dairy sector would be to satisfy the future demand for dairy products in a sustainable manner, by reducing environmental impact and food safety risks.

Source: Analysing the interaction between the dairy sector and climate change from a life cycle perspective: A review, PaolaGuzmán-Luna Et al. (2021)

As discussed earlier, there is substantial scope for exports of traditional Indian milk products, but intensive R&D efforts are needed to develop suitable technologies for large scale manufacture and packaging of traditional Indian milk products. Alongside, scientific documentation of the desirable physico-chemical and shelf-life characteristics of region-specific traditional milk products would also be needed. A holistic framework for such studies needs to be developed, with involvement of the research institutions, the cooperatives, farmers and processing units.

Foreign investments in the dairy products sector will also be crucial for the technology upgradation in the sector. Analysis indicates that the foreign investment in the dairy sector in India has been relatively less, as compared to other milk producing countries. During April 2011 to December 2020, foreign investments in the dairy sector amounted to US$ 32.7 billion globally. Of this, India’s dairy sector received US$ 379.5 million of foreign investments in 7 projects, much less than several other developing countries like China, Turkey, Sri Lanka, Indonesia and Brazil (Table 4.6). Clearly, India has lagged behind in terms of foreign investments in the dairy products sector. Going forward, more incentives are needed to attract investments from foreign dairy firms, especially in high value added activities of the supply chain.

Table 4.6: Top 20 Destinations for FDI in the Dairy Product Sector (April 2011 to December 2020)

Destination Country	Projects	Capex (US$ Mn)	Jobs Created	Companies
The USA	117	5,955.7	9,115	75
China	52	2,484.5	10,831	25
Russia	48	9,672.9	17,812	19
The UK	41	1,052.1	2,526	20
Germany	25	829.4	1,427	17
Turkey	18	183.8	561	10
New Zealand	16	1,378.7	1,331	11
Australia	14	575.0	694	8
France	14	426.5	633	11
Belgium	13	433.0	789	4
Spain	13	225.4	560	8
Sri Lanka	13	341.5	2,407	4
Indonesia	11	776.8	2,629	9
Singapore	11	560.4	1,965	11
Brazil	9	361.5	1,567	6
Ireland	8	443.2	636	7
Mexico	8	1,075.8	1,924	6
The Netherlands	8	540.0	882	5
Thailand	8	179.6	702	7
India	*7*	*379.5*	*1,940*	*7*
Total	**599**	**32,680.8**	**81,267**	**292**

Note: "fDi Markets" database tracks cross-border investment in a new physical project or expansion of an existing investment which creates new jobs and capital investment. This data differs from official data on FDI flows as companies can raise capital locally, phase their investment over a period of time, and can channel their investment through different countries for tax efficiency.

Source: fDi Markets, Exim Bank Research

IMPACT OF INDIA'S FTAs

Free trade agreements are an important aspect of international trade. Countries signing trade agreements have easy and prioritized access to partner country's markets which tends to benefit the exporters. The agreements not only help in reducing and eliminating tariff, but also helps in addressing other barriers which could impede the flow of trade, and encourages investment. Over the past few decades, India has signed numerous trade agreements with various countries and trade blocs. According to a study by the NDDB, out of the seventeen trade agreements signed by India, only seven of them contain provisions related to concession for dairy products[85].

Table 4.7: Trade Agreements Granting Concession for Indian Dairy Products (2019)

Sr. No.	Trade Agreements	Partner Countries	Partner Countries Granting Concession to Indian Dairy Exports
1	Asia pacific Trade Agreement (1976)	Bangladesh, China, Laos PDR, South Korea, and Sri Lanka	China, Laos PDR
2	SAARC Preferential Trading Arrangement – SAPTA (1993)	Pakistan, Nepal, Sri Lanka, Bangladesh, Bhutan, Maldives	Pakistan
3	Agreement on South Asian Free Trade Area-SAFTA (2004)	Pakistan, Nepal, Sri Lanka, Bangladesh, Bhutan, Maldives, Afghanistan	Pakistan, Nepal, Sri Lanka, Bangladesh, Bhutan, Afghanistan
4	India – MERCOSUR Preferential Trade Agreement	Argentina, Brazil, Paraguay, and Uruguay	Argentina, Brazil, Paraguay, and Uruguay
5	India – Korea CEPA	South Korea	South Korea
6	Revised Treaty of Trade India-Nepal	Nepal	Nepal
7	India ASEAN CECA	Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam	Indonesia, Philippines, Myanmar, Thailand, Vietnam

Source: Roadmap and Strategies to Promote Export of Dairy Products for the Organized Dairy Sector, NDDB

[85] Roadmap and Strategies to Promote Export of Dairy Products for the Organized Dairy Sector, NDDB

In Asia, Bangladesh, Afghanistan, Nepal, Bhutan, Pakistan, Sri Lanka, Myanmar, China, Indonesia, Philippines, Laos, Vietnam, South Korea, and Thailand grant tariff concession for some categories of dairy exports from India. Besides the Asian countries, MERCOSUR (Argentina, Brazil, Paraguay, and Uruguay) grants concession to dairy exports from India. List of Indian dairy products eligible for concessional treatment under various trade agreements are provided in Annexure 1.

