ECONOMIC ANALYSIS OF MILK AND MILK PRODUCTS MARKETING BY CO-OPERATIVE AND PRIVATE SECTOR DAIRY PLANTS IN TAMIL NADU

THESIS SUBMITTED TO THE
NATIONAL DAIRY RESEARCH INSTITUTE, KARNAL
(DEEMED UNIVERSITY)
IN PARTIAL FULFILMENT OF THE REQUIREMENT
FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY
IN
DAIRYING
(DAIRY ECONOMICS)

BY

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M.Sc. (Dairy Economics)

DIVISION OF DAIRY ECONOMICS, STATISTICS & MANAGEMENT
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(I. C. A. R.)
KARNAL - 132001 (HARYANA), INDIA

2006

Regn. No. 1100103

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TO

MY PARENTS

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SISTER

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Approved by:

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This is to certify that the thesis entitled, **" ECONOMIC ANALYSIS OF MILK AND MILK PRODUCTS MARKETING BY CO-OPERATIVE AND PRIVATE SECTOR DAIRY PLANTS IN TAMIL NADU "** submitted by **Mr. N. RANGASAMY** towards the partial fulfilment of the award of the degree of **Doctor of Philosophy** in **Dairying (Dairy Economics)** of the **National Dairy Research Institute (Deemed University)**, Karnal (Haryana), India, is a bonafide research work carried out by him under my supervision, and no part of the thesis has been submitted for any other degree or diploma.

Dated: 10th January, 2006

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ABSTRACT

The economic efficiency and success of a dairy plant greatly depends on the effective management of operations like milk procurement, processing and marketing of dairy products. In the liberalized era, Co-operative dairy plants are facing cut-throat competition from Private dairy plants for market share. Therefore, the present study was conducted to compare the marketing of milk and milk products by Co-operative and Private sector dairy plants in Tamil Nadu .

The study was based on the data collected from the selected Co-operative and Private dairy plants of Coimbatore district for the financial year 2001-2002.The major product mix of both Co-operative and Private dairy plants were Toned milk, Standardized milk, Full cream milk, Butter and Ghee. The tabular and regression analysis were used to analyze the data.

The marketing cost of products namely Toned milk, Standardized milk, Full cream milk, Butter and Ghee were Rs. 3.32 per litre, Rs. 3.48 per litre, Rs. 4.12 per litre, Rs. 27.66 per kg and Rs. 42.89 per kg respectively for Co-operative plant and Rs. 3.32 per litre, Rs. 3.34 per litre, Rs. 3.88 per litre, Rs. 27.90 per kg and Rs. 45.90 per kg respectively for Private dairy plant indicating that the marketing cost for Toned milk was same in both the dairy plants whereas it was higher in the Co-operative plant for Standardized milk and Full cream milk. Marketing cost was less in the Co-operative plant for products like Butter and Ghee.

All the dairy products of Private dairy plant were earning more marketing margins than Co-operative plant except for Toned milk. The marketing efficiency of Co-operative plant for all dairy products was relatively less than Private plant except in case of Toned milk .The results have shown that the marketing efficiency of dairy products for Private plant namely Toned milk, Standardized milk, Full cream milk, Butter and Ghee were 0.08, 0.37, 0.23, 1.26 and 0.44 respectively while it was 0.17, 0.22, 0.17, 0.50, and 0.36 respectively for Co-operative plant.

Some of the members of Co-operative dairy plant were selling of milk to private milk vendors whereas inadequate milk collection by some of the collection centres of Private dairy plant were major problems. Moreover, both the plants also encountered

common problems like under capacity utilization of transport vehicles, chilling centres and dairy plants at manufacturing level and higher sales commission to the commission agents, wholesalers and retailers at distribution level. In nutshell, the study recommends the value addition in dairy products without compromising quality, promoting marketing of their dairy products through effective sales promotion and advertisement strategy with a focus on consumer oriented market research and development to the Co-operative dairy plant.

सारांश

किसी दुग्धशाला की आर्थिक दक्षता एवं सफलता मुख्यतया उसके संग्रहण प्रसाधन एंव विपणन कार्यों के प्रभावी प्रबधं पर निर्भर करता है। उदारता के इस युग में सहकारी दुग्धशालायें विपणन को लेकर निजी दुग्ध शालाओं के साथ प्रतिस्पर्धा की मार झेल रही है। इसीलिए वर्तमान अध्ययन तमिलनाडू राज्य में दूग्ध प्रदार्थो के सहकारी एंव निजी संस्थाओं द्वारा विपणन को तुलानातमक दृष्टि से देखने के लिए किया गया है।

यह अध्ययन कोयमबटूर जिले की चयनित सहकारी एवं निजी दुग्धशालाओं के 2001-2002 के आंकड़ो को लेकर किया गया है। सहकारी एंव निजी दुग्धशालाओं के मुख्य पदार्थ मिश्रण, टोंड दुग्ध, मानकीकृत दुग्ध, पूर्ण मलाई युक्त दुग्ध, मक्खन एंव घी थे।

अनुंसधान के लिए दुग्धशाला प्रसितन केन्द्रों के संभावित अनुपात को देखते हुए एकत्रित एंव ढोये हुए दुग्ध की मात्रा के अनुसार 20 दुग्ध संग्रहण केन्द्र एंव 20 दुग्ध वहन मात्रों के नमूने लिए गए। आंकड़ो के विशलेषण के लिए तालिका एंव प्रतिगमन विशलेषण उपयोग में लाये गये।

सहकारी शालाओं के संदर्भ में टोंड दूध, मानकीकृत दूध, पूर्ण मलाई युक्त दूध, मक्खन एंव घी की उत्पादन कीमतें क्रमशः 11.06 रूपये/लिटर, 12.86 रूपये/लिटर, 14.06 रूपये/लिटर, 81.66 रूपये प्रति कि.ग्रा. एंव 98.53 प्रति कि.ग्रा. पाई गई जबकि निजी शालाओं के लिए कीमतें क्रमशः 11.10 रूपये/लि., 12.10 रूपये/लि., 13.59 रूपये/लि., 67.44 रूपये प्रति कि.ग्रा. एंव 97.16 रूपये/कि.ग्रा. पाई गई जो यह बताती हैं कि निजी दुग्धशालाओं की टोड़ दुध को छोड़कर सभी पदार्थो की दुग्ध उत्पादन कीमतें सहकारी शालाओं की दुग्ध उत्पादन कीमतों से कम थी।

सहकारी शालाओं के लिए टोंड दूध, माननीकृत दूध, मलाई युक्त दूध, मक्खन और घी की विपणन कीमतें क्रमशः 3.32 रूपये/लि., 3.48 रूपये/लि., 4.12 रू./लि., 27.66/कि.ग्रा. और 42.89 रूपये/कि.ग्रा. एंव निजी शालाओं के लिए क्रमशः 3.32 रू./किलो, 3.34 रू./कि., 3.83 रू./लि., 27.90 रू/कि.ग्रा. और 45.90 रू./कि.ग्रा. जो इस बात का सूचक है कि टोंड दूध के लिए विपणन कीमतें समान थी जबकि मानकीकृत एंव पूर्ण मलाई युक्त दूध के संदर्भ में सहकारी शालाओं में अधिक थी। मक्खन और घी की विपणन कीमतें सहकारी शालाओं के लिए कम थी।

निजी दुग्ध शालाओं के लिए टोंड दूध को छोड़कर सभी दुग्ध उत्पादों का विपणन हिस्सा सहकारी शालाओं से अधिक था। सहकारी दुग्ध शालाओं की विपणप दक्षता टोंड दूध को छोड़कर सभी दुग्ध उत्पादों के लिए

निजी दुग्ध शालाओं से कम थी। परिणामों से दर्शित होता है कि निजी शालाओं की विपणन दक्षता टोंड दुग्ध, मानकीकृत दुग्ध, पूर्ण मलाई युक्त दूध, मक्खन एंव घी के लिए क्रमशः 0.08, 0.37, 0.23, 1.26, एंव 0.44 ली जबकि सहकारी शालाओं के लिए ये क्रमशः 0.17, 0.22, 0.17, 0.50 एंव 0.36 देखी गई।

सहकारी दुग्ध शालाओं की मुख्य समस्या कुछ सदस्यों द्वारा निजी विक्रेताओं को दुग्ध बेचने की पाई गई, जबकि निजी दुग्धशालाओं की मुख्य समस्या कुछ एकत्रण केन्द्रों की दुग्ध एकत्रण की अदक्षता की पाई गई। इसके अलावा वाहनों की अनुचित उपयोगिता, प्रशीतन केन्द्रों और दुग्ध शालाओं की निर्माण स्तर पर कम क्षमता तथा आढ़तियों, थोक एंव खुदरा विक्रेताओं द्वारा कमीशन लेना और वितरण स्तर पर अधिक प्रतिस्पर्धा की समस्या दोनों शालाओं के लिए सम्मिलत रूप से पाई गई।

वर्तमान शोध सुझाता है कि सहकारी दुग्ध उपयोग के स्थिर विकास के लिए इनकी नितियाँ दूरगामी एंव कूटनितिक होनी चाहिए। अध्ययन बिना गुणवता हास के मूल्य वृद्धि, प्रभावी विक्रय को बढ़ावा देना, विज्ञापन कूटनीति के साथ-साथ उपभोक्ताओं को ध्यान में रखते हुए विपणन शोध एंव विकास के लिए सुझाव देता है।

CHAPTER - 1

Introduction

1. INTRODUCTION

General Background

Dairying has been playing a pivotal role in the farming system of our country and is being considered as an important means for sustainable rural development in generating gainful employment and supplementing the income of farming community. India is having a huge bovine wealth of 204.6 million cattle population and 89.2 million buffaloes (Agricultural statistics at a glance, 2004). It continues to remain the highest milk producer in the world with an annual milk production of 91 mt during 2004-05 with percapita milk availability of 232 gms / day as against the minimum recommended requirement by ICMR of 250 gms / day (Economic Survey, 2005). Dairy sector alone contributed about 18 per cent of agricultural GDP with an estimated consumption expenditure of about Rs 1,19,270 crore to Indian economy during 2004-05. (Govt .of India Statistical abstract, 2004).

