



Assessing snowball effect of COVID-19 pandemic on Indian dairy sector

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ABSTRACT

Dairy sector experienced supply setback as well as demand uncertainties owing to restrictive measures imposed for the control of COVID-19 pandemic. The present paper attempts to assess the multi-dimensional impact of pandemic on dairying by reviewing the emerging literature. The assessment shows that availability of feed and fodder declined by 11% during the initial months of lockdown making it the most affected supply chain. The dairy farmers incurred dual losses due to increase in cost of milk production (+6%) and simultaneous fall in milk prices (-5.6%). Major challenge for the dairy processors was posed by the fall in demand which declined steeply particularly for the ice-creams and milk based beverages. The estimated loss incurred by the dairy farmers is ₹4,000 per milch animal in the initial 40 days of lockdown which can further rise if losses due to missed artificial insemination and change in animal prices are also taken into account. Assessment of impact on the unorganized dairy sector is still unavailable without which the loss estimation from the perspective of milk buyers stands incomplete. Huge inventories of the Skimmed Milk Powder (SMP) are the immediate challenge which requires proper policy intervention for arresting further losses in the dairy sector.

Keywords: Cost, COVID-19, Dairying, Demand, Impact

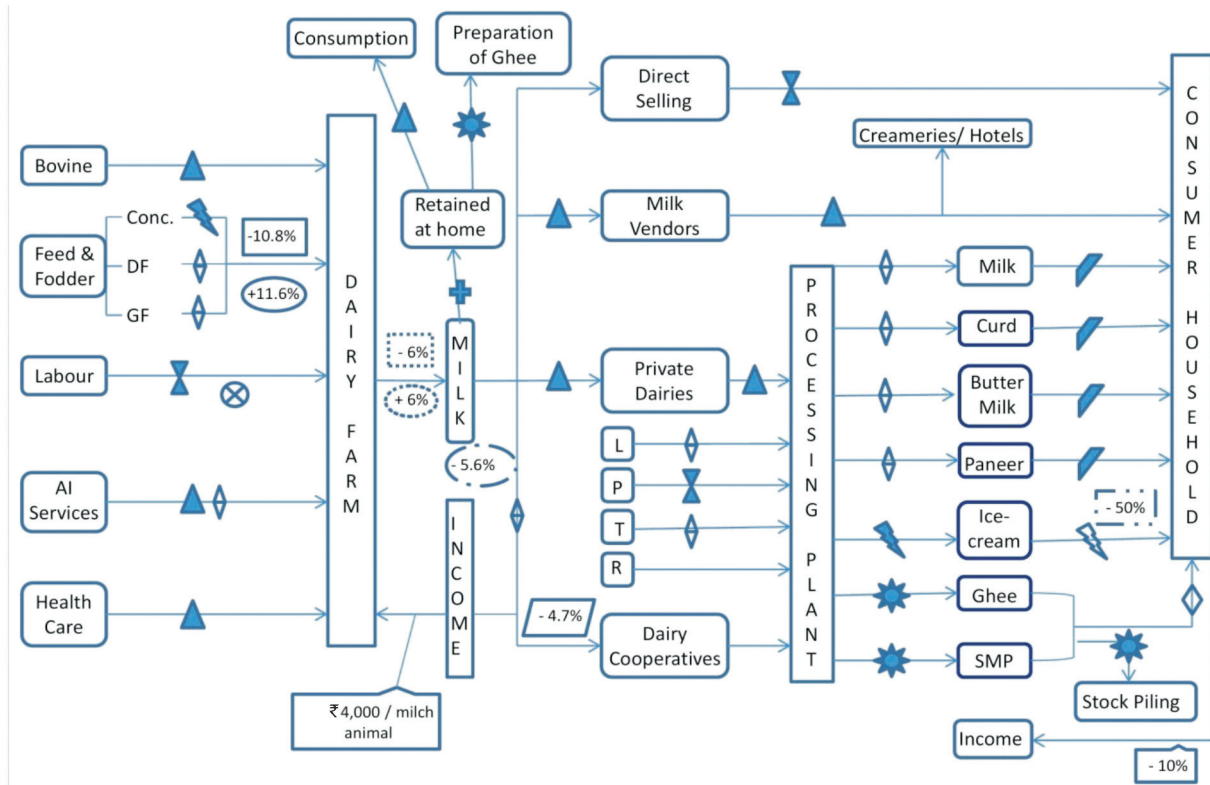
On January 30, 2020, the World Health organization (WHO) declared COVID-19 as a Public Health International Emergency. Even before the pandemic engulfed the world, the interlinkages between outbreaks of diseases/epidemics on livelihoods of affected societies were aplenty in literature. There is unquestionable evidence that diseases like tuberculosis, HIV/AIDS, malaria, and Ebola Virus Disease (EVD) have an adverse effect on livelihoods of individuals, households and communities (Cuddington 1993, Russel 2004, World Bank 2014, Korkoyah *et al.* 2015, Ansell *et al.* 2016, Gatiso *et al.* 2018). With an estimated 60% of the world population depending on agriculture for survival, the COVID-19 pandemic has been affecting different agricultural sectors including crop production and livestock (Lenzen *et al.* 2020, Siche 2020, Hussain *et al.* 2020). In India, agriculture and dairy has always been an important source of livelihood for millions of rural households. The impact of COVID-19 pandemic on both these sectors, and inadvertently, on the farmers, became evident while the country went into lockdown in March 2020. The logistic restrictions imposed in a lockdown pose a hinderance in the supply chains of agriculture and food sector, but in case of dairy where the commodities are highly

