

Available online at [www.sciencedirect.com](http://www.sciencedirect.com)**ScienceDirect**

Procedia - Social and Behavioral Sciences 189 (2015) 285 – 291

**Procedia**  
Social and Behavioral Sciences

XVIII Annual International Conference of the Society of Operations Management (SOM-14)

## A Study on Strengthening the Operational Efficiency of Dairy Supply Chain in Tamilnadu, India

M.Subburaj<sup>a\*</sup>, T.Ramesh Babu<sup>b</sup>, B.Suresh Subramonian<sup>a,b,\*</sup><sup>a\*</sup> Associate Professor / Mechanical Engg. Anand Institute of Higher Technology, Chennai -603103, India<sup>b</sup>Professor, Department of Industrial Engineering, Anna University, Chennai-600025, India<sup>a,b,\*</sup>Professor, College of Food & Dairy Technology, Chennai-600052, India

### Abstract

The main objective of this paper is to study the issues in improving the operational efficiency of the dairy supply chain in Tamil Nadu, India. Dairy Farming is a major occupation of the people of Tamil Nadu, India and it contributes a significant amount to the growth of our country. In this paper, Tamil Nadu dairy development department's objectives and its three-tier structure were studied. Through SWOT analysis its strengths, weaknesses, opportunities and threats were analyzed. In our study Tamil Nadu Cooperative Milk Producers Federation is compared with Gujarat Cooperative Milk Producers Federation (AMUL). The major issues influencing the dairy farming are studied through literature survey, field study and researchers experience. They are presented in this paper. There were three major important field studies conducted at various time periods. The data has been collected through a questionnaire method and these interactions were recorded by a video camera. Based on the research work carried out on dairy supply chain in Tamil Nadu, India, some key recommendations are made for the attention of policy makers to strengthen the operational efficiency. There are five areas of focus. They are, creation of special dairy zone, implementing dynamic milk procurement method, strengthening cooperative societies, creation of feed bank and increasing fodder productivity, integrated animal health plan and information technology.

*Keywords:* Dairy farmer's issues; Dairy supply chain; Co-operative system; Milk procurement price.

\*Corresponding author. Tel.: 09840210907; E-mail address: [subburaj.aiht@gmail.com](mailto:subburaj.aiht@gmail.com).

© 2015 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Peer-review under responsibility of the scientific committee of XVIII Annual International Conference of the Society of Operations Management (SOM-14).

### 1. Introduction

Dairying plays a significant role in strengthen rural economy in Tamil Nadu. It has brought about socio-economic transformation in Tamil Nadu. Small farmers, marginal farmers and downtrodden constitute majority of milk producers. Dairying has vast potential to generate employment and has helped in poverty

alleviation in the rural belt. The milk producers in the state, in the co-operative sector on an average get daily income of Rs.396.20 lakhs for the milk they pour to the dairy societies, which indicate the importance of this sector in the rural economy. Though India is a largest milk producer in the world, there is a huge demand and supply gap. Tamil Nadu is one of the frontline states in milk production and ranks as number one in the country in the coverage of more than 50% of revenue villages under co-operative ambit. There are 9231 functional primary milk societies with 22.60 lakh members (Policy Note, Dept. of Dairy, 2011-12). Even a small improvement in the milk supply chain will make a large impact on rural economy of our country. Hence, an attempt has been made as part of this research work to study the issues involved in improving the operational efficiency of dairy supply chain. The current study is limited to Tamil Nadu state.

## **2. Motivation and objectives**

The lack of per capita availability of milk in Tamil Nadu compared to some selected states in India and a less remunerative milk procurement price to dairy farmers are the major motivations to conduct this research work. As far as per capita milk availability is concerned Gujarat is 36% ahead of Tamil Nadu ([www.nddb.com](http://www.nddb.com)). This is a wakeup call to frame an appropriate strategies and systematic execution to strength dairy supply chain in Tamil Nadu.

## **3. Review of literature**

The literatures were reviewed in the following three major heads such as food and dairy supply chain and its operational issues, factors influencing milk production and input cost based milk procurement price. Rajendran and Mohanty (2004) indicated that 80 percent of the milk produced by the rural producer was handled by unorganized sector and the remaining 20 percent was handled by organized sector. Patil et al. (2009), Gautam et al. (2010), Patil (2009), and Chand et al. (2010) were highlighted the various issues faced by dairy farmers. Studies conducted by Kumar et al. (2012) and Meganathan et al. (2010) recorded that the major constraint among the milk producers were unremunerative price for the livestock products. The existing two axes procurement pricing method does not consider the production cost (Saravanakumar et al. 2009). Raut and Singh (1979), Patel (1975), and Pundir (1996) have concluded that the cost of milk production, seasonal variations and general market trends should be considered when fixing the milk procurement price. Kulandaiswamy (1982) suggested input cost-based procurement price method. Therefore, it is important to fix the price based on input cost, which is dynamic. By considering this, the present study has been conducted to suggest Dynamic Milk Procurement Price (DPP) model based on input cost.