The success of dairy industry revolves around a triangle, i.e., procurement, processing and marketing of dairy products. All these three components are highly indispensable for the development of dairy industry. The economic efficiency of a dairy plant heavily depends on the efficiency of the operations, namely procurement of milk, processing and marketing of milk and milk products.

An efficient marketing system is one, which minimizes the cost of marketing services so as to ensure the largest share of the producer in the consumer rupee. Moreover, the consumers should be provided with quality dairy products at a reasonable price. Thus, dairy products' marketing is an imperative component of dairy development and has been the focus of attention of planners, policy makers, researchers and trading communities.

However, dairy products' marketing is still dominated by unorganized sector. It has been found that organized sector in India handles about 14 per cent of total milk produced. (Govt .of India statistical abstract, 2004). Bulk of

milk and milk products marketing business is still transacted through traditional channels. The private traders exploit both the producers as well as the consumers.

There are various issues that need research efforts in the area of dairy products marketing in India. These issues mainly centre on cost of procurement of milk, processing and manufacturing at the dairy plant level, marketing cost, marketing margin, marketing efficiency of dairy products and constraints faced by dairy plants in handling of milk and milk products.

Dairy plants are adding value to raw milk by processing and marketing their own products such as varieties of liquid milk, Ghee, Butter, Flavoured milk, Ice cream etc. to capture a larger share of consumer rupee by involving in processing, distribution of fluid milk and milk products to reap the advantage of low cost of milk production. Therefore, the challenge is to minimize processing and marketing cost without compromising on quality under globalization era. Many private players would like to set up markets in our country to explore the cost advantage. In order to retain the position in global and domestic markets, the co-operative dairy industry needs to strengthen its efforts to reduce the total operational costs in dairy plants in the value addition chain.

In India, Dairy co-operatives have been considered as one of the most vital channels to improve the milk production and reduce the cost of procurement, processing and marketing of dairy products through economy of scale approach. After liberalization, dairy plants are facing cut-throat competition from private players for market share. In general, the private players are using their resources efficiently and reducing their total operational costs as compared to co-operative sector dairy plants. The increased operational cost leads to decrease in the marketing efficiency of co-operative dairy plants. In this endeavour, a comparative study of cost of procurement, processing, manufacturing and marketing of dairy products in co-operative and private sector dairy plants will be quite useful to reduce the total costs and improve the marketing efficiency of co-operative dairy plant.

A number of marketing parameters like marketing cost, marketing margin, marketing efficiency, etc. depends on the structure of milk and milk products market. Marketing costs and margins of a particular commodity reflect the efficiency of a system to a great extent. The analysis of marketing costs and margin of dairy plants would help in reducing the unwarranted costs in marketing of dairy products. The study would also provide deeper insight into the various problems faced by different functionaries of dairy plants and their priorities.

Statement of the problem

Tamil Nadu is endowed with the cattle population of 90.46 lakhs and 27.41 lakhs Buffaloes with an annual milk production of 4.62 mt. The state has a strong dairy infrastructure with 8,621 milk co-operative societies and 17 co-operative milk producers' unions having 22.57 lakh producer members. The average procurement of milk by co-operative dairy plants is around 17.26 lakh litres per day. The processing capacity of co-operative dairy plants is 18.92 lakh litres per day. (Policy Note on Dairy Development Department and Milk supply schemes in Tamil Nadu, 2004-05). But, the co-operative dairy plants in Tamil Nadu are handling milk much below their installed capacity and facing severe competition from private milk vendors and private dairy plants for marketing of milk and milk products. Due to low handling capacity of co-operative dairy plants, the cost of procurement, processing and distribution has increased enormously.

Dr.V.Kurien said that, the future of dairy Industry depends on our ability to source new dairy product markets. If we fail to do so, our dairy industry will stagnate as supply swamps demand. Prices will drop, investment will decline and the gains of the last few decades will erode for the co-operative sector. Therefore, the systematic and consistent research into the dairy products marketing in Tamilnadu could go a long way in bringing about improvement in milk production, procurement, processing and marketing of dairy products. This investigation is necessary to enable the co-operative dairy plants to capture a major share of dairy products market against the severe competition from private dairy plants.

The outcome of the proposed study would help to understand the dairy products marketing and will improve the marketing system of dairy co-operatives of Tamil Nadu. The study is also important for formulation and implementation of an appropriate policy, improving efficiency of various factors in marketing system for reducing cost and in planning strategies for future development. Moreover, no systematic and comparative research work has been carried out on this important aspect of dairy products manufacturing and marketing in co-operative and private sector dairy plants of Tamil Nadu so far. The results of the study would be useful to improve the efficiency of dairy products manufacturing and marketing in co-operative dairy sector of Tamil Nadu.

Keeping the above facts in view, the present study was undertaken to examine the various aspects of "**Economic Analysis of Milk and Milk Products Marketing by Co-operative and Private Sector Dairy Plants in Tamil Nadu**". More specifically the objectives of the study were:

1. To work out the cost of procurement of milk.
2. To study the processing and manufacturing cost of dairy products.
3. To estimate the marketing cost, marketing margin and marketing efficiency of dairy products.
4. To identify the constraints faced by dairy plants in procurement of milk, processing, manufacturing and distribution of dairy products.

Scope of the study

1. The analysis is useful to improve the milk production, milk procurement, processing and marketing of dairy products in co-operative dairy sector of Tamil Nadu.
2. The analysis of marketing costs and margin of dairy plants would help in reducing the unwarranted costs in marketing of dairy products and improve the marketing efficiency of dairy products for co-operative plant vis-a- vis private sector competition.
3. Research findings of the study would be helpful to planners, policy makers, administrators, researchers and other stake holders who are

concerned with development of dairy co-operatives and dairy development of the state in particular and the whole country in general.

4. The study will throw light on the constraints faced by dairy plants in procurement of milk, processing and manufacturing, and distribution of dairy products during liberalization era.

Limitations of the study

1. The present study was confined to two dairy plants, one each from co-operative and private sector, due to limitations in terms of time and resources available to the investigator.

2. The access to time series data from the selected dairy plants was not permitted to the researcher. Therefore, the data were collected and analysed only for the financial year 2001-02.

3. The constraints were identified in consultation with experts in the different sections of the dairy plants. Hence, their identification is based on their ability to perceive and analyze the situation and also capacity of expression.

4. The study was restricted to two dairy plants only. Therefore universality and generalization regarding results and findings are valid for the selected dairy plants. However, the observations made and findings of the study could be used or applied for plants adopting similar product mix.

Organization of the thesis

The thesis has been presented in six chapters. The first chapter is devoted to statement of the problem, objectives and limitations of the study. A brief review of the work already carried out in the field of milk procurement, processing, manufacturing of dairy products and their marketing have been presented in chapter two. The sampling plan and analytical framework employed to achieve the different objectives are presented in chapter three. Chapter four describes general background of the study area and details of

the selected dairy plants. The results obtained in this study has been presented and discussed in chapter 5. The last chapter summarises the main findings and provides conclusions drawn from the analysis along with policy implications thereof.

CHAPTER - 2

Review of Literature

2. REVIEW OF LITERATURE

Commensurate with the objectives of the study, a survey of available literature that may have a direct or indirect bearing on the framework of this subject was attempted. After liberalization, the organized dairy sector has to face the challenge of competitive environment and fluctuation in marketing for finished dairy products and liquid milk due to private sector entry in milk procurement as well as dairy products marketing. Moreover, the reported work on economics of milk products marketing in co-operative and private dairy plants comparatively is scanty and insufficient. These factors have additionally attracted the attention of researchers to find out cost of procurement, processing and manufacturing cost of dairy products for dairy plants. Keeping these in mind, an attempt is made to present a comprehensive review of research work done under the following heads:

2.1 Cost of milk procurement.

2.2 Processing and manufacturing cost of dairy products.

2.3 Marketing of dairy products.

2.4 Constraints faced by dairy plants.

2.1 COST OF MILK PROCUREMENT

Cost of milk procurement is of primary importance to the dairy industry. The economic efficiency of milk procurement is heavily dependent upon the milk procurement operations. Milk procurement operations includes collection of milk from milk producer co-operative societies or milk collection centres, transportation of milk from collection centres to chilling centres or directly to the plant, chilling of milk and reception of milk at the reception dock. It is highly useful to the dairy industry to estimate the product price, profitability and finally the returns. Keeping these in view, some of the studies conducted on this aspect in the country and abroad are listed below.

2.1.1 Cost of Collection

Uhle (1961) reported that bulk milk collection (daily twice) showed a saving of 25 to 30 per cent cost over than cans milk collection. When the milk

was collected once a day, the savings were increased by nearly 50 per cent. It was further observed that the cost of collection and reception per kg of milk could be reduced by about 30 to 45 percent and suggested that the use of bulk tankers resulted in (i) better cooling facilities for milk, (ii) lessening of work and other savings for the milk production, and (iii) reduction in transportation cost. The adoption of once a day bulk collection of milk could lead to greater economies.

Gay (1962) analyzed the operational cost structure of 223 milk collection depots in Southern Germany. The collection centres collecting the milk between 2750 to 5500 kg per day were showing optimum results. As against this, those depots receiving an average of 600 kg of milk per day were considered to be uneconomic.