In spite of the tariff concessions in the aforementioned 18 countries under various FTAs, the dairy producers and companies in India have not been able to exploit the tariff advantage except in case of a few neighbouring countries, such as Nepal, Bhutan and Bangladesh. While in Nepal and Bhutan, India is a major source for dairy imports, in Bangladesh apart from raw cheese, India has not been able to capitalize the market for other dairy products in which it has a tariff advantage. In Afghanistan as well, in products where India enjoys a tariff concession, countries such as Iran, Pakistan and Spain are the leading exporters. Similarly, India's dairy exports to other neighbouring FTA partners, such as China, Sri Lanka, Myanmar and Pakistan have been negligible.

The underperformance of dairy sector under India's existing FTAs suggests an urgent need for re-evaluation and re-negotiation of these FTAs. Additionally, India is currently reported to have 28 trade agreements that are under negotiations. Given the significance of the sector from the point of output, employment and exports, dairy can be included in the sensitive list for FTAs with countries that are leading producers and exporters of dairy items. Recently, India decided against joining Regional Comprehensive Economic Partnership (RCEP) agreement, as the terms of partnership were not adequately favourable. Concerns were raised from the agriculture sector regarding the distortionary impact of the agreement on the sector. The dairy sector was concerned about heavy competition in both price and technology, as the deal offered zero-duty imports of cheaper dairy products. Tariff on dairy products in India ranges from 40-60% at the Most Favoured Nation (MFN) rate. While dairy sector should be included in the sensitive list for FTAs with major dairy producing countries, negotiations for tariff concessions for the dairy sector in FTAs with countries which run a significant trade deficit in dairy products, such as the UK, may also be considered.

TACKLING THE NON-TARIFF MEASURES

Indian dairy products face several non-tariff measures (NTM) in importing countries, which are mostly protectionist in nature. According to the UNCTAD, the NTMs applied on dairy products primarily include geographical restrictions due to sanitary and phytosanitary measure (SPS), residual tolerance, labelling requirements, testing requirements, certification requirements, inspection requirements, traceability, conformity to assessment, and import licensing. Various NTMs faced by Indian dairy exports are listed in Table 4.9 (to be read with Table 4.8).

Table 4.8: Major Non-tariff Measures Applied by Countries on the Import of Dairy Products from India

S.No.	Major Non-tariff Measures applied by Potential Countries on the Import of Dairy Products	
1	A7	Regulation of foods or feeds derived from, or produced using genetically modified organisms (GMO)
2	A8	Conformity assessment related to SPS
3	A11	Temporary geographic prohibition for SPS reasons
4	A14	Special Authorization for SPS reasons
5	A19	Prohibitions or restrictions of products or substances because of SPS reasons n.e.s.
6	A21	Tolerance limits for residues of or contamination by certain substances
7	A22	Restricted use of certain substances in foods and feeds
8	A31	Labelling requirements
9	A33	Packaging requirements
10	A52	Irradiation
11	A81	Product registration requirement
12	A82	Testing requirement
13	A83	Certification requirement
14	A84	Inspection requirement
15	A85	Traceability information requirements

S.No.	Major Non-tariff Measures applied by Potential Countries on the Import of Dairy Products	
16	A89	Conformity assessment related to SPS n.e.s.
17	B11	Prohibition for TBT reasons
18	B15	Registration requirement for importers for TBT reasons
19	B22	Restricted use of certain substances
20	B31	Labelling requirements
21	B32	Marking requirements
22	B33	Packaging requirements
23	B81	Product registration requirement
24	B82	Testing requirement
25	B83	Certification requirement
26	B84	Inspection requirement
27	B851	Origin of materials and parts
28	B853	Distribution and location of products after delivery
29	C1	Pre-shipment inspection
30	D6	Safeguard duties
31	D42	Antidumping duties
32	D52	Countervailing duties
33	E1	Non-automatic licence
34	E22	Bilateral quotas
35	E25	Quotas linked with domestic production
36	E111	Licensing procedure with no specific ex ante criteria
37	E311	Full prohibition (import ban)
38	E312	Seasonal prohibition
39	F71	Consumption taxes
40	H11	State trading administration, for importing
41	I1	Local content measures

