IMPACT OF TECHNOLOGICAL ADVANCEMENT IN COOPERATIVE DAIRY SECTOR ON VARIOUS GROPUS OF PARTCIPANTS INVOLVED IN THE MILK PROCUREMENT SUPPLY CHAIN FOR BMCU(BULK MILK CHILLER UNIT) AND CAN SYATEM. – A STUDY WITH SPECIAL REFERENCE TO GUJARAT, INDIA.

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Abstract:

The Indian dairy industry is contributing significantly to the country's economy, besides improving the health standard by increasing the nutritional value of the food. India occupies first position in the world having a total bovine population of 288 million compared to the world's total bovine population of 1420 million. As per 1992 livestock census, the country has about 62.90 million breedable cows and 42.46 million breedable buffaloes. There has been a major improvement in milk production which increased from 17 million tonnes in 1951 to 100 million tonnes in 2006. Uttar Pradesh, Punjab, Madhya Pradesh, Rajasthan, Maharashtra, Gujarat, Andhra Pradesh, Haryana, Tamil Nadu and Bihar contributed to the extent of 85% of the total milk production in the country. Today, India is number one producer of milk in the world. The present per capita availability of milk is 212 gm as against the ICMR recommendation of 250 gm.

Having made a significant stride in production and processing, our country is topping the globe as the highest milk producer. Now it is the time to upgrade the quality of milk in similar way to provide hygienically safe milk and milk products to the consumers. The sole criterion for determining quality should no longer be FAT/SNF but bacteriological quality of the milk, which is possible only by proper handling of milk from the udder of the animal to the super market shelf. Since the ambient temperature in our country is as high as 45oC, improvement of raw milk quality is possible only by careful milking conditions and its prompt cooling to 4oC or below.

The best alternative to the present collection system of milk is cooling of milk immediately after milking by Bulk Cooling Tanks. The usage of such tanks has become popular in the recent past because it not only helps in increasing the shelf-life of milk but also provides systematic and simple way of the procurement of milk. It also ensures procurement of more milk by covering untapped farther areas for milk collection.

Introduction

In recent years, Indian dairy industry has witnessed various R&D initiatives. Government federations as well as companies are working upon increasing the productivity in the sector. Recently, Amul has planned to sell fluid milk through “Any Time Milk” vending machines. The pilot project of this 24x7 ATM began recently with the installation of a vending machine at the gate of Amul Dairy at Anand in Gujarat. Other innovations like the new technology of whey based lassi are a conventional method of concentration, drying and membrane processing. With regular new product developments and technological advancements in the processing, Indian dairy sector is set to follow a stupendous growth in the coming years.

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As per the latest Draft Codex International Code of Hygienic Practice for Milk and Milk Products from Codex Secretariat, if the milk is not processed within two hours of milking, it is required to be cooled to a temperature below 7oC. Therefore, the dairies that have to market their milk and milk products in international market will have to comply with the Codex International Code of Hygienic Practice and cold chain will become a must for them. The initial capital investment will pay back in the long run, as the system will eliminate the use of milk cans, milk sourage, reduction in transportation cost, better return etc.The milk collection system at DCS under the Anand Pattern is quite simple in design as it is meant for rural folks. Even today when any new dairy organization decides to start milk procurement, it has to think about this user friendly system in a simple form as explained above. However, during the last 25 years several new technologies have been developed/adopted which have simplified various operations/steps in involved in milk collection, testing and cooling apart from bringingefficiency and reliability. These have been tested over time and can be regarded as dependable. But, these technologies require larger capital investment, recurring costs, and good service back-up and can become affordable for a dairy organization with a product mix that gives value addition.

Problems in the Conventional System

1.Quality control was a major problem that confronted the cooperatives. The National Dairy Development Board (NDDB) worked to reduce quality variations among sellers by upgrading the technology of milk production by improving cattle feed and the milk processing and delivery infrastructure.