Lasley and Whitted (1965) analyzed the factors affecting the cost of milk collection at Missouri in U.S.A. and observed that as the volume of milk was increased to 20 lakh pounds, the cost of milk reception decreased sharply. Beyond this, the decrease was slow. The cost of collection was observed to be 7 cents per 100 lbs.

Sebela (1965) estimated the cost of milk collection in Czechoslovakia. He reported that the cost of milk collection through the milk tankers and cans was 86.3 Czech crown and 98.6 Czech crown per 1000 litres of milk, respectively, showing that the milk collection by the former method was more economical.

Mitten (1965) studied the cost of milk collection in U.S.A. The study revealed that the transportation cost of bulk milk in tankers was lower by 5 to 25 cents per hundred pounds than the handling of milk through cans, which proved the superiority of the former technique over the later technique.

Neitzke (1965) reported that the volume of milk delivered, seasonal fluctuations in distribution of milk, milk production of that area and collection, number of milk producers in the study area, volume of milk per producer, location of the farm and frequency of milk collection are the major factors affecting the cost of milk collection. It could be further observed that these conditions varied from plant to plant.

Schwendinger (1968) reported that collection cost were found to be similar in Australia for the milk collected from collection centres by tankers and from farms and was slightly higher for can delivery under optimum conditions. However, in practice they were lowest for bulk milk collection from farms, with full coverage of the area served by the collection centre and was highest for bulk milk collection, from collection centres.

Los (1969) studied the cost of collection of milk in Poland and revealed that the decrease in milk collection points in the form of centralization resulted in 6.1 percent reduction in total cost of collection. Increase of collection capacity beyond 3000 litres was not beneficial, if it involved increase in the number of collection centres.

Dwyer (1970) reported that the assembling cost ranged from 0.4 to 0.02 cents per quarter. He further observed that the method of milk assembling had a direct relationship with the distance covered for the collection of milk. The introduction of large bulk transport trucks flattened the curve significantly, particularly at long distances. In the area of milk assembly, factors like the size and density of milk production were the important determinants of the optimum assembly method.

Sharma *et al.* (1974) studied the procurement of milk by organized sector in India and observed that 21.43 percent of the plants collected milk once a day and the rest twice a day. In 75 percent of the milk plants studied, milk was procured through co-operatives and found that collection of milk through co-operatives was quite effective due to better involvement of milk producers both in production and marketing activities.

Backlund (1975) estimated that tanker collection of milk was cheaper than the cans collection in Augermland Dairy Association (Sweden) received 52 million kg of milk from 2200 suppliers. About 600 suppliers had farm tanks, who supplied 60 per cent of the total milk intake. The remaining 40 per cent of the milk was delivered through cans. It was also observed that even though the number of can collection vehicles was reduced from 42 to 20, the cost of collection of milk was higher than the national average. So to reduce

the cost, the association proposed to collect the milk by tankers from all its suppliers using a mobile cooled tank of 150-litre capacity.

Keane (1975) compared three methods of milk collection in Ireland, viz. (i) branch methods of milk collection which induced producers' delivery to branch plus operating branch, (ii) daily milk collection of refrigerated milk from the branch, and (iii) alternate day milk collection of refrigerated milk. The total cost per gallon of milk for three methods mentioned above was estimated to be 4.10, 2.93 and 2.40 pence, respectively. Also, it was observed that the collection cost per gallon was 0.30, 1.88 and 1.35 pence for branch method collection of milk, daily collection of refrigerated milk and for alternate day collection of refrigerated milk respectively.

Haish (1976) studied the economics of milk collection by tankers in Frankoria. He reported that the average daily milk delivery was only 44 kg per supplier. The tanker collection was much less common than the other areas of the German Federal Republic. It was further reported that the proportion of the milk collected by tanker was 33.1 per cent as against 76.0 per cent for the whole of the Republic. The speed of the milk collection and the type of milk container were observed to be major determinants of the cost of collection of milk.

Ram and Singh (1987) worked out the cost of milk collection in a public sector plant in Haryana and they have found that average per litre cost of collection was 10.64 paisa. The per litre cost of milk collection decreased with the level of increase in the milk handled. He suggested that the cost of collection could be decreased considerably by increasing the collection of milk possibly by re-organizing the collection centres or diverting milk of cluster of centres to one collection centre.

Felicio *et al.* (1987) studied the organized milk collection costs and systems in a dairy factory in Brazil. About six million litres were collected in 1984, transported by nine independent hauliers. Three hauliers were infact operating below break-even point and another two were fairly close to it. The average return trip was 132.4 kms to a result, collection costs were very high,

averaging $ 9036 per month, 44.62 percent of which was for diesel oil and 29.71 percent for tyres. The need to reduce these costs of collection of milk by increasing the volume of transported milk per haulier was emphasized.

Pundir (1988) estimated the cost of collection of milk in a public sector dairy plant in Haryana. He observed that the average cost of milk collection per litre was 13.30 paisa in the milk shed area and concluded that cost of milk collection was negatively correlated with quantity of milk collected.

Malik (1989) conducted a study on organized milk procurement by Haryana Dairy Development Co-operative Federation. She reported that the average cost of milk collection for three milk unions namely Karnal, Ambala, and Jind unions as 22.40, 15.57 and 46.10 paisa per litre during the year 1983 and decreased to 15.57, 13.12 and 36.12 paisa per litre respectively during the year 1988, due to increased quantity of milk collection.

2.1.2 Cost of Transportation

Khurody (1962) studied the long distance transport cost of milk through cans and tankers from Anand to Bombay. It was observed that when the milk was transported in 37 litre cans in an insulated railway van, the cost of transportation of milk was Rs.1.85 per 37 litres of milk. It was pointed out that by using insulated rail tanks with two 15,000-litre tanks mounted on 8-wheeler railway under frame and found the cost of milk transportation to be Rs.1.09 per litre of milk. The reduction in the transportation cost by using rail tanks accounted to be about 41 percent.

Pathak (1968) studied the long distance transportation of milk and showed the effect of several factors on the operating cost of transportation of milk. The study revealed that the factors like (i) under utilization of milk tanker capacity, (ii) irregular and lower route timings, (iii) under-utilization of vehicles, (iv) higher maintenance cost and finally the higher incidence of breakdown of the vehicles on the route were the major factors accounting for the higher transportation cost. Fuel alone accounted for about 15-20 per cent of the transportation cost.

Azariah (1969) conducted a study at Shirpeer Milk Union. It was observed that milk purchase rates were affected by both the distance from the factory and quantity of milk. The actual overall average cost of handling of milk was 51 paisa per litre. The cost of transportation of milk from the milk collection centres to the factory was 37.6 paisa per litre.

Srinivasan (1973) estimated the cost of transportation of milk on different routes. It was observed that the net cost of milk transportation varied from 1.03 to 6.33 paisa on different routes, the average for the plant being 2.45 paisa. Further, it was observed that the cost of milk transportation from the society to the collection centre varied from 1.50 to 6.91 paisa with an average of 2.65 paisa for a litre of milk for the plant as a whole. The cost of transportation was negatively related to the quantity of milk transported.

All India Coordinated Research Project (1973-74) study found that the cost of transportation of milk by Private and Government vehicles to the city dairies and observed that the average cost of transportation of milk varied from 10 to 35 paisa at Hyderabad, 11.05 paisa at Guwahati, and 2.89 paisa at Mehsana by private vehicles. As against this by using the Government vehicles the cost of transportation for a litre of milk was estimated to be 4.08 paisa and 17.62 paisa at Hyderabad and Cuttack, respectively. Further, it was observed that the cost of transportation was negatively correlated with the quantity of milk transported.

Sharma *et al.* (1974) studied the cost of transportation of milk on small, medium and large sized dairy plants in the country. They revealed that the cost of transportation of milk varied from 6.00 to 17.5, 3.00 to 5.00 and 5.00 to 8.30 paisa for small, medium and large sized public sector dairy plants, respectively. It was also observed that the cost of transporting milk was 4.25 and 6.00 paisa in co-operative sector for the small and medium sized dairy plants, respectively. In the case of direct transportation of milk from collection centre to central dairy, the cost of transportation for a litre of milk ranged between 5.00 to 10.00 paisa for medium sized plants and 7.5 to 15.80 paisa for small sized dairy plants in the public sector. The similar figures for the

small sized dairy plants in the co-operative sector and private sector were observed to be 3.50 and 6.00 paisa, respectively. He concluded that the poor procurement of milk on the long routes was responsible for higher transportation cost of milk.

Kalra (1986) studied the milk pick up routes system in the North-West India. Various conditions and restrictions typically found in India were considered for the route system. On an average, the trucks and tankers taken together for transportation of milk traveled about 1014 km per day in the existing milk pick up system. The efficient routes formulated, which reduced the daily travel distance to 954 km and there was a saving of distance through rationalized routes by about 60 km/day. He observed that the existing route system of the plant was most of the time in circular path was reasonably good and this could be improved by efficient route planning.

Ram and Singh (1982) worked out transportation cost of milk in a public sector plant in Northwest India. The average per litre cost of transportation from collection centre to chilling centre was found to be 16 paisa and from chilling centres to plant was 4.69 paisa which varied on different routes depending upon the quantity of milk transported. He recommended that the transportation cost could be reduced by 8.16 paisa, if the procurement of milk is increased by one-lakh litres.

Pundir (1988) estimated the cost of transportation of milk in a public sector plant in Haryana. The average per litre cost of transportation was 8.03 paisa in the milk-shed area and also concluded that cost of milk transportation could be decreased with increase in quantity of milk transported on different routes.