Source: WITS

Table 4.9: Major Product Specific Non-tariff Measures Faced by Indian Dairy Exports

(Refer to Table 4.8 for the description of the codes for the NTMs)

Products	HS Code	Major Non-tariff Measures Product Specific													
Butter	040510	A7	A8	B11	B22	B32	B851	B853	C1	E22	E311	E312	F71	H11	I1
	040520	A85	B83	B84	E1										
	040590	B11													
SMP	040210	A31	A81	A82	A83	A84	A85								
Cheese	040610	A89	B82												
	040620	A19	A31	A85	E1										
	040630	A89	E1												
	040640	A14	A21	A22	A31	A33	A82	A83	A84	B31					
	040690	A89	B81	E1	F71										
WMP	040221	A14	A21	A33	A82	A83	A84								
	040229	A83	A85												
Cream	040130	Nil													
	040140	A21	A33	A82	A83	E1									
	040150	A14	A21	A31	A83	B31	E1								
Butter Milk	040390	A89	B33	B82											
Condensed Milk	040291	A11	A85	A89	B33										
	040299	B15	F71												
Yoghurt	040310	A89	B84												
Infant Milk	190110	A11	A8	B32	B8	C1	E111								
Casein	350190	A81	C1												
Caseinates	350190	A31	A31	A83	A84	B31									
Lactose Pharma	170211	A52	A7	D42	D52	D6	E25								

Source: IIFT and Industry Sources

The NTM A11 on 'temporary geographic prohibition for SPS reasons' refers to the restrictions on imports from countries or regions due to infectious/ contagious diseases. This is one of the longstanding and major NTMs faced by Indian dairy exports. The presence of Foot and Mouth Disease (FMD) is one such NTM concern that has hindered India from realising its true potential in dairy sector. The World Organization for Animal Health (OIE) has recognised India's official control programme for FMD. The OIE Terrestrial Animal Health Code recommends the import of milk products from FMD infected counties or zones where an official control programme exists. Despite this, India faces market access challenge due to FMD, even for value-added products in the dairy sector. For example, Mexico did not allow the import of casein from India due to FMD concerns. Other NTMs are mostly traceability and certifications related, such as allocated space per animal, feed and fodder requirements, water quality, hygienic environment, veterinary treatment and care, vaccination, and animal husbandry practices.

There is a need to strengthen the testing and inspection infrastructure in the country for dairy exports. Several major milk producing states do not have enough testing labs. The NABL accredited laboratories in India are highly concentrated in nature, with 59% of such labs situated in just 5 states, which are Maharashtra, Delhi, Tamil Nadu, Haryana, and Karnataka. Maharashtra alone has 17% of such labs. The top 5 milk producing states in India—Uttar Pradesh, Rajasthan, Madhya Pradesh, Andhra Pradesh, and Gujarat, account for only 20% of the food labs[86]. The food labs per thousand km^2 of area for the top 4 milk producing states was below the all-India average of 0.004. The food labs per thousand metric tons of production was also lower than the all-India average for the top 5 milk producing states. This indicates that the laboratories and testing capacities in India for the dairy sector is relatively low and not well diversified across the country. Development of testing infrastructure in the top milk producing states will be a sine qua non for the growth of dairy exports from the country. A comprehensive programme for building technical infrastructure by investing in setting up and equipping labs should be introduced.

[86] Potential Exports and Non-Tariff Barriers to Trade, Asian Development Bank, January 2020

It is further reported that merchant exporters frequently procure dairy products from domestic markets without FSSAI labelling resulting in increase in rejection rate in foreign markets due to non-compliance with packaging and labelling requirements. Additionally, wrong product labelling by the merchant exporters to escape import duties and import restrictions in the foreign markets have also affected the perception of Indian dairy products in the international markets. Punitive measures need to be imposed on such practices to ensure quality exports from the country.

Table 4.10: Availability of Food Labs and Physical Accessibility in India, 2015–2016

Top Milk Producing States	No. of Labs	Food Labs per '000 Square Kilometres (Area)	Food Labs per '000 Metric Tons (Production)
Uttar Pradesh	7	0.003	0.0002
Rajasthan	5	0.001	0.0003
Madhya Pradesh	4	0.001	0.0001
Andhra Pradesh	1	0.000	0.0001
Gujarat	7	0.004	0.0004
Punjab	3	0.006	0.0001
Maharashtra	20	0.006	0.0023
Haryana	11	0.025	0.0007
Bihar	0	0	0
Tamil Nadu	14	0.011	0.0012
All India	**121**	**0.004**	**0.0005**

Source: Potential Exports and Non-Tariff Barriers to Trade, Asian Development Bank, January 2020, India Exim Bank Research

According to a report by the ICRIER, India has been able to harmonise certain standards with international standards such as the Codex Alimentarius and the standards of OIE in the case of milk products. India has already achieved compliance with the Codex standards with respect to the Code of Practice for the Prevention and Reduction of Lead Contamination in Foods and aflatoxin M1. Yet, there are still differences across other standards that have been

followed in India and those that are prescribed by Codex Alimentarius[87]. Hence, harmonization of standards still remains an unfinished agenda that will be critical for growth of dairy exports, especially to highly regulated markets.