2. Fair and efficient markets do not occur by accident, but are created. Thus, the cooperatives had difficulties to ensure accuracy in measuring quantity and fat content of milk and in making fair payments to the farmers.
3. Before automation, the farmer was paid only every 10 days. Therefore, even though at times he or she delivered milk each day the farmer was not sure of the reliability of the manual calculations of quality and quantity by cooperative society staff.
4. Milk for testing was stored in plastic bottles and tested only after the milk collection process was over. This led to unhygienic conditions and fear of contamination at the center.

For this project we collected primary data from the DCS of Sabarkantha Region. It covers 100 Dairy Co-operative Societies working in Sabarkantha Region. 27 among 100 DCS having Bulk Milk Cooler at their DCS. Survey includes talukas like Himatnagar, Khedbramha, Prantij, Idar,Vadali, Bhiloda, Vijaynagar, Shamlaji, Malpur, Modasa, Meghraj, Bayad and Dhansura. For milk collection, weighing, testing, payment, storage, and transportation activities done DCS in milk procurement and distribution. After using PC based automatic milk collection system at DCS improve the process of collection by reduce time of collection. It dame speedy working system. Also, it provide accurate weighing of milk at DCS. So, it credit confidence milk procurement at DCS toward. By adopting technological advancement testing of milk for Fat and SNF becomeaccurate. Payment system also becomes efficient by using technological advancement in milk procurement.

The establishment BMCU at DCS for storage of milk is the biggest discovery, which changes whole face of milk procurement and distribution system at DCS. It improve milk quality, reduce cost of milk procurement at long term, flexibility in milk transportation for collecting milk from DCS. By establishing BMCU at DCS, reduce the rate of sour milk and curd milk. BMCU are most profitable for the DCS and dairy union both, Sabar Dairy pays 20 paisa/litter to DCS for BMCU operation expenditure as chilling charge. Sabar Dairy provides financial and technical help to the DCS for Technological advancement in milk procurement and distribution process. The technological advancement in the milk procurement distribution at DCS welcomed by the DCS members. Technological advancement in milk procurement and distribution system is profitable, less time consuming. It make procurement

and distribution system efficient and effective. Sabar Dairy is behind establishment of BMCU at DCS compare with other dairy union in North Gujarat. DCS needs financial and technical helps from the district milk co-operative union. Milk price should be fixe on the bases of Fat + SNF + Microbial Quality of milk. Technological advancement in milk procurement and distribution improve quality of milk. Also, upliftment in DCS operation due to technological advancement is welcomed by the DCS members. They also need to adopt new technology at DCS. BMCU establishment at DCS affect social condition of milk producers because it give time flexibility for milk selling time at DCS.

Theoretical Framework

Social Capital in Service Network and Technological Advancement

Social capital is about creation of a set of resources through value exchange (Bourdieu, 1986). The Theory of Social Capital has been widely used in marketing discipline to describe the outcomes such as value creation, value delivery (Lindgreen and Wynstra, 2005; Baxter and Matear, 2004), organizational effectiveness (Batjargal, 2003), and stakeholder relationship potency (Nahapiet and Ghoshal, 1998). It also helps in understanding network growth (Batt, 2008). According to Ostrom (2000), social capital is "the platform of the sharing understandings, rules, norms, knowledge, and expectations about patterns of interactions that groups or individuals bring to a recurrent activity" (p. 176). Social capital has also been defined as the connections among individuals through social networks which follow norms of reciprocity and trustworthiness (Putnam, 2000). Networks and its relationships are considered a significant instrument in value exchange in social capital. Most commonly used definition of social capital is "the aggregate of resources embedded within, available through, and derived from the network of relationships possessed by an individual or organization" (Inkpen and Tsang 2005, p. 151). The dimensions of social capital are structural (social interaction), cognitive (shared values), and relational (identification-based trust) (Tsai and Ghoshal, 1998). To reduce asymmetry among the network members, it is necessary to have social interaction between all parties. Moreover, social interaction also reduces chances of opportunism (Wang et al., 2013) among network members. As per the second dimension of social capital, perceived fair intention and desire of each network member determines the level of trust among network members (Zaheer et al., 1998). In addition, goal congruency and shared value among network members also increase the chances of success in network relationship (Wuyts and Geyskens 2005; Jap and Anderson 2003). The present study tries to understand the role played by trust, commitment, co-operation and density in exchange outcome.