Malik (1989) found that the average cost of transportation of milk for three milk unions namely Ambala, Jind and Karnal unions was 32.66, 36.81 and 28.44 paisa per litre respectively and reported that milk transportation cost varied on different routes depending upon the quantity of milk transported.

efficiency of different methods of chilling of milk, and revealed that the cost of chilling of milk varied from 1.8 to 4 paisa per litre. Further, they investigated chilling cost per litre of milk was 3.22 paisa and 2.93 paisa with bulk cooler for having direct system of refrigeration and indirect system of refrigeration respectively and 4.41 paisa and 5.70 paisa with plate chiller during flush and lean seasons, respectively, 3.84 paisa with surface cooler, 3.56 paisa with root-freeze and 4.05 paisa with intermittent absorption unit.

Jaishanker *et al.* (1974) compared the cost of chilling at Dudhsagar Dairy, Mehsana by the different chilling equipments and observed that the plant chiller was more economical, when quantity of milk exceeded 6,000 litres. The surface cooler could be used economically for about 5,000 litres of milk, where as bulk coolers could be used to cool about 4,000 litres of milk per day. The immersion coolers could be operated when 100 to 200 litres of milk was available and operational cost was more economical and their performance was better as compared to other chilling equipments and storage tank as a unit. Thus, chilling equipments could be selected depending upon the amount of milk available at the collection centres. It was concluded that the cost of chilling was related to the capacity utilization of the equipment used.

Ram and Singh (1982) worked out the total procurement cost in a Public sector plant in Northern India as 37.75 paisa per litre .The share of chilling of milk in total procurement cost was observed to be 22 percent. They further observed that the cost of chilling was higher at owned chilling centres as compared to the chilling centres, which were running in the rented premises, presumably due to higher overhead cost.

Pundir (1988) estimated the cost of chilling of milk in a public sector plant in Haryana. He reported that total cost of chilling per litre of milk was found to be 28.50 paisa in the milk-shed area and recommended that cost of chilling could be reduced by full capacity utilization of the chilling centers.

Malik (1989) observed that the total cost of milk chilling for three milk unions namely Ambala, Karnal and Jind unions as 2.04, 2.05 and 2.82 paisa

per litre respectively and suggested that that cost of chilling could be reduced by increase in quantity milk chilled.

2.1.4 Procurement Cost

Bhanja (1974) studied the comparative efficiency of different milk procurement systems, viz., contractors, agent and co-operatives and their socio-economic impact in milk shed areas of Haryana Milk Food, Pehowa, Infant Milk Food Factory, Moradabad, Jagajit Distilleries and Allied Industries, Hamira. He observed that the agent system is more effective, flexible and committed as compared to other systems.

Rao (1976) studied the cost of milk procurement in a multi-products Dairy plant in Vijayawada (Andhra Pradesh). The average procurement cost was observed to be 33.08 paisa per litre of milk. Out of the total procurement cost, 10.18 paisa (30%) was shared by the cost of collection. The transportation cost per litre of milk was worked out to be 13.53 paisa. The chilling cost was worked out as 9.37 paisa per litre of milk. It was observed that cost differed from centre to centre depending upon the total collection of milk. He also concluded that, the transportation cost varied from route to route depending upon the total milk procurement and the distance traveled by the vehicles.

Sharma *et al.* (1978) studied the cost of procurement, reception and chilling of milk for a public sector milk plant situated in North-West region of India. The cost of milk procurement, reception and chilling for a litre of milk was observed to be about 46, 8 and 3 paisa, respectively. They suggested that efforts to increase the milk procurement could help in reducing the cost of milk procurement and observed that milk procurement cost was higher by almost one and a half times in the lean season than the flush season.

Singh and Kalra (1979) indicated that the reception cost of cow milk and buffalo milk at the factory dock were about 3 and 5 paisa per litre of milk respectively. In the cow milk reception cost, the steam and quality control accounted for about 56 percent, while the refrigeration and quality control shared 60 percent of the buffalo milk reception cost.

Sandhu (1980) studied milk production, transportation and procurement in India. He concluded that milk collection distance should be less than 60 miles and circular rather than to and fro and annual transportation cost should be kept varying from Rs.6 to Rs.7 per 100 kg milk.

Rawat *et al.* (1984) estimated the cost of milk procurement per litre as 37.75 paisa. The relative share of collection, transportation and chilling was 28, 50 and 22 percent, respectively. They further observed that the milk procurement cost varied not only from area to area but also from collection centre to collection centre depending upon the total quantity of milk procured, transported and chilled.

Khokhar (1985) carried out a study in the Feeder Balancing Dairy, Meerut and found that cost of milk procurement, which comprised of the cost of collection, transportation and reception including the cost of can sterilization to be 52 paisa per litre. The relative share of collection, transportation and reception in the procurement was observed to be 54, 42 and 4 percent respectively. The average cost of chilling of milk was observed to be 2.76 paisa per litre. He found that the cost of collection could be reduced by 3.71 paisa, when the quantity of milk procurement was increased from 5,000 to 10,000 litres. The cost of transportation could be reduced by 8.5 paisa for every 1000 litres increase in milk procurement, by keeping the expenditure constant. The cost of chilling could be reduced by increasing the quantity of milk chilled at the chilling centre.

Bhanja *et al.* (1986) studied the comparative efficiency of milk procurement in India. They concluded that efficient milk procurement is crucial for millions of small milk producers and the dairy industry. Several systems of milk procurement are in operation in India. Each system has its own merits and demerits. An ideal system is one, which combines effective input delivery and dairy extension with procurement.

Chauhan (1987) studied the different systems of milk procurement in a private milk plant in U.P. He noticed that the system of milk procurement through contractors was the most efficient and the cost was the lowest

because of little expenditure made by the contractors for the procurement of milk and concluded that cost of milk procurement could be reduced by increasing the milk procurement and reduction of commission paid to commission agent.

Rangasamy (2001) studied economics of milk procurement in a co-operative dairy plant in Tamil Nadu and reported that average procurement cost of milk was Rs. 1.43 per litre. The share of collection, transportation, chilling and reception cost were observed to be 68 paisa, 42 paisa, 28 paisa and 5 paisa per litre respectively and concluded that milk procurement cost could be reduced by increase in the quantity of milk procured.

2.1.5 Seasonal Variation

Khokhar (1985) studied the seasonal variation in the cost of collection & transportation of milk in Feeder Balancing Dairy, Meerut. He found that the cost of collection and transportation of milk was higher by almost one and a half times in the lean season than the flush season.

Ram and Singh (1987) studied the seasonal variation in the cost of collection and transportation of milk in North-Western India and observed that the cost of collection of a litre of milk was lowest in the cold season (8.20 paisa) and highest in the hot humid season (30.25 paisa). The cost of transportation in the hot season was almost twice than that in the cold season.

Pundir (1988) studied the cost of collection per litre of milk and observed that it varied from 9.69 paisa in the month of December to 21.11 paisa in June. The cost of transportation of milk per litre varied from month to month from 20.26 paisa in November to 95.14 paisa in June. The cost of chilling varied from 15.72 paisa in October to 124.46 paisa in the month of June.

2.2 PROCESSING AND MANUFACTURING COST OF DAIRY PRODUCTS

Economic efficiency of dairy plants is intimately related with costs involved in the processing and manufacturing of dairy products. The

examination of prevailing cost structure for the different dairy products in a dairy plant is a pre-requisite for efficient planning of any operation, and, moreover, a suitable costing methodology is essential for that purpose. Keeping all these factors in mind, an attempt has been made to present a comprehensive review of research work done in India and abroad are listed below.

Knudson and Kaller (1960) worked out the cost of processing of whole milk creameries in Minnesota for four model plants and found that with the increased scale of operation, there was reduction in the unit equipment costs due to more intensive use of labour. They also developed short run cost function by synthetic cost method for the sampled model plants.

Chaudhary (1968) observed that 55 percent of the consumers' dollars in USA were spent to meet assembling, distribution, processing and packaging cost of milk. The percentage shares of expenditure under these heads were observed to be 5, 23, 18 and 9 percent respectively. Further, it was concluded that in Govt. Milk schemes, overhead cost was very high due to higher number of highly paid staff.

All India Coordinated Research Project Report (1970-74) indicated that the electricity consumption was 0.0062 units per kg of product at Lucknow dairy and 150 units for 1000 kg of milk at Udaipur dairy. The electricity consumption at Udaipur dairy was estimated to be 1.20 units, 3.06 units, 4.25 units and 19.60 units for receiving and can washing, processing, packaging, refrigeration and steam production per metric tonne of milk, respectively.

Grubele (1973) conducted a study on milk plant operations in USA and found that labour productivity increased and per unit costs of labour in general decreased, as plant volume increased and as the number of items processed decreased.

Metwally (1973) reported the diminishing unit costs with output increments, in a study of economies of size in Butter production in Butter factories operating in New Zealand. Further, it was further pointed out the amount of decrease in unit cost was found to be insignificant after 12000 tons.

He pointed out that since output was shown to be related to size of plant, these results may be interpreted as demonstrating. The role, the size plays in making for economies in production and the optimal capacity of plant operation was not beyond 12000 tons and not below 9000 tons.

Somasekhera (1974) studied pricing and investment practices in public sector dairy in Bangalore. Procurement costs, handling and processing costs, distribution cost were analyzed and he bifurcated these into fixed and variable cost, so that managerial techniques for rational decision-making could be applied. He observed that fixed costs were 16 percent of total cost. Seasonal prices were also worked out for various dairy products. Optimum prices and optimum products mix were determined.

