

“Chapter-4”

INNOVATIVE PROCUREMENT PRACTICES INCREASES THE PRODUCTIVITY: INDIAN DAIRY INDUSTRIES

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Abstract:

In dairy industry farmer is an important part, irrespective of any country he belongs to. India is the major milk producing nation in the globe with 18% involvement. In the world most of the population depends on dairy industry for their livelihood, about quarter of the population in the world involve in producing and buying of milk and their products. It is essential for the Indian Dairy Industry to assist the growing customer demand with satisfactory supply of milk. Procurement of milk and their products is very important to fulfil the growing demands of customers. Procurement is an act of gaining or obtaining goods and services. The process contains preparation and processing of a demand along with the end receipt and approval of payment. Procurement is mainly depending on technology and innovations. Present study mainly focused on the innovative practices for the procurement of milk in Indian dairy industry. These four practises and recommendations are very helpful to increase the productivity of milk in India.

1. Introduction:

Since 1998, India is one of the major manufacturers and buyer of dairy products with a continuous development in the accessibility of milk and their products. Dairy farming and other actions play an important role in the rural Indian economy by providing employment. India has the major illiterate population in the world, although the making of milk each animal is considerably low in comparison with other dairy producers.

In India all the dairy produce is consumed by its own population and rest they sell in the form of fluid milk. Dairy industry plays a crucial role for the upliftment of Indian economy (Mangla et.al., 2019 b; Singh, et. al.,2019).

Through dairy industries many people get employment thus helping in the poverty improvement in the rural areas of India. Regarding this, the Indian dairy industry is proving to be a possible for value-addition and complete development of the country (Yawar, and Kauppi, 2018; Ishrat, et. al., 2018). India is one of most populated country with 1.30 billion populations, with most of the population depending on dairy products like milk, curd, cheese, sweets etc. For meeting demands for the dairy products industry is fully reliant on raw material i.e., milk, which is a perishable with wide cyclic fluctuations (Ciarli, et. al., 2018; Ali, et. al., 2019). Now, the question arises from where and how to collect milk to meet the daily needs of the population or what factors influence milk procurement (Lehtinen, 2012). As India is one of the largest milk producer but still there is huge gap between demand and supply. If this gap is crammed by improving milk supply chain, it would directly enhance the economy of our country (Kamath, et. al., 2019). Improving the supply of milk, sustainability is very important throughout the whole supply chain. To deal with these universal challenges, the concept of “sustainability” has an impact on the milk supply and dairy sector, as it emphasizes upon the feeding of resources in a most effective way (WCED, 1987). According to Indian government economic survey 2015-2016, India claims nearly 146.3 million tonnes of yearly milk production.

In the current research attempt had been made to investigate about the innovative procurement practices to increase the productivity of Indian dairy industries (Rijswijk, and Brazendale, 2017; Glover, 2019).

Milk procurement is done by using latest technologies and innovations in dairy industry like Cattle Health: The milk production from animals is directly dependent on their wellbeing (Burkitbayeva, 2019). So, it is very important to track the health of cows or buffalos for good production of milk. This can be done with the use of smart watches which are easily available in the market. These watches continuously monitor pulse rate and other signs in the animals for the examination of their health. Irregularities in milk production: Bluetooth Low Energy (BLE) and Radio Frequency Identification (RFID) technologies are used for tracking cows. All the animals are given a unique identification number by organizations to track animal's health and milk production (Gupta, 2017; Gargiulo, et. al., 2018; Sharma et.al., 2019 c) Also, milk production depends on the food which animals eat, affecting the taste and quality of

milk. The feed is the important factor in the milk production and constitutes major cost in the dairy's operation. Thus, the quality of feed should be good to ensure greater yield both in quantity and quality of milk (Hall, et. al., 2019).

Based on the newly published report by IMARC Group, titled “**Dairy Industry in India 2019 Edition: Market Size, Growth, Prices, Segments, Cooperatives, Private Dairies, Procurement and Distribution**” the dairy marketplace in India has got a worth of INR 9,168 Billion in 2018.