TECHNOLOGICAL ADVANCES

The milk collection system at DCS under the Anand Pattern is quite simple in design as it is meant for rural folks. Even today when any new dairy organization decides to start milk procurement, it has to think about this user friendly system in a simple form as explained above. However, during the last 25 years several new technologies have been developed/adopted which have simplified various operations/steps in involved in milk collection, testing and cooling apart from bringing efficiency and reliability. These have been tested over time and can be regarded as dependable. But, these technologies require larger capital investment, recurring costs, and good service back-up and can become affordable for a dairy organization with a product mix that gives value addition. Some technologies, which can be directly applied, are mentioned bellow:

- Electronic Milk Tester
- The Micro-Processor-Based Milk Collection System
- Electronic SNF Tester
- Ultrasonic ANF Tester
- Portable Milk Analyzer
- Electronic Weighing Scales
- Automatic Milk Collection Unit

- Row Milk Reception Dock (RMRD) Automation System
- Bulk Milk Cooling Tanks / Bulk Milk Chiller Unit (BMCU)
- Instrumentation for Quality Control Analysis
- Animal Database Management System (ADMS)
- Data Processor Milk Collection Unit (DP-MCU)
- Automatic Milk Collection Unit (AMCU)
- Automated Raw Milk Reception Dock
- Enterprise Resource Planning
- Geographical Information System (GIS)
- Village Self-Leadership Improvement Programmed(VSLIP)

Study Set-Up

Anand Milk Union Limited (AMUL), the first dairy cooperative, was established in 1946 in India to address the problems of milk distribution and pricing of milk for milk producers. Today, it has become one of the most trusted brands. At present it is managed by Gujarat Co-operative Milk Marketing Federation (GCMMF). Popularized as *White Revolution*, the co-operative model of AMUL has been replicated all over India. Amul has made significant changes in milk collection and distribution in country (Bellur et al., 1990). The Amul model, set-up to delegate the various functions and services to milk producers, is a four-tier cooperative structure. 1. The village dairy cooperative society (VDCS) operates at village level and is affiliated to the 2. District level milk producers' union. Milk Producers' Union in turn is further connected to 3. milk federation at the state level. 4. Customer. The village dairy cooperative society procures raw milk from milk producers and supplies it to the district level milk union. Collected milk is processed and some milk is converted into milk products at the district level. Federation markets milk and milk products and generates revenue for milk producers' union. The customer gets good quality milk and milk products through federation. The village dairy cooperative society gives economic and social benefits to milk producers such as higher price for milk and provides cattle feed. It also runs rural health scheme. Moreover, it also tries to explore the role played by all network members in social transformation.

1). The milk procurement and distribution system of milk before establishing of BMCU when they use Can for milk storage, transportation.2). Second phase of figure shows the milk procurement and distribution system of milk after using technological advancement (BMCU), storage system at DCS to dairy.

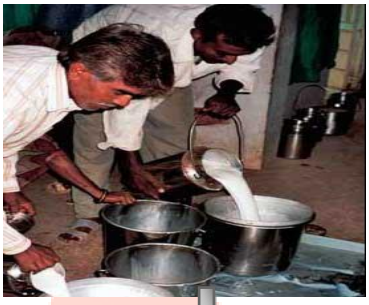
1) Can using milk procurement & distribution system from DCS to Dairy	2) BMCU using milk procurement & distribution system from DCS to Dairy

Rural woman milking buffalo.