CREATION OF DAIRY EXPORT ZONES

Establishing and developing Dairy Export Zones (DEZ) may help in addressing barriers related to large herd size. Scale of operations is an important aspect in limiting operating expenses, improving price competitiveness and tapping the international markets. These zones may be developed as exclusive regional zones for exports of dairy products with ability to address traceability requirements and manage quality as per the international standards. The zones may be developed with focus on export oriented MSME dairy units. The DEZs could have common infrastructure facilities like cold chain, chilling plants, processing facilities, R&D facilities, and better connectivity to ports and airports. These could be set up in states which are FMD free. The zone could be spread across 50-100 acres, providing ample space for dairy related activities. Foreign investments could also be encouraged in the DEZs for setting up of hi-tech dairy processing units and duty concession on import of dairy equipments in these zones could be given. Policy regarding this could be announced in the Foreign Trade Policy.

EXPORT INCENTIVES FOR DAIRY PRODUCTS

The Government of India has a wide array of programmes for incentivizing exports from the country. A key export promotion programme was the Merchandise Exports from India Scheme (MEIS), under which incentives were provided to exporters to offset infrastructural inefficiencies and associated costs for exports. Under MEIS, exporters received duty credit scrips which could be used for payment of basic customs duty and additional customs duty and payment of central excise duties. The incentives under the schemes were calculated as a percentage (2 to 5 percent) of the FOB value of exports.

[87] Arpita Mukherjee (2019), SPS Barriers to India's Agriculture Export: Learning from the EU Experiences in SPS and Food Safety Standards, Indian Council for Research on International Economic Relations

The dairy sector received duty benefits of 2-3 percent under MEIS, however, during 2019, the government incrementally increased the export incentives on milk and certain products to 20 percent, for a limited period of time. The move was aimed at boosting overseas shipment in the wake of fall in the domestic price of milk.

The MEIS scheme was discontinued by the Government of India after the scheme was challenged at the WTO. The Refund of Duties and Taxes on Exported Products (RoDTEP) scheme has been introduced by the Government of India, as a WTO-compliant substitute for the MEIS scheme. The scheme aims to provide refund of embedded central, state and local duties and taxes paid on inputs that were so far not refunded or rebated, to the exporters. The refund is issued in the form of transferable electronic scrips. These duty credits are maintained and tracked through an electronic ledger. In the RoDTEP, all the products from dairy sector would receive refund at the lowest rate of 0.5 percent. The refund under this scheme is lower than that provided under MEIS. Given the need for higher incentives to the industry for enhancing export orientation, especially in scenarios of price slumps, the Government, in consultation with the dairy industry, could consider increasing the rates under the RoDTEP for the dairy sector.

The Transport and Marketing Assistance (TMA) scheme was introduced in 2019, under which freight cost up to a specific limit were reimbursed by the Government of India to make agricultural products competitive in the global market. Dairy products were initially part of the exclusion list of the scheme. In September 2021, the Government announced the inclusion of dairy products under the TMA. However, in March 2022, the Government has decided to foreclose the scheme to revamp, redesign and refocus it for better outcomes. The revamped scheme needs speedy introduction and implementation as the freight prices have been on a rise, globally. The revamped scheme should also be made applicable for the dairy sector.

EXPORT POTENTIAL AND MARKET DIVERSIFICATION

India's share in world dairy export has been marginal, estimated at 0.3% during 2019, despite having a share of more than 20% in global production

of dairy products. Data from ITC Export Potential Map indicates that the dairy sector in India has an untapped export potential of US$ 165.6 million. Tapping this potential can nearly double dairy exports from India. Strengthening exports in areas of comparative advantage, building capacities in segments where the market penetration is low, and diversification of target markets, can further help increase the dairy exports.

Identification of Products

An analysis of India's dairy products at 6-digit HS code has been undertaken to segregate products which have a larger share in the world export as compared to the overall share of India's dairy export in world export. The objective is to identify products where India has adequate competence and has fared better in tapping the opportunities in the international market. These products would be the low hanging fruits for bolstering India's dairy exports.