Garg *et al.* (1975) studied the problems of Co-operative Milk Board, Kanpur and concluded that under-utilization of milk processing plant, due to poor procurement of milk has led to higher cost of processing, sale and distribution of milk per litre .The total cost per 100 litres of standardized milk was observed to be about Rs.80.00. The percentage share of procurement cost was estimated to be around 20 percent of the gross cost. High cost per litre of milk was attributed to the high overhead cost and low procurement of milk by the milk board.

Kunwar *et al.* (1975) compared the cost of processing of milk in public and co-operative dairy plants in Kanpur District of U.P., by selecting one dairy plant from each sector. They observed that in public sector dairy, the cost of processing was 50 percent higher (36 paise per litre) as compared to the co-operative dairy plant (24 paise per litre). Low quantity of milk handled during the year under study, and emphasis on research and experiment in public sector dairy plant were attributed as the reasons of high cost of processing as compared to the co-operative dairy plant.

Somasekhera (1975) identified 60 different items of expenditure in Bangalore dairies. He reported that in a typical Govt. Sector dairy, 60 percent of expenditure was on raw milk. Direct costs were allocated directly to particular product while joint costs were allocated on the basis of revenue earned by each product.

Venkatakrishna (1975) estimated the short run and long run cost relationship for plants processing whole milk. The long run average cost curve was derived from long run cost relationship and showed that this curve slopes downwards as the volume of milk processed increases. He attributed this phenomenon to economies of scale. If the shape of long run average cost curve is horizontal, then these are constant returns to scale. The short run average cost curve is due to dis-economies of scale. The short run average cost curve was derived helps in explaining what would be the cost when a plant of given size processes various quantity of milk.

Commer *et al.* (1976) conducted a study on economies of size in processing and manufacturing of dairy products for the Southern Dairy Industry in United States by Economic engineering procedure. An inverse relationship between volume of milk processed and cost of processing was observed. The number, size and location were also important determinants of cost-output relationships. It was further pointed out that the cost of cheese and butter powder was reduced by $ 0.9/cwt and $ 0.9/cwt respectively, as the quantity of milk increased from 3.5 million pounds of 10.5 million pounds per month. It was concluded that efficient technical conversion of milk into various products would help in reducing the processing costs.

Imbs *et al.* (1976) studied 633 out of 655 regional dairy co-operatives in 17 provinces of Poland and found that dairy co-operatives processed 3706 million litres of milk of which 23.45 percent 47.28 percent, 4.43 percent, 4.85 percent, and 20.25 percent were used respectively for liquid milk, Butter, Cheese, Casein and miscellaneous. In the total cost, the raw material accounted for 77.07 percent and the relative share of items of the remainder were composed of wages (28.9%), transport (12.0%), and material other than fuel (11.5%), maintenance (10.0%), depreciation (9.0%) and fuel (6.4%).

Sharma (1978) made an attempt to investigate the processing cost in a dairy plant located in Ambala, Haryana. The study revealed that processing cost was almost same as 29.5 paise per litre for Pasteurized milk, Sterilized flavoured milk, Standardized milk and Sterilized flavoured double toned milk.

Singh and Kalra (1979) conducted a study based on the data collected for the financial year 1976-77 from a public sector milk plant situated in north-western India and estimated the cost of production of *lassi* as 79 paise per bottle ,and out of the total cost, 57% was accounted for processing costs. Raw material cost alone accounted for 43 per cent. Further, it was pointed out that because of low quantum of products manufactured, depreciation and interest accounted for about one paise per bottle. The other cost components like labour (7 paise), packing material (6 paise) and steam (3 paise) accounted for most of the total unit cost of manufacturing of lassi.

Brathwal and Nair (1979) used regression analysis and taken total cost, marginal, average cost and wage cost as dependent variables separately and quantity of output as independent variable. They observed that besides size of plant, cost of production should vary with difference in technology and difference of capacity utilization.

Sharma and Singh (1980) conducted an analysis of Toned milk processing for a liquid milk plant situated in North Western state in India. They estimated component wise and process wise cost of production of Toned milk and found that the total production cost of Toned milk was Rs. 2.07/kg. In the total production cost, the share of raw material was reported to be highest (80%) followed by steam (over 5%) and milk losses (2.53%). Remaining items contributed less than 12% of the total cost incurred on the production of Toned milk.

Singh and Kalra (1980) reported the cost on different components and on processing relevant to varied operations of products manufacture in experimental dairy of NDRI, Karnal for the year 1975-76, and found that the share of raw milk cost varied between 26.02 to 93.89 percent being minimum for sweetened condensed milk and maximum for skim milk (unpasteurized).

In general, among all the processes involved in the manufacturing of milk products, bottling or packing commanded maximum expenditure. However, an exception was noticed for the skim milk powder (roller and spray) where pre-heating and condensing shared maximum expenditure level among all the operations employed in their manufacture.

Raju (1980) worked out processing and manufacturing cost for various milk products in a dairy plant at Vijayawada and noticed the average cost of production of different dairy products namely Ghee, Baby food, Doodh peda, Industrial casein, Toned milk and Sweetened skimmed milk as Rs 18.55 per Kg, Rs 15.36 per Kg, Rs 8.42 per Kg, Rs 22.61 per Kg, Rs 1.51 per litre and Rs 1.34 per litre respectively. The results of the study suggested that increasing volume of raw milk and proper maintenance of utilities generated at factory level will help in minimizing the total cost of processing and manufacturing at the milk products factory.

Sharma (1981) fitted average cost functions for all sampled manufacturing units selected for the study by taking cost of handling milk (Rs. Per 1000 kg) as the dependent variable and the quantity of milk intake (in 1000 kg) as independent variable. The coefficients of fitted equation (quadratic form) i.e. intercept and the regressions were found to be statistically significant at 1% level. The quantity of milk intake explained 82 percent of the variation in the cost of milk handling.

Ram and Singh (1982) established cost capacity relationships, the total as well as per litre costs were regressed with capacity utilization of the study plants of the federation. The results revealed that while total costs experienced positive relationship with the capacity utilization, the per litre costs displayed negative relationships with per unit capacity utilization. The results revealed that with increase in milk handled, adequate levels of total and processing costs registered an increase. However, per unit costs experienced decline during study period with increase in capacity utilization.

Kalra and Singh (1985) estimated the cost of production of cheddar cheese by both the component wise and process wise in the Experimental dairy plant of NDRI, Karnal. The analysis revealed that raw material alone accounted for 74% of the total cost. It was followed by services (13.46%) and labour (5.27%). The process wise cost of production revealed that ripening of cheese was most expensive operation, which costs about 1/3rd of total costs followed by parafining (16.43%) and pasteurization.

Kumar (1987) studied manufacturing cost for dairy products in a dairy plant located in North West India and pointed out that the average cost of production of different dairy products namely Toned milk, Ghee, Paneer, Table butter, SMP, Lassi, Flavoured milk, Ice cream and Kalakand were Rs 1.34/litre, Rs 49.18/Kg, Rs 19.56/Kg, Rs 41.44/Kg, Rs 19.12/ kg, Rs1.87/litre, Rs 1.25/litre, Rs 2.50/Kg and Rs 21.32/Kg respectively.

Chahal (1991) compared the cost of processing of milk by co-operative and private sector dairy plants in Punjab and the results revealed that cost of processing for three co-operative plants were Rs. 119.75, Rs. 56.49 and Rs. 43.38 per 100 kg of milk and for two private dairy plants were Rs. 69.18 and Rs. 88.30 per 100 kg of milk respectively and concluded that private dairy plants were comparatively more efficient.

Chand (1991) conducted a study in Ganganagar district of Rajasthan for 60 indigenous milk product manufacturing units and found that the cost of production per kg. of Rasogolla was Rs. 17.83, for Chum-Chum was Rs. 15.40 and for Sandwich was Rs. 17.83. The profit margin on the units revealed that the large units showed a higher profitability in terms of milk products manufactured.

Saha (1996) studied the procurement cost of raw milk, processing cost and distribution cost of Toned and Double toned milk in Co-operative Milk Producer's Union Ltd., Orissa and found that the Procurement cost of raw milk was Rs 1.07 per litre. The average processing cost was found to be 1.16 paise per litre for Toned milk and 1.15 paise per litre for Double toned milk and found that share of fixed costs was 7.72 percent and share of variable costs was 92.38 percent of total processing cost for both types of milk. Distribution cost was 22.3 paise per litre of milk, of which variable cost accounted for 99.5 percent, while fixed cost accounted for 0.5 percent for both types of milk.

Singh and Kalra (1997) conducted a study on economic efficiency of the Experimental dairy plant, NDRI, Karnal. Based on 1993-94 data, the costing was done for 30 products and per kg cost of milk based raw material

were Rs. 50.23 for Ghee, Rs. 45.35 for Table butter, Rs. 34.62 for Paneer, Rs. 36.19 for Skim milk powder, Rs. 46.27 for Processed cheese, Rs. 17.92 for Ripened cheese, Rs. 6.19 for Dahi, Rs. 51.85 for Cheese spread, Rs. 15.53 for Gulab Jamun, Rs. 3.68 for Flavoured dairy drink and Rs. 4.86 for Toned milk.

Chakraborty (1998) conducted a study in Calcutta for 100 milk products manufacturing units. In that, the unit cost of production of Rasogolla, Sandesh, Pantoa, Chum Chum, Rajbhóg, Amrithi and Rasmalai were studied particularly in relation to fixed and variable cost. In the products, it was found that variable cost accounts for 2 only percent. Though all the products were making profit, net profit of Sandesh was highest (Rs. 32.16), followed by Rasmalai (Rs. 24.10), Rajbhog (Rs. 19.42) and Rasogolla (Rs.8.25). However, while calculating profit in percentage, it was Rajbhog which ranked first i.e. 47.58, followed by Rasmalai (44.96), Amrithi (41.61), Sandesh (41.14) and Chum-Chum (18.67). Profit in percentage for Rasogolla and Pantoa were 24.09 and 31.16 respectively.