perishable, the sector can be expected to take a more severe hit.

For 22 years now, India has been the world leader in milk production. The country produced 198.4 million tonnes (MT) of milk (about 20% of world milk production) in 2019–20 (Economic Survey 2021). While India's milk production has been steadily increasing at the CAGR of 4.5%, the world's milk production has been increasing at the CAGR of 2% over the last two decades (Chairman, Gujarat Cooperative Milk Marketing Federation or GCMMF's Annual General Body Meeting 2019). Milk contributes more than 25% in the total value of output of the country's agriculture and allied sector.

Since milk production is a biological process, it continued at its own pace during and post lockdown due to COVID-19 pandemic. On one hand, the consumers displayed a tendency to hoard essentials such as milk in the form of SMP, while on the other hand the supply was severely hit by logistical challenges. The sale of liquid milk was especially impacted with the shutdown of schools, hotels, restaurants, and other such services that absorbed a large share of milk production. As the demand for liquid milk decreased, dairy farmers had little or no avenues to sell the milk or to convert it into dairy products. The mismatch between demand and supply of milk lead to fall in milk prices, directly impacting the livelihoods of dairy farmers throughout the country.

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▲ Literature not available; Level of decline in availability/ production: ✖ low, ◆ moderate, ▼ severe; Increase in availability/ production: ◆ moderate, ★ high; Change in sales: ▼ moderate decline, ▼ heavy decline, ◆ moderate increase; percentage change in availability □; ○ percentage change in prices, ⊗ no significant change in prices; □ change in income, □ percentage change in milk production, ○ percentage change in cost of milk production, □ percentage change in quantity of milk procurement, ○ percentage change in farm gate prices, □ percentage change in sales. Conc., Concentrate; DF, Dry fodder; GF, Green fodder; L, Labour; P, Packaging material; T, Transportation; R, Other raw materials

Fig. 1. Impact of COVID-19 pandemic on Indian dairy sector.

Many researchers in India and abroad have attempted to study the multidimensional damages of COVID-19 pandemic on the Indian dairy sector and to potentially outline ways to cushion the adverse effects in future. This review paper is an attempt to present comprehensively in one place all the work that has been done so far in this regard, and to identify the lacunas, if any, that need further investigation. This systematic literature review assessment considers all studies undertaken by researchers in India or abroad to assess the impacts of the pandemic on various aspects of dairy sector, viz. production, procurement, sales, prices, demand, supply and consumption in India.

Impact of COVID-19 pandemic on Indian dairy sector

A comprehensive picture of the impact of COVID-19 on Indian Dairy Sector is presented in Fig. 1 by summarizing the findings based on the review of selected studies which are further discussed in detail in the successive paragraphs.

Input supply and cost

Input supply chain was one of the components which were immediately affected by the imposition of lockdown. Feed and fodder accounts for approximately 60% of the total cost of milk production and it is the major input in dairy farming followed by labor and veterinary services.

Feed and fodder logistics across the country suffered greatly during the initial days of the lockdown owing to travel restrictions and halting of transport services. Even during normal period, India faces a net deficit of 35.6% green fodder, 10.95% dry crop residues and 44% concentrate feed ingredients (IGFRI 2013) and the breakdown of supply chain only aggravated this problem.