Out of the 24 dairy products at 6-digit HS code level, there are 5 product categories where the share of India in global exports of that item is larger than the share of overall dairy exports from India in global dairy exports, i.e., 0.3%. Among these products, India has the largest share of 3.4% in global exports of fats and oils derived from milk, and dehydrated butter and ghee (excluding natural butter, recombined butter and whey butter) (HS 040590), followed by milk and cream in solid forms, of a fat content by weight of > 1.5%, sweetened (HS 040229) where India's share is 2.7% in world exports, and butter (excluding dehydrated butter and ghee) (HS 040510) where India has a share of 1.5% in world exports. The identified products would be important for enhancing exports from the country, in the short term. In the medium term, capacity building is needed in other areas where India's presence in the global market is currently limited.

Table 4.11: Products with Significant Share in Global Exports (2019)

HS Code	HS Description	India's Export (US$ Million)	Share in World Export	Top Exporting Countries for the Product (%)
040590	Fats and oils derived from milk, and dehydrated butter and ghee (excluding natural butter, recombined butter and whey butter)	81.1	3.4%	New Zealand (43.1%), The Netherlands (17.5%), Germany (6.1%), Belgium (5.3%), The UK (5%)
040229	Milk and cream in solid forms, of a fat content by weight of > 1,5%, sweetened	11.1	2.7%	New Zealand (13.2%), France (12.3%), The UK (8.8%), Australia (7%), The UAE (6.9%)
040510	Butter (excluding dehydrated butter and ghee)	108.2	1.5%	New Zealand (17.2%), Ireland (16.5%), The Netherlands (14.9%), Germany (8.5%), Belgium (7.6%)
350110	Casein	6.8	0.7%	New Zealand (34.7%), Ireland (30.7%), France (16.1%), Germany (4.6%), Ukraine (3.3%)
040630	Processed cheese, not grated or powdered	13.6	0.5%	Germany (15.2%), France (12.7%), Belgium (6.5%), Poland (6.1%), Austria (5.9%)

Source: ITC Trade Map, Exim Bank Research

Diversification of Markets

Analysis of the dairy exports indicates that the top 10 export destinations account for approximately 83% of India's dairy exports. For comparative assessment of the extent of market concentration, a Market Concentration Index (MCI) has been constructed for dairy exports and compared with the MCI for agricultural products and overall merchandise exports from the country.

The MCI index measures the degree of export market concentration by indicating if a large share of exports is accounted for by a small number of countries, or on the contrary, exports are well distributed among the export destinations. The MCI can be defined as a normalized Herfindahl-Hirschmann index of the market concentration of exports at the country-level. It is calculated as per the following formula:

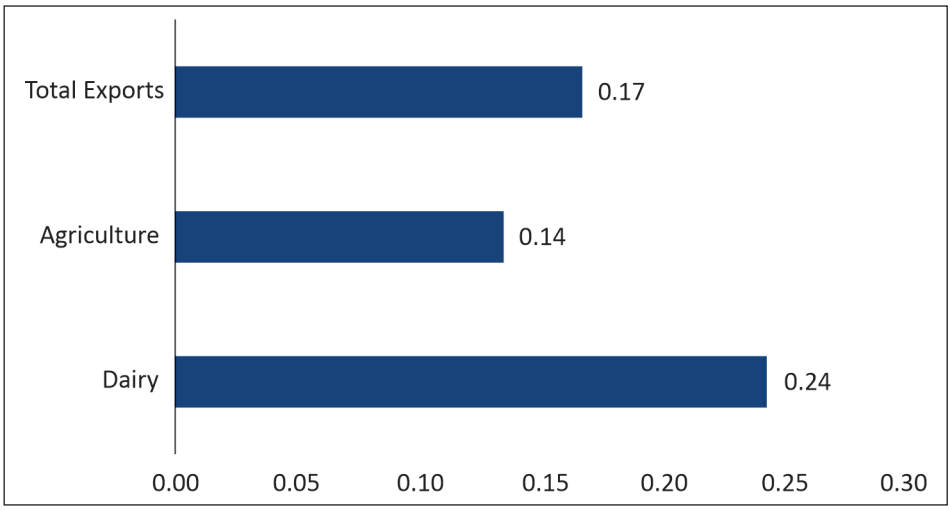
$$H_j = \frac{\sqrt{\sum_{i=1}^{N}\left(\frac{X_{i,j}}{X_j}\right)^2} - \sqrt{\frac{1}{N}}}{1 - \sqrt{\frac{1}{N}}}$$

Where, H_j is the market concentration index of the product from country j;
$X_{i,j}$ is the value of exports of the product from country j to country i;
X_j is the total value of exports of the product from country j;
and N is the total number of destinations for exports of the product from country j.

This index ranges from zero to one, with a larger value denoting a higher concentration in the export markets. A value of H_j equal to one indicates a single country is the market for all merchandise exports from country j, while a value of zero means that the exports are homogeneously distributed among all export destinations.