2. Motivation and aims

In India, per capita availability of milk is less than other countries in the world and a very low lucrative milk procurement to dairy farmers are the main objectives of this study. In India most of the milk is wasted due to lack of awareness, technologies, policies and cold chain (Sharma et.al., 2018 a; Sharma et.al., 2018 b). So, in the current work more stress is given to the procurement of milk by innovative practices in dairy supply chain to increase its productivity. This will help in establishing or making new policies and plans for the successful execution and to improve dairy sector in India.

3. Literature Review

In this literature review, focus is mainly on the three key factors i.e., dairy supply chain and food, its functioning problems affecting milk production and input cost i.e. grounded on milk procurement price. Approximately 80% of the milk is produced by villagers and is handled by unstructured sector and the rest of 20 % is handled by structured sector (Rajendran and Mohanty 2004). (Eastwood, et al., 2016; Rijswijk and Brazendale, 2017; Eastwood, et al., 2018) highlights the numerous issues which is faced by dairy farmers. The two-axis gaining pricing process does not reflect the making cost of milk when payment is credited to farmers account (Saravanakumar et al., 2009). Mor, et al., (2019 b); mainly focused on the Critical Factors of Dairy Supply Chain. Prasad, and Kumari, (2016) giving attention towards rethinking Cooperatives for Sustainable Development: Meganathan et al., (2010); Kumar et al., (2012); suggested that the main concern for the milk producers are profitless price for the cattle goods. Sharma et. al., (2018a); Sharma et. al., (2018b); Mangla et. al., (2019 a); mostly focused on the sustainability implementation in food supply chain. Läßle, and Thorne (2019) investigates that how innovation impacts economic sustainability is an important step in attaining a more sustainable production development of the dairy sector. Soteriades, et. al.,

(2016) found that the environmental 'sustainability' of concentrated dairy farming depends on farming systems and situations. Kulandaiswamy, (1982) recommended cost-based obtaining value process. Thus, to fix the cost of input which is rather unstable is an important step. According to Subburaj, et. al., (2015); D'Haene, et. al., (2019) milk procurement prices should be remain fixed on the basis of cost of production of milk, cyclic variations and overall market movements.

Based on the literature review current work mainly focused on the innovative procurement practises/policies in Indian dairy industries to increases their productivity and enhance the economy of India (Sharma, 2015; Eastwood, et. al., 2016; Asayehegn, et. al., 2019).

4. Innovative practises in Indian dairy industry:

India is the major manufacturer along with major buyer of milk or dairy products in the world. Middle class population in India is increased rapidly, so it will never face a shortage of milk or milk products (Mangla et.al., 2016; Kumar, and Mohan, 2018; Sharma et.al., 2019). The NDP-I (National dairy plan phase-I) a central sector scheme of the government of India, which is supported by National Dairy Support Project (NDSP). The objective of the organization is to increase the milk productivity and market access to the farmers to full fill the growing demands. The (NDDB) National Dairy Development Board is the chief executing agency for the NDP-I. These organizations mainly focused on the following milk procurement practices in Indian dairy market for their upliftment.

4.1 Supply chain consolidation for village-based milk procurement

In India presently near about 16 million milk fabricators are available who are candidates of about 150,000 village dairy cooperatives. As milk is a highly unpreserved item, any mistake in the supply chain may spoil the whole milk before reaching the processing plants. It is very important for the maintained proper hygiene while bringing milk to collection centres (Subburaj, et. al., 2015).

To address the above challenges, the NDSP financed EIAs' purchase and installation of **bulk milk chillers (BMC)** at village milk collection points, which generate savings in transportation, operations, handling and processing costs. For streamlining milk collection and testing for quality of the milk supplied, EIAs also purchased standardized **Automated Milk Collection Units (AMCU)** and **Data Processor-based Milk Collection Units (DPMCU)** at collection centres along with associated IT systems. Adulteration testing kits

were also supplied. These EIAs also procured **Milk Cans** and provided them to producers to ensure hygiene while bringing milk to collection centres. The NDSP also encouraged formation of new village-level cooperatives to bring new producers to supply the milk. Since the mid-point of the project's implementation period, 23,487 villages have been covered and 660,935 additional milk producers have organized

4.2 Framework Agreements for Decentralized Procurement of equipment

In India about 150 EIAs are working in 18 different states which requires some standard items frequently (for example, Bulk Milk Cooling Unit). To overcome the issue of purchasing, delaying in placing the order and delaying in the releasing of payments. Government proposed Framework Agreements (FA) for such items. Use of FA has not only resulted in accelerating procurement process but also in monetary saving up to 15% in many cases.