Issues regarding availability were more severe in the case of concentrate feed (Venkatesh *et al.* 2021) as the instant decline in its supply was reported to be as high as 40–50% (Chandel *et al.* 2020) in several places during the first phase of lockdown. Many cattle feed plants shut down temporarily either due to shortage of raw materials or labor (Umarji 2020, Biswal *et al.* 2020). As obvious, the inputs for which farmers’ dependency on market was more were the ones where major problems were encountered. Farm survey in Uttar Pradesh found that cost of all the major inputs required for milk production during lockdown was higher than the cost during same period in 2019 but the difference was more in the case of concentrate and green fodder (Kumar *et al.* 2021). Farmers in Haryana faced more severe issues in the availability of cattle feed (Bhandari and Ravishankar 2020). In Bengaluru rural and Chikkaballapura districts of Karnataka, prices of concentrate increased during lockdown but no such effect

was seen in the case of green and dry fodder (Thejesh 2021) while the comparative effect of lockdown was more in the case of dry fodder in the Kozhikode district of Kerala (Haritha 2021).

The average decline in the availability of fodder and cattle feed was 10.8%. Among the major milk producing states, significant decline in availability of fodder/ cattle feed was observed in the case of Gujarat (-15%), Haryana (-9.7%), Tamil Nadu (-9.2%), Andhra Pradesh (-7.5 %), Madhya Pradesh (-14.2%), Karnataka (-7.8%) and Bihar (-17.6%) due to which the prices of cattle feed and fodder increased by 9–12% in these states (Department of Economic Analysis and Research 2020). Increase in the prices of feed and fodder posed a new challenge for the farmers who were already struggling with lower milk prices.

Unlike the industrial sector, majority of the dairy farms did not face any serious issues regarding labour availability except few commercial dairy farms which suffered initially (Biswal *et al.* 2020) (Bhandari and Ravishankar 2020, Haritha 2021, Thejesh 2021) but gradually their problem was also resolved. Consequently, labour wages were also not affected significantly. Though, exact national estimates are unavailable but dairy farmers do faced issues in availing veterinary and artificial insemination services during the lockdown. Around 27% dairy farmers were unable to get AI services at the right time in the Kozhikode district of Kerala (Haritha 2021). Another study (Bhandari and Lal, 2020) used a small survey to estimate that dairy farmers might have failed to avail AI services for approximately 30% of the breedable female bovine which roughly accounts for a short term loss of ₹989 crore at the national level till the end of May, 2020 and a larger loss of around ₹6,000 crore in the longer run due to productivity loss.

The dairy processing sector didn't incur major losses due to disruption in the input supply chain barring shortage of packaging material for few days and increased transportation cost which affected their profitability to some extent. Few of them were able to gain from lower milk procurement prices while some others reported losses due to increased time lapse in moving raw milk tanks across inter-state borders (Chandel *et al.* 2020, Bhandari and Ravishankar 2020). Some processing units faced the problem of labour shortage (Biswal *et al.* 2020, Thejesh 2021).

Milk production

Chandel *et al.* (2020) in their study reported that milk production is expected to decrease due to non-availability of feed and fodder caused by lockdown restrictions. Sufficient scientific literature is yet not available regarding impact of COVID-19 on milk production but a survey (Department of Economic Analysis and Research 2020) estimates that milk production at all India level might have declined by 6% within one month of the lockdown primarily due to less availability of feed and lower milk prices. Thejesh (2021) reported a significant decline in milk yield (2–4%) of crossbred cattle in selected areas of Karnataka

during the lockdown and post lockdown period. No significant change was observed in the case of indigenous cattle and buffalo with respect to milk production. Based on telephonic survey of farmers from 28 districts, Venkatesh *et al.* (2021) estimated an increase of 6% in the total cost of milk production. This is in line with the value of 6.7% estimated by us on the basis of 11.6% increase in the price of feed and fodder reported by DEAR (2020).

Milk procurement and sales

Around 40% of milk in India is marketed through organised sector which is divided almost equally between cooperatives and private dairies. Rest 60% is still marketed through unorganized sector. The effect of lockdown on milk procurement varied across marketing channels and states but in general, milk procurement/sales declined initially in all the channels due to transportation issues and confusion over lockdown restrictions. Later on, lower procurement was mainly due to drop in demand due to closure of hotels, restaurants and cafeteria (HoReCa) which roughly consume 25% of the total marketable surplus.