Analysis indicates that the market concentration index for the dairy sector was valued at 0.24, which is higher when compared to the MCI for the agricultural sector and overall exports from India. The MCI value for agricultural export was estimated at 0.14 and that for overall merchandise exports was estimated at 0.17. This indicates that the market for dairy exports is more concentrated as compared to the market for India's merchandise exports and agricultural exports.

Exhibit 4.9: Market Concentration Index for Dairy, Agriculture and Total Merchandise Exports (2019)



Source: ITC Trade Map, Exim Bank Research

Analysis of the MCI for the top 10 exported commodity from India at 6-digit level in the dairy sector indicates that in several products, India's exports were highly dependent on a few markets. In case of Casein (HS 350110), MCI value was as high as 0.70 (Table 4.12). The products with high market concentration would need an appropriate market diversification strategy.

Further analysis of the top exported dairy products which have an MCI of greater than 0.50 indicates that in all product categories, except Casein (HS 350110), the top 5 global importers do not feature among the top 5 export destinations for India. China, which is a major importer in most categories, does not feature among the top 5 export destinations for India in any of the product categories. There is need for market penetration strategies for the top importing markets.

Table 4.12: Market Concentration Index for Top 10 Dairy Products (2019)

Product	Product Description	Market Concentration Index
350110	Casein	0.70
040150	Butter (excluding dehydrated butter and ghee)	0.70
040229	Milk and cream in solid forms, of a fat content by weight of > 1,5%, sweetened	0.58
040510	Butter (excluding dehydrated butter and ghee)	0.55
040210	Milk and cream in solid forms, of a fat content by weight of <= 1,5%	0.52
040630	Processed cheese, not grated or powdered	0.38
040610	Fresh cheese “unripened or uncured cheese”, incl. whey cheese, and curd	0.36
040120	Milk and cream of a fat content by weight of > 1% but <= 6%, not concentrated nor containing added sugar or other sweetening matter	0.35
040690	Cheese (excluding fresh cheese, incl. whey cheese, curd, processed cheese, blue-veined cheese and other cheese containing veins produced by “Penicillium roqueforti”, and grated or powdered cheese)	0.29
040590	Fats and oils derived from milk, and dehydrated butter and ghee (excluding natural butter, recombined butter and whey butter)	0.25

Source: ITC Trade Map, Exim Bank Research

Table 4.13: Comparison of the Top Global Importers vis-à-vis Top Export Destinations in Top Exported Dairy Products from India with High Market Concentration (2020)

Product	Product Description	Global Import (US$ Billion)	Top 5 Global Importers	India's Export (US$ Million)	Top 5 Export Destinations for India
350110	Casein	1.1	The USA (28.7%), **Mexico (10.6%), Germany (6.6%), Poland (5.6%), China (4.4%)**	6.8	The USA (76.2%), Thailand (13.4%), Philippines (5.1%), South Korea (1.8%), Japan (1.1%)
040150	Butter (excluding dehydrated butter and ghee)	3.2	**China (16%), Belgium (13.4%), France (12.4%), Germany (11.7%), Italy (5.9%)**	3.1	Bhutan (76.8%), The UAE (17.7%), Nepal (2.5%), Singapore (1.5%), Brunei Darussalam (0.5%)
040229	Milk and cream in solid forms, of a fat content by weight of > 1,5%, sweetened	0.6	**China (12.3%), Saudi Arabia (9.4%), France (8.6%), Mauritania (7.7%), Australia (4.5%)**	11.1	Bhutan (62%), Nepal (35.4%), Afghanistan (1.5%), The UAE (1%), Iraq (neg)
040510	Butter (excluding dehydrated butter and ghee)	7.2	**France (12.4%), Germany (9.6%), The Netherlands (8.8%), Russia (7.7%), Belgium (6%)**	108.1	Turkey (59.5%), Egypt (18.5%), The UAE (5.9%), Morocco (5.8%), Bahrain (1.7%)
040210	Milk and cream in solid forms, of a fat content by weight of <= 1,5%	7.4	**China (11.7%), Mexico (10.7%), Indonesia (6%), Philippines (5.1%), The Netherlands (4%)**	17.3	Bangladesh (55.5%), Afghanistan (21.7%), The UAE (5.7%), Pakistan (5%), Turkey (3.2%)

Note: Products in bold are ones which do not feature among the top 5 markets for India's exports of the product
Source: ITC Trade Map, Exim Bank Research

CONCLUSION

Despite having the largest livestock herd and being the largest producer of milk, India's dairy exports have been sub-optimal. The sector is plagued with productivity issues, incidence of diseases, poor quality, high raw material costs, inadequate cold chain infrastructure, lack of processing facilities, low availability of credit, among other issues. In the export markets, the dairy sector of India also has to grapple with ever-increasing non-tariff barriers and competition from highly subsidized dairy sectors of other countries. The country has also failed to effectively leverage the free trade agreements to enhance market access.