4.3 Procurement error and quality assurance

Government hired the services of a trustworthy check-up agency for quality checking of items procured by FA arrangements. A quality assurance plan (QAP) was developed for each item to minimize the scope of absence in quality and inspections started right from the manufacturing stage of equipment.

Besides from rectification and detection of defects in items by the supplier, these proactive measures resulted in cancellation of FA of some suppliers, who were unable to maintain required quality standards. A web-based procurement management information system (MIS) was developed to help in monitoring and utilization on the overall progress on decentralized procurement. The MIS also helped EIAs in sharing data among each other.

5. Endorsements

There are many suggestions for the policy makers and higher authorities based on current effort, carried out on procurement in Indian dairy sector.

- Formation of special dairy zone.
- Self-motivated milk procurement method implementation.
- Cooperative societies establishment.
- Construction of feed bank and growing feed productivity.

5.1 Formation of special dairy zone

As we all know that the demand of milk is going to be increases day by day, so to fulfil the demands, improve the milk production and dairy products a (SDZ) special dairy zone should be formed. SDZ method is very significant in terms to increase the production and distribution of milk. If the surplus milk is produced it can be exported and will contribute to foreign exchange.

5.2 Implementation of self-motivated milk procurement method

The two-axis theory explains that the cost of milk is formulated by fixing a pre-determined amount for fat and solids-not-fat. In the current system fat and SNF are usually given equal price and per kg. price for fat and SNF are fixed. This method is normally used for milk procurement, but this method is not capable for giving proper payment to milk manufacturers in India. Production cost is not considered in this method.

The milk procurement price might be reviewed 10% each year, because a dairy agronomist devotes nearly 60% of entire working cost to fodder alone. The fodder price spontaneously increases by 5% in half yearly. The complete milk making rate as well as rises from 10 percent to 10.50 percent each year. This will allow steady financial profit to dairy agronomists.

5.3 Establishment of co-operative societies.

The milk co-operative society should make clear rules as it provides the link between producers and buyers of milk. Co-operative societies are not profit groups. The chief goal of co-operative society is to fulfil the desires of makers and buyers. If the members of co-operative societies are chosen by dairy agronomists, the probabilities of loss become less. Definite gaining is thinkable during the year (Prasad, et. al.,2016)

5.4 Construction of feed bank and growing feed productivity.

The key purpose of feed bank is “feed to all cattle”, cattle feed card may be discretely distributed only to the (DCS) Dairy Co-operative Society’s driving associates.

The remains of food grains, concerted feed should be distributed to members of DCS continuously in subsidized rates. Thus, the cost of milk production can be reduced for the farmers who are dependent on market for procuring feed. In this study it was observed that

farmers want an additional official support for growing feed and deliver it to milk producers through DCS. Using this technique, the cost price of feed can be decreased.

Importance should be given to fodder cultivation and the farmers should be appreciated for the cultivation of fodder through cluster farming. Also, water and farming land should be endangered from exploitation. Combined projects between co-operative societies and village panchayat in feed farming may affect and provides backing to powerless dairy agriculturalists.