Most of the private dairies and milk vendors reduced milk procurement from farmers as soon as the demand came down but majority of the cooperatives tried to procure same quantity of milk despite fall in sales (Rawal *et al.* 2020, Jena *et al.* 2021). The unorganized sector wasn't receptive and this led to increase in procurement of milk by the cooperatives. In fact GCMMF, Gujarat and MILKFED, Punjab increased milk procurement respectively by 15 and 25% immediately after lockdown for minimizing the losses faced by farmers due to reduced purchase by private milk buyers (Bera 2020, Chinna 2020). This led to surplus milk with the cooperative which was then converted into products having longer shelf life like milk powder, butter, ghee and sweets. Overtime, as the stocks started piling up, some of the cooperatives were forced to announce milk holidays due to limited infrastructure and storage facilities.

Overall, there was a steep decline in per day milk procurement (4.7%) by the cooperatives immediately after lockdown which then gradually stabilized at the lower level till May 31, 2020 (Fig. 2). Sales fell at a much faster rate than the procurement leading to surplus milk (Ramakumar *et al.* 2020). Around 72% of the total milk procurement was being sold before lockdown which fell down to 63% immediately after lockdown and then steadily rose back to the initial level by the end of May, 2020.

Only few cooperatives having large infrastructure like GCMMF continued procuring same quantity of milk despite fall in sales and converted surplus milk to Skimmed Milk Powder (SMP). The monthly trend in milk procurement remained same also for BAMUL and KOMUL, the milk unions affiliated to Nandini in Karnataka due to continuous government support. In fact, the quantity of milk sold by both the milk unions increased during the month of April, 2020 as the Government of Karnataka started procuring surplus milk from the milk unions for distributing it among the needy as a social welfare measure (Thejesh 2021).

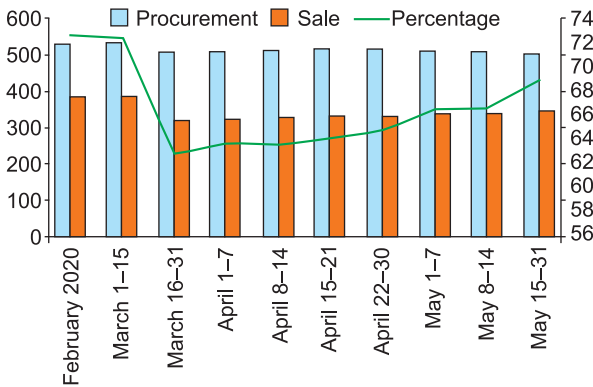


Fig. 2. Procurement and sale of liquid milk by dairy cooperatives (lakh litre per day). Note: Percentage denotes sales as a percentage of total procurement. Data Source: Ramakumar *et al.* 2020.

Contrary to this, milk procurement by Milma of Kerala declined during lockdown due to weakening of sales and high dependency of the plant on the facilities of neighboring states for converting milk into powder (Haritha 2021). Decline in milk procurement during lockdown was also recorded in the data collected by us from VITA milk unions in Haryana. Procurement of milk fell especially in the case of smaller cooperatives in several states, namely, West Bengal, Odisha, and Jharkhand (Biswal *et al.* 2020). A drastic reduction in the quantity of milk sold during lockdown was also observed in the case of Uttar Pradesh, the major milk producing state (Kumar *et al.* 2021).

Milk prices

Imposition of lockdown led to decreased sales and lesser milk procurement which ultimately affected the farm gate prices of milk. Even cooperatives which continued procuring same/increased quantity of milk also had to slash the procurement prices in some cases. Survey by Department of Economic Analysis and Research, 2020 reported an overall decline of 5.6% in the farm gate prices of milk in India. Uttar Pradesh which is the major milk producing state of the country saw a tremendous decline of 10% while Haryana which has good number of private dairy processing plants saw a dip of 10.7 per cent. Though, there was no significant change in the quantity of milk procured by milk unions in Karnataka but the procurement prices declined by 8–10% (Thejes 2021, DEAR 2020) Percentage reduction was comparatively low in the states of Gujarat (2.1%) and Punjab (2.7%) which have strong presence of cooperative network.