While the sector faces these myriad challenges, it holds significant untapped export potential, estimated at US$ 165.6 million[88]. If this potential is realized, exports from the sector can be nearly doubled. With efficiency gains, government support, enabling infrastructure, quality improvements, technological innovations and greater processing facilities, dairy exports can be further increased.

The strategies in the Study provide a broad template for strengthening the dairy sector of India, encompassing measures for improving productivity, enhancing availability of feed and fodder, improving disease management, addressing the quality issues in milk, strengthening the capacity to meet the NTMs in import markets, price support and income support to the Indian dairy farmers, enhancing market access, strengthening the cold chain infrastructure for dairy, promoting traditional areas of competence such as buffalo milk and traditional milk products, greater technology penetration and commercialization of technologies in the sector, improving the availability of credit to dairy farmers, and creating economies of scale in dairy production through dairy export zones.

[88] ITC Export Potential Map

ANNEXURE 1

List of Indian Dairy Products Eligible for Concessional Treatment under Various Trade Agreements (2019)

S.No.	Countries Granting Concession to Indian Dairy Exports	Concession Granted	
		Products Eligible (HS Codes)	Nature of Concession
1	Laos	040390, 040510, 040520, 040590, 040620, 040640, 040690	These products are listed in Lao Republic's concession list under APTA and are offered a tariff reduction between 20% to 35%
2	Afghanistan	040140, 040150, 040210, 040291, 040299	These products are eligible for tariff concession as they are excluded from SAFTA sensitive list maintained by Afghanistan
3	Argentina	040210	Indian dairy exporters are eligible to get concessional tariff on export of 040210 to Argentina as they are a member of MERCOUR and this product comes under MERCOUR's offer list to India
4	Bangladesh	040310, 040390, 040490, 040610, 040620, 040630, 040640, 040690	These products are eligible for tariff concession as they are excluded from SAFTA sensitive list maintained by Bangladesh
5	Bhutan	040110, 040120, 040140, 040150, 040210, 040221, 040229, 040310, 040390, 040410, 040490, 040520, 040590, 040610, 040620, 040640, 040690, 210500	These products are eligible for tariff concession as they are excluded from SAFTA sensitive list maintained by Bhutan

S.No.	Countries Granting Concession to Indian Dairy Exports	Concession Granted	
		Products Eligible (HS Codes)	Nature of Concession
6	Brazil	040210	Indian dairy exporters are eligible to get concessional tariff on export of 040210 to Brazil as they are a member of MERCOUR and this product comes under MERCOUR's offer list to India
7	China	040210, 040221, 040520	These products are listed in China's Concession list under APTA and are offered a tariff reduction between 19% to 30%
8	Indonesia	040640	This dairy product from India is eligible for concessional tariff treatment of 3.75% to 4% from Indonesia as this is listed in concession list maintained by the country under India-ASEAN Agreement
9	Myanmar	040299	This dairy product from India is eligible for concessional tariff treatment of 3% from Myanmar as this is listed in concession list maintained by the country under India-ASEAN Agreement
10	Nepal	040110, 040120, 040140, 040150, 040310, 040390, 040410, 040490, 040610, 040620, 040630, 040640, 040690, 210500	Nepal grants tariff concession for these products as they are not listed under sensitive list of SAFTA. Additionally Nepal extends concession to milk and homemade products of milk under India-Nepal Treaty of Trade

S.No.	Countries Granting Concession to Indian Dairy Exports	Concession Granted	
		Products Eligible (HS Codes)	Nature of Concession
11	Pakistan	040210, 040110, 040120, 040140, 040150, 040291, 040310, 040390, 040520, 040620, 040640, 040690, 210500	20% concession is granted for 040210 under SAPTA while rest of the products are eligible for concession as they are excluded from SAFTA sensitive list maintained by Pakistan
12	Paraguay	040210	Indian dairy exporters are eligible to get concessional tariff on export of 040210 to Paraguay as they are a member of MERCOUR and this product comes under MERCOUR's offer list to India
13	Philippines	040310, 040630	These products from India are eligible for concessional tariff treatment of 5% from Philippines as they are listed in concession list maintained by the country under India-ASEAN Agreement
14	South Korea	040520	South Korea extends 10% concessional tariff on exports of this product from India under India-Korea CEPA
15	Sri Lanka	040620, 040630, 040640	These products are eligible for tariff concession as they are excluded from SAFTA sensitive list maintained by Sri Lanka
16	Thailand	040299, 040640	These products from India are eligible for concessional tariff treatment of 5% from Thailand as they are listed in concession list maintained by the country under India-ASEAN Agreement