6. Conclusion:

The current work is projected to fulfil the gap for the procurement of milk in Indian dairy industry by implementing innovative practices. In addition to this, present work provides recommendations to decision makers for the successful procurement of milk. It is noted that 75% of perishable food is wasted due to the negligence of sellers. The outcome of the chapter is that the procurement of milk in daily supply can be increased by the adoption of innovative practices. The procurement practices are highly affected by irregular wastage and poor handling of milk at the site as well as source (Mor et.al.,2018 b; Mor, et.al., 2019 a;). More wastage is happened due to multiple collection points and unhygienic practices. These hurdles further force Indian dairy industry for substantial development in their procurement system (Mor et.al.,2018 a; Mor, et.al., 2019 b; Mangla et.al., 2019 a). However, adaption of newer technologies will help in the improvement of productivity. According to dairy minister in India, dairy sector in India raised at a rate of 6.4 % annually in the last four years against the global growth rate 1.7 % and the aim is to improve milk productivity per animal. Minister also draw attention towards technology adaption under Rashtriya Gokul Mission such as embryo transfer technology, creation of facility for sex sorted semen production and genomics selection, would help to improve the productivity. Additionally, tackling of milk adulteration is a key factor for the procurement of milk at the village level, for that NPDD (National Programme for Dairy Development) is a main agency that can maintain the trust among the farmers as well as customers. In addition, to many studies were found that in dairy industry, lack of refrigeration and defective power supply is a main source of food wastage, for that implementation of innovative refrigeration technologies to reduce spoilage and improve milk quality. Apart from confirming consumption of safe milk, established laboratories in dairy plants would help to encourage export. India books for only 0.01 % of the worldwide dairy export market. The dairy sector is trying to build their long-term sustainable growth. Existing financial models calculate the increased costs for the dairy

sector will be handled by escalating overseas market access in combination with value addition during technical revolution across the supply chain.

It is intended that the organization must change their traditional dairy practices to supply chain. For attaining sustainability in dairy supply chain, it is compulsory to minimize the waste at all levels of supply chain like packaging, transportation, processing, storage and distribution of processed milk products.

For sustainable dairy industry focus should be mainly on new farm practices which improve sustainability. There must be research for refining the facility of the farm to contract with milk from a transformed milk supply (Augustin, et. al., 2013). Also, the technological innovations, automatic milk testing, effective collection centre, traceability in transportation and quality issues, and the implementation of information technology system effectively can help the dairy sector to achieve their long runs goals. Therefore, the proposed innovative practices in dairy industry will help dairy experts to plan their procurement practices competently to fulfil the product quality and their sustainability.

7. Limitations & Future Scope:

The findings of the present work depend on the support of academicians and policy makers from the dairy industry. The projected innovative techniques can be useful to other milk procuring and processing firms across the India and other countries also. However, the proposed innovative techniques may be implemented to other perishable food processing industries.

Acknowledgement: The authors acknowledge and express the gratitude for the support of the research facilities and funds provided by the Department of Mechanical Engineering, Graphic Era (Deemed to be) University, Dehradun, India.

References:

1. Ali, S. M., Moktadir, M. A., Kabir, G., Chakma, J., Rumi, M. J. U., & Islam, M. T. (2019). Framework for evaluating risks in food supply chain: Implications in food wastage reduction. *Journal of Cleaner Production*, 228, 786-800.
2. Asayehegn, K., Temple, L., Vaast, P., & Iglesias, A. (2019). Innovation systems to adapt to climate change: Lessons from the Kenyan coffee and dairy sectors. *Handbook of Climate Change Resilience*, 1-24.

3. Augustin, M. A., Udabage, P., Juliano, P., & Clarke, P. T. (2013). Towards a more sustainable dairy industry: Integration across the farm–factory interface and the dairy factory of the future. *International Dairy Journal*, *31*(1), 2-11.
4. Burkitbayeva, S., Janssen, E., & Swinnen, J. (2019). Technology Adoption and Value Chains in Developing Countries: Panel Evidence from Dairy in Punjab. *LICOS Discussion paper series*, 1-51.
5. Ciarli, T., Savona, M., Thorpe, J., & Ayele, S. (2018). Innovation for inclusive structural change. A Framework and Research Agenda. *A Framework and Research Agenda (January 23, 2018)*. SWPS, 4.
6. D'Haene, E., Desiere, S., D'Haese, M., Verbeke, W., & Schoors, K. (2019). Religion, food choices, and demand seasonality: Evidence from the Ethiopian milk market. *Foods*, *8*(5), 167.
7. Eastwood, C. R., Greer, J., Schmidt, D., Muir, J., & Sargeant, K. (2018). Identifying current challenges and research priorities to guide the design of more attractive dairy - farm workplaces in New Zealand. *Animal Production Science*.
8. Eastwood, C. R., Jago, J. G., Edwards, J. P., & Burke, J. K. (2016). Getting the most out of advanced farm management technologies: roles of technology suppliers and dairy industry organisations in supporting precision dairy farmers. *Animal Production Science*, *56*(10), 1752-1760.
9. Gargiulo, J. I., Eastwood, C. R., Garcia, S. C., & Lyons, N. A. (2018). Dairy farmers with larger herd sizes adopt more precision dairy technologies. *Journal of Dairy Science*, *101*(6), 5466-5473.
10. Glover, D., & Poole, N. (2019). Principles of innovation to build nutrition -sensitive food systems in South Asia. *Food Policy*, *82*, 63-73.
11. Gupta, S. (2017). Dairy Industries in India: Technological Implementation and Challenges. *Journal of HR, Organizational Behaviour & Entrepreneurship Development*, *1*(2), 1-7.
12. Hall, A., Turner, L., & Kilpatrick, S. (2019). Using the theory of planned behaviour framework to understand Tasmanian dairy farmer engagement with extension activities to inform future delivery. *The Journal of Agricultural Education and Extension*, *25*(3), 195-210.
13. Ishrat, S. I., Grigg, N. P., Jayamaha, N., & Pulakanam, V. (2018). Cashmere Industry: Value Chains and Sustainability. In *Sustainability in Luxury Fashion Business* (pp. 113-132). Springer, Singapore.