## **4. Tamil Nadu cooperative milk producers federation's supply chains network**

Tamil Nadu Cooperative Milk Producers Federation's (TNCMPF) supply chain network, as all other agri businesses, is complex. Technically, the dairy chain starts at raw milk production and ends when other processors, institutions and consumers utilize products that were created in the value chain. The dairy supply chain includes four echelons, namely individual milk producers, village co-operative societies (with and without chilling centers), milk processing union and warehouses, and dairy federation and warehouses.

The village cooperatives, private dairies, and government dairies are called organized sectors. They procure milk, process and market the milk and milk products. In this supply chain network, the producers deposit milk in the village cooperative societies, after the local consumption, the remaining is sent to nearby chilling centres. In Tamil Nadu totally 36 chilling centres are there. Their total installed capacity is 13.5 lakh litres per day (LLPD). In the chilling centres the bulk milk is cooled to 4°C. Then it is filled in tankers and transported to the dairy units. In the dairies, the milk is processed into various categories such as liquid milk and milk products. The packaged milk is sent to milk parlours/ retail stores, where consumers buy it. The value added products transported to the distribution centres from where it reaches the consumers through retailers.

The strength, weakness, opportunities and threats of TNCMPF are given below.

STRENGTHS: Traditional farming community, Anand Model, i.e., “three tier structure”, no major complaints about the quality of milk and milk products, good supply chain network.

- WEAKNESSES: Co-operatives are run by government officials, not elected representatives (at the time of data collection), Lack of E-initiatives, such as, “KIOSKS”, GIS, lack of implementation of modern quality management tools, such as TQM, KAIZEN
- OPPORTUNITIES: Vast market for milk and milk products, milk is an essential commodity with a constant demand from the customer; International market is open, availability of human resources.
- THREATS: Urbanisation, deterioration of graze land held by farmers, migration of farmers’ community, increasing cost of feeding to cattle, eradication of water resources (pond, lake), no guaranteed year round remuneration to milk producers, growth of unorganised sector, the presence of middleman in milk marketing, exploiting the advantage of producers’ vulnerability/ weakness.

#### 4.1 Comparison of Tamil Nadu and Gujarat states dairy chain.

Gujarat Cooperative Milk Producers Federation (GCMPF) is one of the best performing dairy supply chain in India. In our study TNCMPF is compared with GCMPF (AMUL) shown in table 4.1.

#### 5. Data collection

Tamil Nadu has seven agro-climatic zones. Out of seven, two zones (high rainfall zone, hill zone) are exclusive in nature. So they have been excluded from the survey. The present survey was carried out in five zones with one district representing each zone. They are Viruthunagar for south zone, Theni for western zone, Perambalur for Cauvery delta zone, Salem for north western zone and Kanchipuram for north-eastern zone. Each survey was conducted at various time periods as shown in Table 5.1.

**Table 4.1 Comparison of Tamil Nadu and Gujarat States Dairy Chain.**

Items	Particulars		Performance of TN over Gujarat
	TAMILNADU	GUJARAT	
Population	7,21, 38,958	6,03,83,628	+ 16.3 %
Per capita availability(grams/day)	278	435	- 36 %
Total no. of functional milk producers co-op societies	10,691	16,117	- 33.66 %
Total no. of members in milk producers co-op societies (lakhs)	22.26	31.8	- 30%
No. of district unions	17	17	---
Milk procurement by unions on	21 o 25	106 (average)	- 80%

seasonal average (in LLPD)		130 (peak season)	
<b>Milk handling capacity (in LLPD)</b>	30.72	136.7	- 7.52%
<b>Milk production (000 tonnes)</b>	6831	9321	- 26.71 %
<b>Total cows &amp; buffaloes (in thousands)</b>	5911	7655	- 22.78%
<b>Areas of fodder crops (2008-09); (000 ha)</b>	173	901	- 80.79 %
<b>Permanent pastures and other grazing land. (2008-09); (000 ha)</b>	110	853	- 87.10%
<b>Number of Veterinary Institutions (As on 31-3-2011)</b>	3197	1207	+ 62.22 %
<b>State farm and other infrastructures (as on 31-3-2011)</b>	6014	6598	- 8.85%