Mondal (1999) conducted a study in Burdwan district of West Bengal on cost and returns of different Khoa and Chhana based products and reported that the per unit cost in Chhana based sweets varied from Rs. 26.71 (*Mouchak*) to Rs. 51.10 (*Sandesh*) and in case of Khoa based sweets it was Rs. 27.50 (*Gulab Jamun*) to Rs. 67.65 (*Peda*). Overall, it was observed that the percentage of net return from Chhana based products was more than khoa based products.

Singh *et al.* (2000) conducted a study on economics of Khoa and Chhana based products in Karnal market and reported that the overall variable and fixed cost was 92 percent and 8 percent, respectively. In case of Chhana based products, the average cost for all chhana based sweets was ascertained to be Rs. 35.81. The share of variable cost was 92.77 percent, where the fixed cost was 7.23 percent of the total cost and it was observed that overall net profit from Khoa-based sweets was Rs. 12.16 per kg, while of chhana based sweets it was Rs. 14.76 per kg. of the product.

Murali (2001) conducted a study on economics of milk processing and manufacturing of milk products in a dairy plant in Tamil Nadu and revealed that average cost of production of different dairy products namely Standardized milk, SMP, Butter and Khoa were 46.8 paise per litre, Rs 70.19 per kg, Rs 91.23 per Kg and Rs 47.41 per Kg respectively.

Narnaware (2002) worked out manufacturing cost for various dairy products in experimental Dairy at NDRI, Karnal and found that the average cost of production of different dairy products namely Ghee, Butter, Pannier, Gulabjamun mix, Cheddar cheese, Ice cream, Burfi, Toned milk, Lassi and Flavored Dairy drink were Rs 126.53 per Kg, Rs 41.34 per 500 gm, Rs 66.41 per Kg, Rs49.64 per Kg, Rs 115.20 per Kg, Rs 3.93 per 100ml, Rs26.82 per 500gm, Rs3.25 per 200ml, Rs 3.25 per 200ml and Rs1.95 per 200ml respectively.

2.3 MARKETING COST, MARGIN AND MARKETING EFFICIENCY

Marketing cost and margin of a particular product reflect the efficiency of marketing system to a greater extent. Marketing efficiency is influenced by the channel, type, number and combination of market functionaries used for marketing of dairy products at a specific period of time. So, an attempt is made to review the available literatures related to marketing cost, margin and marketing efficiency for milk and milk products.

Ram and Singh (1971) studied the creameries in Karnal market and found that chhana based products like Rasogulla and Gulab Jamun offered highest economic opportunities. The net returns for these products were Rs. 120/- and Rs 113 per Rs. 100/- investment. Burfi also found a prominent position in milk utilization pattern by creameries consuming one -fourth of total milk. Dahi ranked third in profitability indicating 69.7 percent margins. Sweetened milk also commanded a good market for sale and carried 41.5 percent margin of profit. In case of creameries, butter carried comparatively more margin of profit (42%) as compared to cream (24.6%) and ghee (17.6%). The authors mentioned sufficient potentiality for maximization of profit in the business through alternative use at various product combinations

and together with the marketing of new products like flavoured milk and Ice-cream etc.

Ram and Solanki (1975) studied the milk market structure in Karnal city of Haryana. The study revealed that the existing systems of marketing in the hands of private venders were not conducive for dairy development. Four categories of intermediaries handled the trade of milk in the city. It was observed that majority of the milk venders were small traders handling 10 to 400 Kg. of milk per day. The volume of business of city producers varied from 20 to 120 kgs of milk. The halwai were handling milk ranging from 10 to 120 kgs and the majority was handling 10 kgs per day. The creameries handled a much larger amount of milk from 200 to 800 kgs daily. The number of market functionaries varied in different seasons. They observed that in channel (product – milk vendors – consumer) the producer's share in consumer's rupee was 79.5 percent, 69.9 percent and 79.5 percent in winter, summer and rainy seasons respectively. The Halwai / creamery's share was 15 percent, 22.6 percent and 19.6 percent in winter, summer and rainy seasons respectively. The study revealed that, the existing system of milk marketing is in the hand of private traders and was not conducive for dairy development. The producer's share in consumer's rupee was much less for the village milk producers as compared to urban producers ,as the number of intermediaries increased ,the producer's share in consumer rupee decreased.

Arora and Patel (1976) studied the role of various functionaries engaged in marketing of khoa in North West India. The study reported the price spread analysis, which showed that the producer received a share of 82.44 percent from consumer price and the remaining 17.56 percent was distributed among the wholesalers, retailers, brokers and for the other incidental charges associated with the marketing of the product.

Anand (1979) conducted a study on marketing cost for variety of milk and milk products for the Ambala milk plant under Haryana Dairy Co-operative Federation .He reported that marketing cost for various products namely Toned milk (1kg), Standardized milk (1kg), Sterilized milk (200 ml),

Lassi (200 ml), Paneer (200g) and Ice cream (60 ml) were Rs 0.14, Rs 0.14, Rs0.75, Rs 0.25, Rs 0.37, and Rs. 0.16 respectively.

Pawar and Sawant (1979) conducted a study to compare the efficiency of Private, Public and Co-operative milk processing units. The results revealed that among the three agencies the private agency was comparatively more efficient in terms of cost of milk procurement, processing and distribution services. Since, the milk marketing trade is carried on in a perfectly competitive market the costs and returns structure of milk marketing business and rate of returns on investment are mainly influenced by the ability of the individual agency in utilizing the installed capacity and diversifying the use of raw milk for different purposes. The study suggested that under utilization of milk plant should be avoided to make the plant economically viable.

Kumar (1981) studied on the innovations in the packaging of chhana in Eastern and Northern regions of India and reported that especially for dairy products, as they are extremely perishable, proper packaging is very essential. Hence, utmost care for proper packaging of chhana just after manufacturing must be taken in order to avoid post-manufacture contamination and subsequent spoilage during handling of transportation.

Bal *et al.* (1983) conducted a study on economics of milk production and its marketing in rural Punjab. They identified five marketing channels for milk:

1. Producer – milk vendor – consumer.
2. Producer – milk vendor – Halwai – consumer.
3. Producer – milk fed – consumer.
4. Producer – Halwai – consumer.
5. Producer – consumer.

Under these channels, they concluded that the intermediary agencies chewed 30 to 40 percent of the consumer's rupee depending upon the number of agencies involved in the channel. The break up of the total share was like that, the milk vendor chopped nearly 33 percent and 29 percent from

consumer rupee under channel I and channels II respectively. The Halwai pruned 18 and 27 percent under channel II and III respectively; milk fed too sliced 37.31 percent of consumers' rupee. The cumulative share of different agencies in consumer's rupee was as high as 38.32 percent under channel-II and 37.31 and 32.56 per cent under channel III and I respectively. This shows that higher is the number of agencies involved in the channel, lower is the share of producers in consumer's rupee.

Awasthi (1987) concluded that marketing of milk and milk products during drought requires re-programming of the marketing mix. The organization must ensure scheduling, that decide which consumer to supply and how much to allocate to each. It must concentrate on producing the high profit margin products rather than concentrate on the entire product line.

Singh (1987) studied the structure of milk marketing in rural Punjab in 1982-83. The study revealed that on an average farm in the state quantity of milk produced during 1982-83 was estimated to be 3250.71 litres, about 16 percent of milk produced was sold and remaining 84 percent was consumed at home. In marketing of milk, although state's involvement through Milkfed has played a commendable role in collection and distribution of milk particularly in rural Punjab area. The role of milk vendor is still dominant; he handles more than 45 percent of the milk marketed in the state. The study also showed that the extent of price spread is in between 33 to about 40 percent in marketing of milk in the state. The difference in the share of various agencies involved in marketing of milk is also significant .Producer received around 60 to 70 percent share of consumer's rupee. Although producer was benefited by selling of milk direct by either to consumer (or) to Halwais in comparison to other agencies, yet it was profitable to sell milk through milk federation.

Baxi (1988) concluded that the operation flood dairies must display the operation flood logo on all milk products packaging, advertisements etc. Products were marketed under 25 brand names at that time but he concluded that marketing under one brand name would reduce costs, standardize quality, facilitate planning and offer other advantages.

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Kaintt (1988) studied on efficiency of milk marketing channels in Amritsar district of Punjab and determined the share of producers in consumer rupee through various marketing channels. It varied from approximately 72 percent to 98 percent. The marketing channels studied were Producer – Consumer, Producer – Milk vendor – Consumer, Producer – Halwai – Consumer, Producer – Milk vendor – Halwai – Consumer. The marketing margins varied from 10.6 to 15.58 percent. These margins were comparatively more in summer than in winter whereas producer's share was more in winter than in summer season.

Kaur and Gill (1989) estimated marketing costs and marketing margin for liquid milk in various marketing channels in Ludhiana district of Punjab and observed that the marketing costs and marketing margin was highest in the channel Producer –Milk vendor- Halwai –Consumer as Rs 1.29 and Rs 0.61 per litre respectively and marketing margin was the lowest to the co-operative dairy plant as Rs.0.09 per litre in the channel Producer–Milk fed-Consumer and concluded that private milk vendors were getting more margin for milk.