14. Kamath, V., Biju, S., & Kamath, G. (2019). A Participatory Systems Mapping (PSM) based approach towards analysis of business sustainability of rural Indian milk dairies. *Cogent Economics & Finance*, (just-accepted), 1622172.
15. Kulandaiawamy, V. (1982). *Cooperative Dairying in India*, Rainbow Publication, First Edition, Chapter IV, pp.125-145
16. Kumar, D., & Mohan, A. (2018). Factors Leading to Customer Satisfaction in Dairy Industry: A Study in Indian Perspective. *International Journal on Customer Relations*, 6(1).
17. Laple, D., & Thorne, F. (2019). The Role of Innovation in Farm Economic Sustainability: Generalised Propensity Score Evidence from Irish Dairy Farms. *Journal of agricultural economics*, 70(1), 178-197.
18. Lehtinen, U. (2012). Sustainability and local food procurement: a case study of Finnish public catering. *British Food Journal*, 114(8), 1053-1071.
19. Mangla, S. K., Luthra, S., Jakhar, S. K., Kumar, A., & Rana, N. P. (2019a). *Sustainable Procurement in Supply Chain Operations*. CRC Press.
20. Mangla, S. K., Sharma, Y. K., Patil, P. P., Yadav, G., & Xu, J. (2019b). Logistics and distribution challenges to managing operations for corporate sustainability: Study on leading Indian dairy organizations. *Journal of Cleaner Production*, 117620.
21. Mangla, S. K., Y. K. Sharma, and P. P. Patil. "Using AHP to rank the critical success factors in food supply chain management." *Int. Conf. on Smart Strategies for Digital World-Industrial Engineering Perspective*. Vol. 58. 2016.
22. Meganathan, N., Selvakumar, K. N., Prabu, M., Pandian, A. S. S., & Kumar, G. S. (2010). Constraint analysis of tribal livestock farming in Tamil Nadu. *Tamilnadu Journal of Veterinary and Animal Sciences*, 6(1), 12-18.
23. Mor, R. S., Bhardwaj, A., & Singh, S. (2018 a). Benchmarking the interactions among Performance Indicators in dairy supply chain: An ISM approach. *Benchmarking: An International Journal*, 25(9), 3858-3881.
24. Mor, R. S., Bhardwaj, A., Singh, S., & Kharub, M. (2019 a). 3 Framework for Measuring the Procurement Performance in the Dairy Supply Chain. *Sustainable Procurement in Supply Chain Operations*, 61.
25. Mor, R. S., Bhardwaj, A., Singh, S., & Nema, P. K. (2019 b). Framework for Measuring the Performance of Production Operations in the Dairy Industry. In *Managing Operations Throughout Global Supply Chains* (pp. 20-49). IGI Global.