Collecting Milk samples

Raw Milk weighing & testing

Rural farmer using milking machine for milking cow



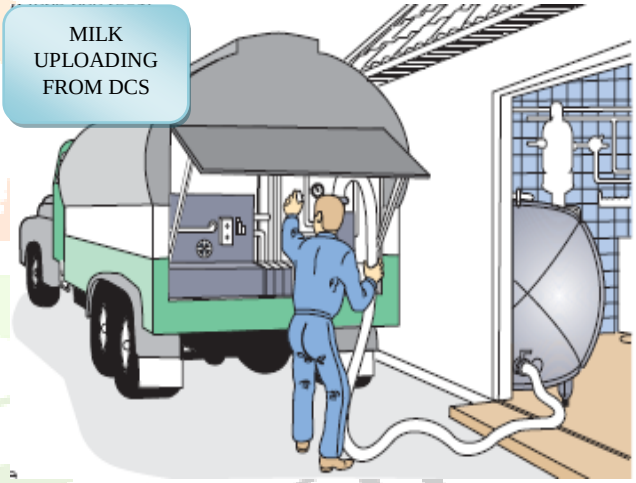
Collecting Milk samples

Raw Milk weighing & testing

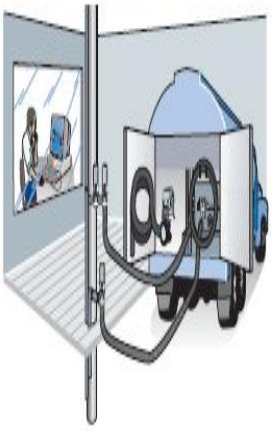
A village milk co-operative society operative automatic computerized milk weighing and fat testing system

(Milk store in BMCU)

Society people loading the milk cans in milk route vehicle of milk union.



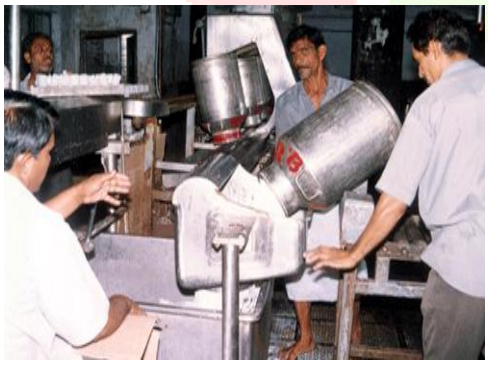
Milk Rout Vehicles Waiting for Unloading of Milk Cans at Dairy Dock



Milk tanker unloaded to dairy dock

Unloading of Milk Cans

Visual Inspection of Milk.



Society Wise Computerized Milk Weighing

Cleaning of Milk Cans

Milk Tanker being Unloaded at Dairy Dock.

1. 

2. 

Above shows years ago Transportation condition of milk from DCS to chilling center or dairy union due to lack of road infrastructure in Sabarkantha region.

RESEARCH PROBLEM:

Dairy sector occupy the important place in the national economy in terms of providing sustainance to the rural people as well as satisfying an important , essential need of cosumers both in Rural and Urban areas. Improvement in the efficiency of this sector will be important for both producers of milk products in rural area and consumer in general. The present study focuses on analysing technological advancementin procurement,production , storage and distribution of milk and milk products and examining their impact on various groups of participants involved in this chain.

Objectives:

1. To measure the impact of technological advancement in cooperative dairy sector on various groups of participants involved in this chain.

2. To study the gains to production operations due to technological advancement in dairy cooperative sector.

3. To study the impact of technological advancement in cooperative dairy sector on quality of milk & milk products marketing.

- **Data Sources**

Research Plan

- **Primary Data**

1) Questionnaire.

2) Expert opinion

- **Secondary Data**

1) Websites.

2) Magazines &News papers.

3) NDDB.

4) Agricultural & Processed Food Products Exports Developments Authority (APEDA)

5) Financial institutions , Semi government organizations , Foreign organizations and other authority related to Indian dairy industry.