Dairy farmers selling milk to milk vendors experienced significant losses (Kumar *et al.* 2020). Milk prices fell even in the cases where farmers were selling milk directly to the consumer households as was revealed in our interaction with farmers in few areas of Maharashtra, Bihar and Kerala during May, 2020. Many consumers hesitated in purchasing milk directly from the farmers due to fear of COVID-19 and switched to packed milk due to which farmers supplying milk to these households were forced to reduce its price for

its disposal (Biswal *et al.* 2020). Similar findings were reported by Haritha (2021) who found that though the prices for the milk procured by cooperatives in Kozhikode district of Kerala remained stable but it fell by 8–10 per cent where milk was directly being supplied to consumer households.

Lockdown also affected wholesale and retail prices of milk but the effect was not significant (Cariappa *et al.* 2020, Ramakumar *et al.* 2020). Wholesale and retail prices of milk prevailing after a week of lockdown were respectively 1.3 and 0.6% more than the pre-lockdown prices.

Production and sale of processed dairy products

Most of the milk produced in India is sold as liquid milk and only one-fourth of that is converted into milk products (Ramakumar *et al.* 2020). Even in the formal sector, 65 to 70% of the total processed milk is sold as liquid milk which is immediately vended after packing and only 30% is processed into other dairy products like ghee, butter, cheese, curd, ice-cream, milk powder etc. Yet, value addition and production of dairy products having comparatively longer shelf life than liquid milk emerged as a popular strategy for disposal of surplus milk during lockdown. Most of the dairy farming households converted the surplus milk into ghee. Farm households all over the country have been traditionally preparing ghee at their home since ages so they have sufficient knowledge regarding its preparation but they faced problem in its storage as the quantity produced was more than usual.

Similarly, dairy processing plants also converted the excess milk into value added products like Skimmed Milk Powder (SMP), Ghee, Sweets, Ultra-Heat-Treated (UHT) milk and Butter. Our interaction with one of the SARAS dairy plants, Rajasthan in the month of May, 2020 revealed that while the production of packaged milk and curd has declined during lockdown it is the SMP and Ghee which has registered a significant increase. Similarly, per day SMP production during lockdown in one of the VITA dairy plant in Haryana was almost double of the quantity produced by them during the same period in 2019. NDDDB data show that the closing stock of skimmed milk powder increased from 67,792 tonnes as on the March 15, 2020, to 134,995 tonnes as on April 30, 2020 and 158,624 tonnes as on May 31, 2020 (Rath 2020).

Nevertheless, production of SMP from surplus milk reduced the risk of immediate losses but its stock piling emerged as a new concern for the processors. Prices of SMP in 2020 were already prevailing at 16–17% lower than the earlier year which added to their woes. Lower stocks from 2019 due to more exports were a sigh of relief for some extent. Prices of SMP recovered only in fourth quarter (Q4) of 2020 after recovery from the first COVID lockdown due to moderate demand revival, retrieval of global prices and comparatively lower milk production even in the flush season of 2020–21 but they again plummeted from ₹ 260–265 to ₹ 215–225 per kg after arrival of second wave in April, 2021 (Biswas 2021). Smaller dairies have started selling SMP stocks for meeting their financial obligations

which is further leading to collapse of prices (FE Bureau 2021). As the prices prevailing in the world market are lower than the manufacturing cost of SMP in India, most of the dairy cooperatives are now looking for export subsidies from the government for disposing excess milk powder stocks. Gujarat Government has recently announced a subsidy support of ₹50 per kg of SMP export with a ceiling of ₹150 crore extending from July 1, 2021 till December 31, 2021.

Sales of most of the dairy products declined after lockdown but the decline was very steep for ice-creams and milk based beverages. The sales of ice-cream which is one of the fastest growing dairy processing food industry fell by 50% in 2020 (Sampal 2020) and remained only one-third of its pre-COVID level in the year 2021 (Biswas 2021)¹. Few plants reported increased sales of Ghee and UHT milk particularly during the initial days of lockdown (Haritha 2021).