26. Mor, R. S., Singh, S., & Bhardwaj, A. (2018 b). Exploring the causes of Low-Productivity in Dairy Supply Chain using AHP. *Jurnal Teknik Industri*, 19(2), 83-92.
27. Prasad, C. S., & Kumari, J. (2016). Rethinking Cooperatives for Sustainable Development: Insights from Vasudhara Dairy and Dharani Organic cooperatives. In *11th ICAAP cooperative research conference, New Delhi." Cooperatives and Sustainable Development. http://www.ica-ap.coop/sites/ica-ap.coop/files/Shambu_Prasad India. PDF*.
28. Prasad, C. S., & Kumari, J. (2016). Rethinking Cooperatives for Sustainable Development: Insights from Vasudhara Dairy and Dharani Organic cooperatives. In *11th ICAAP cooperative research conference, New Delhi." Cooperatives and Sustainable Development. http://www.ica-ap.coop/sites/ica-ap.coop/files/Shambu_Prasad India. PDF*.
29. Rajendran, K., & Mohanty, S. (2004). Dairy co-operatives and milk marketing in India: Constraints and opportunities. *Journal of Food Distribution Research*, 35(856-2016-56967), 34-41.
30. Rijswijk, K., & Brazendale, R. (2017). Innovation networks to stimulate public and private sector collaboration for advisory services innovation and coordination: the case of pasture performance issues in the New Zealand dairy industry. *The Journal of Agricultural Education and Extension*, 23(3), 245-263.
31. Saravanakumar, V., & Jain, D. K. (2009). Evolving milk pricing model for agribusiness centres: an econometric approach. *Agricultural Economics Research Review*, 22(347-2016-16735), 155-160.
32. Sharma, V. P. (2015). Determinants of Small Milk Producers' Participation in Organized Dairy Value Chains: Evidence from India. *Agricultural Economics Research Review*, 28(347-2016-17180), 247-261.
33. Sharma, Y. K., Mangla, S. K., Patil, P. P., & Liu, S. (2019). When challenges impede the process: for circular economy-driven sustainability practices in food supply chain. *Management Decision*, 57(4), 995-1017.
34. Sharma, Y. K., Mangla, S. K., Patil, P. P., & Uniyal, S. (2018 a). Analyzing Sustainable Food Supply Chain Management Challenges in India. In *Soft Computing Techniques and Applications in Mechanical Engineering* (pp. 162-180). IGI Global.
35. Sharma, Y. K., Mangla, S. K., Patil, P. P., & Uniyal, S. (2018 b). Sustainable Food Supply Chain Management Implementation Using DEMATEL Approach. In *Advances in Health and Environment Safety* (pp. 115-125). Springer, Singapore.

36. Sharma, Y. K., Mangla, S. K., Patil, P. P., Yadav, A. K., Jakhar, S. K., & Luthra, S. (2018 c). Ranking the IT Based Technologies to Enhance the Safety and Security of Food Using AHP Approach. *Mathematics Applied in Information Systems*, 2, 108-122.
37. Singh, R. K., Luthra, S., Mangla, S. K., &Uniyal, S. (2019). Applications of information and communication technology for sustainable growth of SMEs in India food industry. *Resources, Conservation and Recycling*, 147, 10-18.
38. Sinha, M. K., Dhaka, J. P., & Meena, M. S. (2012). Milk production economics and micro financing impacts in Chhotanagpurplateau of Jharkhand.
39. Soteriades, A. D., Stott, A. W., Moreau, S., Charroin, T., Blanchard, M., Liu, J., &Faverdin, P. (2016). The relationship of dairy farm eco-efficiency with intensification and self-sufficiency. Evidence from the French dairy sector using life cycle analysis, data envelopment analysis and partial least squares structural equation modelling. *PloS one*, 11(11), e0166445.
40. Subburaj, M., Babu, T. R., &Subramonian, B. S. (2015). A study on strengthening the operational efficiency of dairy supply Chain in Tamilnadu, India. *Procedia-Social and Behavioral Sciences*, 189, 285-291.
41. WCED. (1987). Our Common Future: Report of the World Commission on Environment and Development.
42. Yawar, S. A., & Kauppi, K. (2018). Understanding the adoption of socially responsible supplier development practices using institutional theory: Dairy supply chains in India. *Journal of Purchasing and Supply Management*, 24(2), 164-176.