**Table 5.1 Period of study.**

Name of the Study	Districts	Period
Identifying major constraints among dairy farmers and suggesting appropriate remedial policies.	Theni (Western zone); Viruthunagar (Southern zone); Perambalur (Cauvery delta zone);	November 2010 - April 2011
Factors influencing dairy supply chain's sourcing	Kanchipuram (North eastern zone); Salem (North western zone)	February 2011 - April 2011
Dynamic milk procurement price method.		November 2011 - April 2012

### 5.1 Major observations

The value chain of milk is deprived of minimum resources of land, labour, water resources, and capital. Because of urbanisation sources of labour for dairy sector is decreasing. The major challenges before dairy industry are animal health (low productivity of dairy animals, lack of availability of nutrient balanced cattle feed), growth of unorganized sector (reducing the decision making power of the milk pouring members), water source (encroaching farm land, low rain fall, environmental factors), infrastructure (lack of cold chain, lack of medical facility), and urbanization (deterioration of agricultural land, decreasing the size of graze land, labour shortages). These challenges are deteriorating the milk production. The major constraints among the dairy farmers

are increasing the milk production cost and inadequate milk procurement price, Subburaj et al. (2011). Out of 125 sample respondents in the survey 96% of the farmers answered high milk production cost is the major constraints. Low milk procurement price is the next challenge.

### 5.2 *Dynamic milk procurement price*

There is no guaranteed year round remuneration to farmers, which is discouraging them to involve in dairy production. The presence of middleman in the milk marketing is exploiting producers' vulnerability / weakness. Since middlemen have given an advance loan to the milk producers, they dictate the price of the milk. Minimum shelf life of milk also limits the bargaining power of milk producers. Inadequate infrastructure for transportation, distribution and warehousing / cold storage makes milk procurement difficult. Presently the procurement price is fixed based on fat and solid non-fat content of milk which is known as two-axis method. The existing method does not consider the production cost. The production cost is highly influenced by fuel price and dynamic market condition. The milk production cost is a dynamic one. The input costs involved in milk production are: cattle cost, interest on capital, feed cost (dry fodder, green fodder, concentrate), labour cost, milking cost, land rent cost, electricity and water cost. So, the milk procurement price must be fixed based on the input cost.

## 6. Recommendations

Based on the research work carried out on dairy supply chain in Tamil Nadu, India, the following recommendations are made for the attention of policy makers. These are five areas of focus. They are,

- (i) Creation of special dairy zone.
- (ii) Implementing dynamic milk procurement method.
- (iii) Strengthening cooperative societies.
- (iv) Creation of feed bank and increasing fodder productivity.
- (v) Integrated animal health plan and information technology.

### 6.1 *Creation of Special Dairy Zone*

In order to meet the milk demand, a Special dairy zone (SDZ) should be created. SDZ approach will improve the production to meet the demand of milk by 2020-21. The increase of urbanized middle class and spending significant amount on milk and milk products increases the demand for dairy products. The industry like SDZ approach will be one of the alternatives to maximize production and distribution. The surplus milk export will contribute to foreign exchange.

### 6.2 *dynamic milk procurement price policy*

Though the two-axis milk procurement method is rational, it does not give appropriate remuneration to milk producers in Tamil Nadu. The existing method does not consider the production cost. A dairy farmer spends around 60% of total operating cost to feed alone. The feed cost linearly increases 5% for every six month. The total milk production cost also increases from 10% to 10.50% every year. So, the milk procurement price may be revised 10% every year. This will ensure consistent monetary benefit to dairy farmers.

### 6.3 *Strengthening Co-operative Society*

The milk co-operative society should be strengthened further because it has good association and direct contact between the milk producers and consumers. The cooperative societies are not profit organization. Its main objective is welfare of producers and consumers. If the co-operative societies are supervised by the dairy farmers' elected representatives, the chances of underperformance will be minimum. Guaranteed procurement is possible throughout the year.

### 6.4 *Creation of Feed Bank and Increasing Fodder Productivity*

The main objective of feed bank must be "feed to all cattle", cattle feed card may be separately issued only to the Dairy Co-operative Society's (DCS) pouring members. In Tamil Nadu universal public distribution

system (PDS) is implemented through 33,222 fair price shops. Tamil Nadu civil supplies corporation is procuring food grains from farmers and converts them into rice and other value-added products through its own rice mills and through private units. The total food grains production in Tamil Nadu is 430.47 lakhs metric tons during 2010-11. The concentrated feed, residues of food grains, may be distributed, to DCS milk pouring members, through this existing PDS network with subsidized rate. This will reduce the milk production cost to farmers who purchase feed from open market. (<http://www.tn.gov.in/policynotes/pdf/food.pdf/03-1-2013>).