6) Agricultural & food processing based journals, books.etc...

7) Agriculture department of Government of Gujarat.

I. Research Instrument:-

Questionnaire.

IV . Sampling Plan:-

1) **Sample type:**

According to the target population the sample type is a SIMPLE CONVINIENCE SAMPLING.

2) Sample population:

It is the total collection of the element about which I wise to make the inferences, i.e. COOPERATIVE DAIRIES OF GUJARAT.

3) **Sample frame:**

The sample frame will be consisting of tree components (1) The secretaries of the dairy cooperative society,(2) Dairy farmers, (3) The managers of the dairy cooperative sector.

4) Sample size:

500 respondents.

(1) The secretaries of the dairy cooperative society – 150 respondents.

(2) Dairy farmers - 250 respondents.

(3) The managers of the dairy cooperative sector – 100 respondents.

(a) Contact Methods :-

E-Mail questionnaire, Telephone interview, Personal Interview etc.

Hypothesis:

1.) <u>Analysis Using Z test</u>

1. Whether 93% of respondent say that installing BMCU at various DCS is important.

2. **Null hypothesis: Pho**>=93% of respondent say that installing BMCU at various DCS is not important.

   Alternative hypothesis: Ph1<=93% respondent say that installing BMCU at various DCS is important.

   N= 100 (sample size)

   Pho= 0.93 (sum of important + very important consumers)

   Qho = 1- Pho = 0.07

   p= sample proportion of respondent not qualifying for null hypothesis

   = 93/100

   = 0.07

   q = sample proportion if respondent not qualifying for null hypothesis

   = 1 –p

   = 1 – 0.93 = 0.93

   Z = 1.96

   Significance level = 0.05(5%)

   Standard error of sample proportion p = √ (Pho*Qho)/n

   = √ (0.07 * 0.93)/100

   = 0.00255

   This is the lower limit case with the significance level of 5%

   Z = p- Pho / p

   = (0.93 - 0.07) / 0.00255

   = + 337.49

*** Source: ESB Statistic problem solver Software , www.runiter.com**

Expected Outcome

Technological advancement in milk procurement and distribution system is profitable, less time consuming. It make procurement and distribution system efficient and effective. DCS needs financial and technical helps from the district milk co-operative union. Milk price should be fix on the bases of Fat+SNF+Microbial Quality of milk. Technological advancement in milk procurement and distribution improve quality of milk. Also, upliftment in DCS operation due to technological advancement is welcomed by the DCS members. They also need to adopt new technology at DCS. The Bulk Milk Coolers are installed in the village itself so that milk is chilled as soon as it comes out of the animal's udder. The main advantages of Bulk Milk Coolers are:1) Elimination of souring/ curdling of milk because of cooling at the collection centre itself.2) Adulteration of milk and spillage from cans can be eliminated during transport. 3) Transportation cost of milk can be brought down by regulating transportation to the main dairy either on alternative days or once in a day.4) Saving of initial investment on purchase of cans and subsequent maintenance cost (Repairs, cleaning etc) of those cans, 5) Improved quality of milk can be supplied to the main dairy to manufacture quality products for domestic as well as export markets, 6) Flexibility in milk collection time results in increase in volume of milk collected at the centers,7) Farmers will get better ret-urns for the quality of milk, 8) Chilling at the main dairy can be avoidedBMCU establishment

at DCS affect social condition of milk producers because it give time flexibility for milk selling time at DCS. There are major problems of lack of Sabar Dan availability in time at DCS from Sabar Dairy.

Limitations and Future Research

This investigation is based on the interviews from limited number of network members from a single co-operative network. Multiple case studies would give better insight about social capital related to co-operative network. It's difficult to draw prediction regarding social transformation based on mere interviews from limited number of respondents. Future research can be conducted with ethnographic approach which can give concrete understanding about transformation. Even generalization has been made based on exploratory study, however empirical study will help to establish, validate and generalize the results of the study.

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