S.No.	Countries Granting Concession to Indian Dairy Exports	Concession Granted	
		Products Eligible (HS Codes)	Nature of Concession
17	Uruguay	040210	Indian dairy exporters are eligible to get concessional tariff on export of 040210 to Uruguay as they are a member of MERCOUR and this product comes under MERCOUR's offer list to India
18	Vietnam	040110, 040120, 040130, 040210, 040221, 040229, 040510, 040520, 040590	These products from India are eligible for concessional tariff treatment of 7.5%-9% from Vietnam as they are listed in concession list maintained by the country under India-ASEAN Agreement

Source: Roadmap and Strategies to Promote Export of Dairy Products for the Organized Dairy Sector, IIFT

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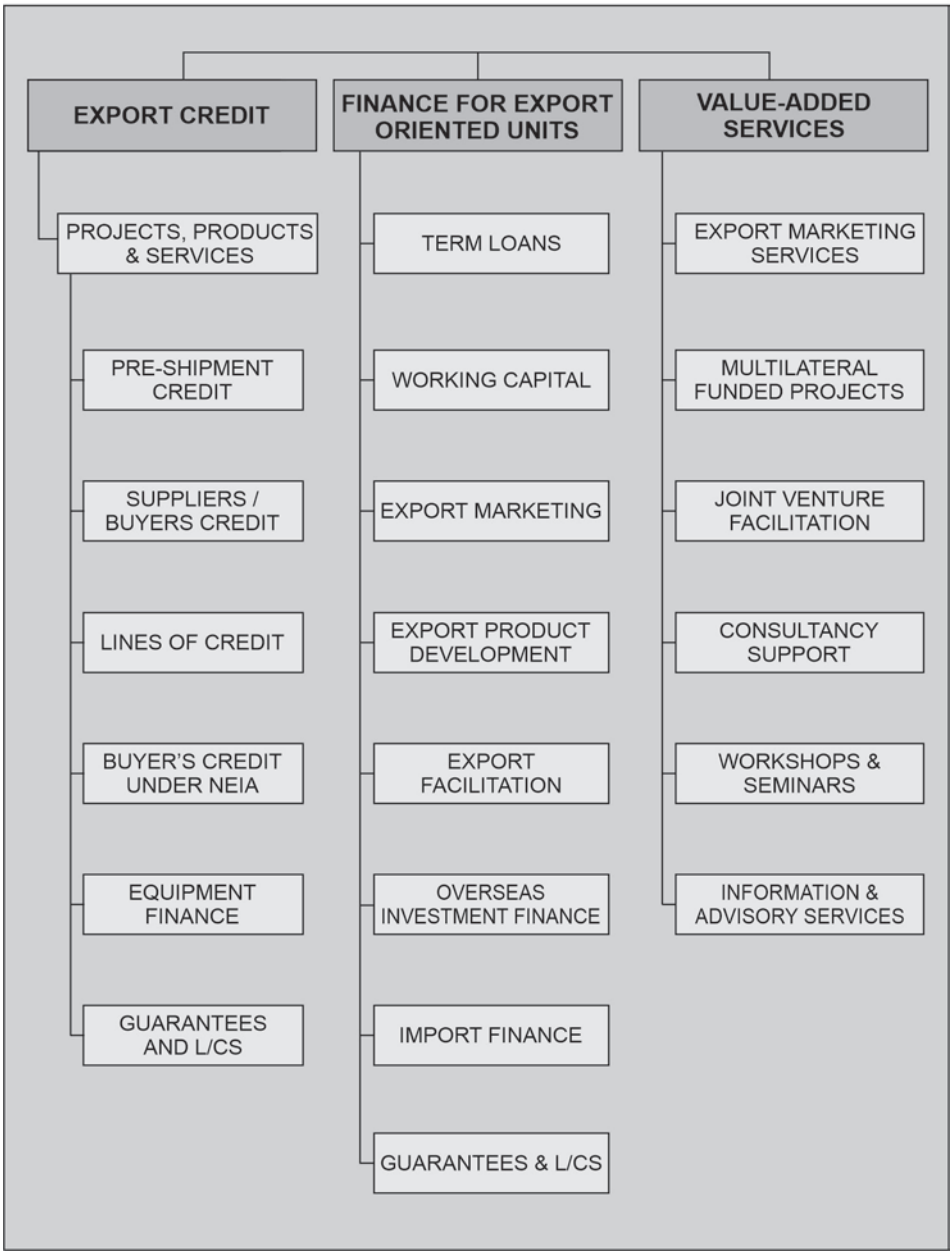

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