Chahal (1991) compared the distribution cost of milk by co-operative and private sector dairy plants in Punjab and noticed that cost of distribution for three co-operative dairy plants were Rs. 37.17, Rs. 20.51 and Rs. 10.53 per 100 kg of milk and for two private dairy plants were Rs.7.67 and Rs. 18.71

Rs.0.72, respectively in the channel Producer-MPCS-Milk plant-Consumer and marketing margin was Rs 0.63 for co-operative plant and Rs. 0.95 for private plant and concluded that marketing margin was higher for private plant than co-operative plant.

Devaraja (2001) carried out a study on price spread for liquid milk in various marketing channels in Karnataka and reported that marketing costs for three co-operative dairy plants were Rs 0.92, Rs.2.04 and Rs.0.60 per litre and for two private dairy plants were Rs 0.80 & Rs 0.60 per litre respectively in the channel Producer–Milk plant-Consumer and also marketing margin were Rs.0.02, Rs.-2.86 and Rs.1.36 per litre of milk for co-operative dairy plants, and for private dairy plants were Rs.1.08 and Rs.0.16 per litre respectively, and concluded that marketing margin was higher for private plants.

2.4 CONSTRAINTS FACED BY DAIRY PLANTS IN PROCUREMENT OF MILK, PROCESSING, MANUFACTURING AND AT MARKETING OF DAIRY PRODUCTS.

Constraints mean all those factors, which hinder the process of effective milk procurement, processing, manufacturing and distribution of dairy products. The available literature on constraints faced by dairy plants in procurement of milk, processing, manufacturing and distribution of dairy products is scanty. The literature reviewed here, deals with constraints faced by milk producer's co-operative society, milk union, and at dairy plant level.

2.4.1 Dairy Plant Level

Raghunath (1968) studied 234 companies to analyze the reasons for under utilization of capacity. Out of the total, 200 companies reported under utilization. Among the various reasons, lack of demand (56) and shortage of raw materials and components (55) stood out prominent. Other companies reported either some other reason (or) a combination of these.

Helamma (1974) attempted to study possible energy saving methods by analyzing energy consumption in a liquid milk plant. It was pointed out that with the introduction of economy measures (the reduction of room

temperature, correct adjustment of burning and cleaning of boiler, reduced use of air conditioning and various modifications in milk processing) resulted in 25 percent saving in the prevalent energy use. Further, it was suggested that application of such measures throughout the Finnish Cooperative Dairy Organization would save about 15 million package material and methods have also been identified as crucial constraints in dairy industry. Economists in the different countries analyzed the various package types for processed milk and manufactured milk in terms of comparative costs, labour productivity in packing operations and proportion of the revenue from the sale of particular package in the total sale proceeds of milk products.

Paul (1974) classified all the factors that can explain under utilization in any industry at any point of time into three groups. 1. Industries characteristics: (i) market structure; (ii) pressure of demand and (iii) size of firm. 2. Policy influences: (i) Import substitution; (ii) Effective rate of protection and (iii) Raw material allocation. 3. Outliers: (i) Major additives to capacity in the industry in the preceding year (ii) strikes (iii) power shortages and (iv) transport bottlenecks.

Frank (1975) identified the points of energy usage on dairy farms for the purpose of conservation and allocation of energy. He further quantified the fixed and variable energy needs of selected tasks. His discussion was primarily based on the major uses of electricity on dairy farm operations.

Karim and Bhide (1975) examined the causes, which lead to under utilization of capacities in public enterprises. In brief, reasons identified were (i) rated capacity were wrongly calculated (ii) incorrect choice of technology (iii) inadequacy of demand (iv) inadequacy of raw materials (v) Inadequacy of power (vi) Lack of balancing equipment (viii) Industrial unrest and (viii) managerial short comings. They were of the opinion that it is by no means that capacity utilization should be treated as the role indicator of operating efficiency of a plant.

Singh (1981) studied processing constraints for two public dairy sector dairy plants in North-Western India and found that for the plant 'L' the highest

constraining influence owing to the less than optimum availability was of Aluminum foil expenditure on the profitability of double toned milk. The lowest degree of constraint was milk expenses in Paneer. For whole milk powder, the highest constraining impact was due to labour expenses and lowest constraining influence was fuel expenses in milk cake. For the economic efficiency of milk plant, in dry period, for the optimum use of milk availability, packing material, expenditure on sugar, power, consumable, quality-testing chemicals were the main constraints in different months. Apart from underutilization of plant capacity, primary resources labour, fuel, Aluminum foil and corrugated box acted as constraints in existing resource mix in varying degrees owing to their more than optimum use.

For the dairy plant 'V', the highest constraining influence was labour in butter, packing material in skim milk powder and lowest constraining influence was sugar in lassi and identified primary resources, packing materials, Aluminum foil, corrugated boxes, labour, fuel, testing chemicals, ghee tins, parchment paper and butter cartons as constraining influences at different degrees.

Singh (1981) in his study identified, ranked and analyzed the processing constraints affecting the economic viability of the selected milk plants of Punjab. He categorized milk as primary resource constraint for dairy sector followed by second category of resources of industrial origin like chemicals, detergents, glassware, tins, water, electricity, coal, fuel, aluminum foil, bottles, cartons, craft paper bags and machinery spare parts.

Rawat (1985) analyzed and reported that qualitative improvement of dairy industry rests primarily on the area of milk procurement. Liquid milk supply remains the biggest constraint the dairy industry faces today. Low capacity utilization also increases percentage fat losses, which however, declines with better utilization of capacities .Thus low capacity utilization increases the handling costs on both sides i.e. increases the handling costs on both sides i.e. more losses per litre handled and less variables share fixed costs.

Anand (1986) studied the constraints at experimental dairy of NDRI and identified (i) Inadequacy of raw milk (ii) Inadequacy of demand (iii) Wrongly estimated rated capacity (iv) incorrect choice of technology (v) Inadequacy of power (vii) Industrial unrest as major constraints.

Choudary A.R (2002) studied the impact of liberalization on dairy co-operative economy of West Bengal and found that the brunt of liberalization was severely felt by the marketing sector followed by procurement. The author reported that lack of retail outlets for sale of products was the biggest problem of marketing, Irregularity and lack of advance payments were most serious constraints during milk procurement and lack of processing plant was identified as most serious constraint in processing.

2.4.2 Milk Producers' Society Level Constraints

Vithal (1986) reported that (i) factions in the village (2) lack of adequate staff and trained personnel (3) lack of adequate infrastructure (buildings, apparatus) and (4) lack of transport facilities were major factors affecting working of co-operative society in Anandpur district of Andhra Pradesh .

Singh (1987) studied constraints in Milk producer co-operative societies of Karnal district and found that (i) violation of bye laws, (2) low utilization of input services, (3) less knowledge about cooperative principle and functioning (4) mis-management (5) dishonest and inefficient committees (6) Inter group – Intra group rivalries among leaders (7) lack of coordination with union officials (8) factions in milk producers and (9) lack of interest among members, were major factors affecting functioning of society.

Shroti (1989) reported that irregular payment, unqualified and untrained first aid workers, lack of supply of FMD and HS vaccine were the very serious constraints at milk producers' society level regarding procurement of milk in the Aligarh milk shed area.

Kaushik and Singhal (1992) felt that the infrastructural problem, i.e. the dairy co-operative society being far away from home or having difficulty in taking milk to dairy co-operative society was the major problem for dairy farmers in Karnal district of Haryana.

Bairathi (1994) listed timely unavailability of veterinary services, lack of coordination and cooperation between society and union and lack of fund for circulation were three very serious constraints faced by dairy farmers of Rajasthan at milk producers co-operative society level.

2.4.3 Milk Union Level Constraints

Bhanja and Dubey (1983) emphasized that lack of rational system of milk collection, cut throat competition between plants, unhealthy competition from unorganized sector and prejudice of milk producers against milk sale were main drawbacks in milk procurement in Haryana Co-operative dairy plants.

Shroti (1989) studied constraints in Milk producers' Cooperative Union Ltd., Aligarh and found that very serious constraints affecting milk procurement were middlemen providing incentive to the milk producers in the form of advance payment, lack of co-operative building, lack of fund for circulation, lack of educational and training programmes about society, lack of training programmes for milk enhancement etc.

The literature reviewed here, shows that, all these studies conducted regarding milk procurement, processing, manufacturing, and distribution of dairy products partly in co-operative dairy plants or partly in private dairy plants. Most of the studies were conducted regarding liquid milk marketing aspects in Co-operative or Private dairy plants alone or in some other channels only. Very few studies have compared only the liquid milk marketing of Co-operative and Private dairy plants. No study has been conducted to compare the marketing of milk and milk products by Co-operative and Private dairy plants in an in-depth manner. Keeping these things in view, the present comparative study is an attempt to cover all the aspects from milk procurement to distribution of dairy products by Co-operative and Private dairy plants in Tamilnadu.Therefore, the results of the study are highly useful for dairy farmers, dairy industry, researchers and the policy makers alike.

CHAPTER - 3

Methodology

3. METHODOLOGY

This chapter presents the methodological framework used in the study mainly covering selection of study area, sampling methodology, data collection, costing methodology and the analytical tools used. These are presented and discussed under the following subheads:

3.1 Sampling methodology.

3.2 Data collection.

3.3 Analytical framework.

3.1 SAMPLING METHODOLOGY

3.1.1 Selection of the State

Tamil Nadu has been purposively selected for the present study. Because, the state is rich in animal wealth with the cattle population of 90.46 lakhs and 27.41 lakhs Buffaloes .The state has a well-developed dairy infrastructure with 8,621 milk co-operative societies, 17 co-operative milk producers' union having 22.57 lakh producer members. The average procurement of milk by co-operative dairy plants is around 17.26 lakh litres per day. The processing capacity of co-operative dairy plants is 18.92 lakh litres per day. Besides, 9 private dairy plants are also operating in various capacities in the state and the state ranks fifth with an annual milk production of 46.22 lakh metric tonnes. (Policy Note on Dairy Development Department and Milk supply schemes in Tamil Nadu, 2004-05).