During the interview, it has been observed that the farmers expect an institutional support to grow fodder and supply it to milk pourers through DCS. This new method may reduce the feed cost significantly. DCS should give first priority to fodder cultivation. DCS can identify farmers to cultivate fodder through “cluster farming”, and marketing through women self-help groups (SHG). Poramboke lands vested with local bodies and forest area can be utilized for fodder cultivation to overcome dry and green fodder insufficiency. Water and agricultural land should be protected from encroachment. Joint venture between village panchayat and co-operative societies in fodder cultivation may give support to landless dairy farmers.

### 6.5 Integrated Animal Health Plan and IT

Creation of integrated animal health plan to strengthen veterinary services, artificial insemination centers, cattle insurance, etc. will give confidence to dairy farmers about their profession. Implementation of Information Technology and its tool, strengthening milk marketing infrastructure, setting up of dairy-based factories, which will convert milk into its value-added dairy products in national and international markets are possible ways for improvement. The drivers of supply chain both in upstream and downstream will be geared by professional management of these factories. This will create enough employment opportunity in which younger generation will also be attracted to dairy business on a large scale.

## 7. Conclusion

The Tamil Nadu Cooperative Milk Producer Federations supply chain network was studied. The dairy farmers' issues were observed through data collection. Based on the research outcome some key recommendations were presented to improve the operational efficiency of dairy supply chain in Tamil Nadu, India. Laying a roadmap for implementing the recommendations are the scope for future work.

### References

- Chand Sukumar., Saraiya Anesh., and Sridhar, V. (2010). Public private partnership in Indian dairy industry, Initiating White Revolution-II, *CII and Technopak Publication*.
- Gautam., Dalal, R.S. and Pathak, V. (2010). India dairy sector: time to revisit operation flood, *Livestock Science*, 127, 164-175.
- Kulandaiaiwamy, V. (1982). Cooperative Dairying in India, *Rainbow Publication*, First Edition, Chapter IV, pp.125-145.
- Kumar Sinha Mukesh, Dhaka, J. P. and Meena, M. S. (2012). Milk production economics and micro financing impacts in Chhota Nagpur Plateau of Jharkhand, *Indian Journal of Animal Sciences*, Vol. 82, No.7, pp.757-761,
- Meganathan, N., Selvakumar, K.N., Prabhu M. Serma Saravan Pandian, A. and Senthilkumar, G. (2010). Constraint analysis of tribal livestock farming in TamilNadu, *Journal of Veterinary and Animal Sciences*, Vol. 6, No.1 pp. 12-18.
- Patel, R.K. (1975). Sound basis of pricing Milk, *Indian Dairyman*, Vol.36, No.1, pp.1-7.
- Patil Vijay Gorakh. (2009). The constraints faced by the dairy farmers and milk co-operative societies, financing agriculture, *A National Journal of Agriculture and Rural Development*, pp. 24-27, May-June.
- Patil, A.P., Gawande, S.H., Nande, M.P. and Gobade, M.R. (2009). Constraints by the dairy farmers in Nagpur district while adopting animal management practices, *Veterinary World*, Vol.2, No.3, pp.111-112.
- Pundir, R.S. (1996). Cost and price determination models for milk. PhD Thesis, *National Dairy Research Institute, Karnal*.

Rajendran, K. and Mohanty, Samarendu.(2004). Dairy co-operatives and milk marketing in India: constraints and opportunities, *Journal of Food Distribution Research*, Vol 35, No. 2, pp.34-41.

Raut, K.C. and Singh, S. (1979). A system of continuous milk costing by balancing interest of both producers and consumers, *Indian Dairyman*, Vol.31, No. 9, pp. 635-639.

Saravanakumar, V. and Jain, D.K. (2009). Evolving milk pricing model for agribusiness centre: An econometric approach, *Agricultural Economics Research Review*, Vol.22, pp. 155-160.

Subburaj, M., Ramesh Babu, T. and Gladstone, E. (2010). A Study on Milk Supply Chain of TamiNadu Cooperative Dairy Industry, *ORSI 2010- ORURD*, Thiyagarajar college of Engineering; Madurai, India, 15-17<sup>th</sup> December.

Subburaj, M., Ramesh Babu, T., Gladstone, E. and Suresh Subramonian, B.(2011). Factors influencing Dairy Supply Chain's Sourcing in Tamilnadu, India," *ICASCMM*, IIT-Kharagpur.