Household consumption

Contrary to the HoReCa sector, demand of dairy products in households soared initially due to panic buying but waned off in a few days (Shashidhar 2020). Milk remained accessible and available to the majority of population even during lockdown (Aneesh and Patil 2021). In one of our online pan-India survey covering 1000 households we found that there was a significant decline in the household consumption of milk, paneer, butter and ice-cream during lockdown whereas no significant change was observed in the consumption of ghee, curd and buttermilk. Consumption of ice-cream, curd and butter-milk didn't show an increasing pattern even with the arrival of summer season. The fall in demand was comparatively higher in the urban households, milk deficit zones and among the lowest income class. COVID-19 also affected the shopping behaviour of the consumers (Bhandari *et al.* 2020). Preference for packaged dairy products and online delivery services increased among the consumers (Modi 2021).

Income and profitability

Chandel *et al.* 2020 estimated that owing to COVID-19, Indian dairy sector will face loss equivalent to 3.5 percent of the total value of output per day from milk group and the amount of loss will be comparatively more in the western and central region of the country followed by northern region. Average loss incurred by dairy farmers on per milch animal basis is estimated to be Rs. 4,000 for the initial forty days of lockdown (Venkatesh *et al.* 2021) but this estimation is based only on the losses due to added cost, reduction in output and unsold milk. Accounting for losses due to missed artificial insemination, change in animal prices and additional cost incurred on precautionary measures can further escalate the loss estimates.

Besides dairy farmers, losses were also incurred by the processors mainly due to less sales and increased cost of operation. Though, exact data from all the processing plants is not available but Chandel *et al.* 2020 estimated that dairy

processors have incurred a total loss of 10% amounting to ₹ 464.15 crore due to three months lockdown in 2020. Turn-over of AMUL grew only by 2% in the FY 2020–21 as compared to the 17% growth recorded in the previous financial year 2019–20 (PTI 2021). Other smaller processing plants might have recorded even a negative growth, viz. gross income of MILMA plant in Kozhikode, Kerala which fell by 6% in 2020–21 mainly due to lower sales (Haritha 2021). Losses were also incurred by feed plants and semen stations due to reduction in quantum of production and sales (Kerala State Planning Board 2020).

Way forward

Though, still lot of work is required for correct quantitative estimation of the impact of COVID-19 on Indian dairy economy but it has already taught us some important lessons. The first and foremost step required for minimizing the impact of similar crisis on dairying is to ensure an uninterrupted supply of feed and fodder. Feed and fodder significantly affects the cost of production as well as the milk yield. Emphasis on increasing fodder availability is required irrespective of the pandemic. Promotion of silage, creation of fodder banks, dissemination of information regarding local substitutes for cattle feeds, use of wasteland for fodder production, etc. can help in mitigating this problem to some extent. Special plans should be designed for the central belt including states like Gujarat, Madhya Pradesh, Chhattisgarh, Jharkhand, Bihar and West Bengal which experienced relatively more shortage of feed and fodder during the pandemic.

The demand of value-added dairy products is continuously increasing in the country and the pandemic has also slightly shifted the preference of consumers towards packaged products. Thus, expansion of processing infrastructure and storage facilities will help to meet this increasing demand along with acting as a back-up for similar crisis where demand for liquid milk experiences a sudden jolt. Setting up of Animal Husbandry Infrastructure Development Fund followed by Dairy Investment Accelerator is a positive step by Government of India in this direction. An advisory created well in advance for managing such pandemics can further help in avoiding the multiple confusions arising out of miscommunications at the last moment. The relaxations on activities related to both input (feed, AI, labour supply) and output dairy supply chain (milk procurement and sales) should be explicitly mentioned in the advisory for avoiding the interruptions particularly in the state borders. Strengthening of alternative marketing channels like e-marketing and doorstep delivery can help in arresting the drop in demand for dairy products to some extent. For immediate relief, government may also procure some amount of surplus milk and arrange for distributing it among the needy and deprived as was done by few states during the lockdown. It is also necessary to relax the credit regulations during such crisis for enabling the stakeholders to deal with the liquidity problem.

As of now, huge inventories of Skimmed Milk Powder

(SMP) and fat (ghee) are the most important challenge in front of the Indian dairy sector. Export subsidies can help in the short run but cost of production of SMP will have to be minimized for making it globally competitive in the long run. Bilateral free trade agreements with neighboring countries are also important for promoting export of milk and milk products (MMP) including SMP. The domestic demand of SMP may be increased by making it part of the government's welfare programmes like public distribution system, mid-day meals, free ration (Pradhan Mantri Garib Kalyan Ann Yojana), etc. and preparing products out of it.

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