The dairy plants in Tamil Nadu are facing major problem in terms of increased cost in milk procurement, processing, manufacturing and distribution cost of dairy products. Moreover, after liberalization, co-operative dairy plants are facing cut-throat competition from private sector plants and various middlemen in marketing with regard to the market share.

3.1.2 Selection of Milk Plants

In Tamil Nadu during 2001-02, 29 dairy plants were operating with varying capacities, out of which 20 were in co-operative sector and 9 in

private sector. Out of these dairy plants, one milk plant from co-operative sector and one milk plant from private sector were selected purposively in Coimbatore district of Tamil Nadu to compare the marketing aspects of co-operative and private dairy plants.

3.1.3 Selection of Co-operative Societies and Collection Centres

The secondary information on quantity of milk collection by Primary milk producers' co-operative societies and collection centres was collected from their records. On the basis of this information, Primary milk producers' co-operative societies and collection centres were classified into different categories based on quantity of milk collection. From these categories, twenty milk collection centres from private dairy plant and twenty milk producers' co-operative societies from co-operative dairy plant were selected by Probability proportion to sample size method. While selecting the collection centres and co-operative societies, distance from the plant was also considered.

3.1.4 Selection of Chilling Centres

The selected co-operative plant and private plant had four chilling centres each which were selected for detailed investigation.

3.1.5 Selection of Transportation Routes

The milk is transported from collection centres to chilling centres and collection centres to plant directly by private hired vehicles (lorries, covered lorries and metadors). The secondary information on quantity of milk transported on different routes by co-operative and private dairy plants was collected .On the basis of this information, milk transportation routes were classified into different categories based on quantity of milk transportation. From these categories, twenty routes were selected by Probability proportion to sample size method.

3.1.6 Selection of respondents for identification of constraints

To identify the major constraints faced by dairy plants in procurement, processing and distribution of milk and milk products, the respondents were

plants. By this method seventy respondents from co-operative dairy plant and seventy respondents from private dairy plant were selected at different levels namely milk producer co-operative societies or milk collection centres, milk transporters, chilling centre, processing, manufacturing and distribution of dairy products.

3.2 DATA COLLECTION

Commensurate with the objectives of the study, both primary and secondary data were collected.

3.2.1 Primary data collection

In order to know about the history, organizational set up and functioning of the dairy plant, personal interviews were taken with dairy plant management personnel. The information regarding the future prospects, conduct variables like product, pricing, promotional and place of marketing information was collected from different dairy plant personnel and the information regarding the constraints faced by dairy plants at various levels namely milk producer co-operative societies or milk collection centres, milk transporters, chilling centres, processing and manufacturing and distribution of dairy products was ascertained from selected respondents through well structured and pre-tested schedules by personal interview method.

3.2.2 Secondary data collection

The data on milk collection components from milk producer co-operative societies and that of chilling cost components were collected from chilling centres, cost components of reception of milk from dairy plant and transportation cost components from the milk procurement section of selected dairy plants were collected for the financial year 2001-02. The fixed assets value for milk producer co-operative societies, chilling centres were elicited from respective milk producer co-operative societies and chilling centres.

The fixed assets value of dairy plant, salaries of staff in different sections were collected and also processing cost components like electricity, water, steam, refrigeration, packaging cost, detergents etc. were collected from the respective sections of selected dairy plants.

The data on distribution cost including transportation cost, sales commission for milk and milk products, selling expenses, administrative expenses, sales promotion and other miscellaneous expenditure were collected from distribution section of selected dairy plants for the financial year 2001-02.

3.3 ANALYTICAL FRAMEWORK (COSTING METHODOLOGY)

3.3.1 Milk Procurement Cost

Cost of milk procurement was ascertained by taking into account the cost of collection, transportation cost, chilling cost and cost of reception of milk at the reception dock.

3.3.1.1 Cost of collection

Total cost incurred on the cost of collection comprised of the fixed and variable costs. Fixed cost included (a) Salaries and wages paid to the procurement and administrative staff (apportioned as per the utilities derived) engaged in the process of procuring the milk (b) Depreciation on fixed assets and (c) Interest on fixed assets.

Fixed assets for collection centres were valued in terms of equipment supplied by the plants to the various co-operative societies, the milk cans, furniture and fixtures etc. maintained at the society level. Depreciation on value of fixed assets was taken from books and accounts section of respective dairy plants. Interest on the fixed assets was calculated at the prevailing rate of 6.25 per cent per annum respectively during the year.

Variable cost included the expenditure incurred on consumable articles like EDTA powder, Emulsifying agent, Antifoaming agent, various detergents and chemicals etc. used in the testing of milk, cleaning of cans, glass apparatus, books and forms ,and stationery supplied by the plant. The Milkotester service charges and rent paid for societies was also taken into account in the variable cost.

$$\text{Cost of collection per litre of milk} = \frac{\text{Total cost}}{\text{Total quantity of milk collected}}$$

3.3.1.2 Cost of Transportation

The milk collected at various collection centres is either transported to chilling centres or directly to the plant. The milk is transported by hired vehicles in milk cans to the chilling centres and directly to the plant from the areas around the milk plant and also milk is transported from chilling centres to the plant by the insulated milk tankers.

Taking these facts into consideration, the transportation cost was calculated in three phases:

(i) From collection centre to plant directly

(ii) From collection centre to chilling centre

(iii) From chilling centre to plant.

Transportation cost was worked out by using the formula given below from collection centre to the dairy plant directly and from collection centre to the chilling centre.

Total transportation cost = Salary and wages paid to the procurement staff for the different routes + Payment made to the transporter on the different routes - the penalty levied for the spoiled milk on the different routes.

$$\text{Transportation cost per litre of milk} = TCi / MT_i$$

Where

TC_i = Total transportation cost on the i^{th} route

MT_i = Total Quantity of Milk transported on the i^{th} route

3.3.1.3 Cost of chilling

The milk collected from various collection centres is transported to chilling centres. At the chilling centres, the milk is tested, weighed, chilled and stored in insulated storage tanks.

$$\text{Total cost of chilling} = \text{Fixed cost} + \text{Variable cost}$$

Variable cost at the chilling centre comprised of electricity charges, water charges, fuel charges, stationery cost, repairs and maintenance cost, consumables cost, wages of staff, telephone charges and miscellaneous cost

(cost of testing material, compressor oil). The fixed expenditure at the chilling centre included the salary of managerial staff, depreciation and interest on fixed assets.

Depreciation values on fixed assets were taken from books and accounts section of respective dairy plants. Interest on the fixed assets was calculated at the prevailing rate of 6.25 per cent per annum as mentioned earlier.

$$\text{Cost of chilling per litre of milk} = \frac{\text{Total cost of chilling}}{\text{Total quantity of milk chilled}}$$

3.3.1.4 Transportation cost from chilling centre to plant

The hired insulated tankers are used by the plant for transporting the milk from chilling centres to the milk plant. All these routes were included in the study to estimate cost of transportation from chilling centre to plant.

$$\text{Cost of transportation per litre of milk} = \frac{\text{Total payment made to transporter}}{\text{Total quantity of milk transported}}$$

3.3.1.5 Cost of milk reception

The milk is received at milk reception dock from various routes. Cost of milk reception was ascertained by taking into account the salaries and wages of procurement staff at milk reception dock, the water and electricity consumed in cleaning, washing and sterilization of cans, cost of spare parts, lubricants cost, repairs and maintenance cost and consumables cost. The depreciation and interest on fixed assets was also taken into account.

Depreciation values on fixed assets were taken from books and accounts section of respective dairy plants. Interest on the fixed assets was calculated at the prevailing rate of 6.25 per cent per annum respectively.

$$\text{Cost of reception per litre of milk} = \frac{\text{Total cost}}{\text{Total quantity of milk received}}$$

The procurement cost of milk in co-operative and private sector milk plants was worked out by using tabular analysis for the financial year 2001-

$$\text{Cost of reception per litre of milk} = \frac{\text{Total cost}}{\text{Total quantity of milk received}}$$

The procurement cost of milk in co-operative and private sector milk plants was worked out by using tabular analysis for the financial year 2001-02. To study the seasonal variation in the procurement cost of milk, the year was decomposed into four district seasons viz. Flush (April-July), Transitory season 1 (August-October), Lean season (November-January) and Transitory season II (February-March).

3.3.2 Processing and Manufacturing Cost of Milk Products (Cost of production)

Cost of production of dairy products comprised of the raw material cost and total processing cost of dairy products. Hence, total processing cost of dairy products excluded raw material cost of dairy products. Therefore, cost of production of dairy products comprised of following cost components:

a) Raw material

The raw material cost comprised of expenditure incurred on raw milk as total solids purchased, skim milk powder used, skim milk added, cream used and procurement expenses of milk. The value of the fat and SNF (total solids) used was taken as the basis for apportionment. The other raw material costs were allocated as such to the products concerned.

b) Electricity

Wages and salaries of electricians, the expenditure on electric goods, and the expenditure incurred for payment of electricity bills for different product manufacturing sections, depreciation and interest on electric installations were included in electricity costs. The cost was apportioned to different products based on electricity consumption in different product manufacturing sections from total electricity expenditure. Electricity charges were estimated on Kilo –watt - hour electricity consumption basis.

d) Steam

This group comprised of the expenditure on steam generation included fuel, electricity, repair and maintenance, interest and depreciation on boilers, water cost, consumable articles consumed and overheads incurred in the boiler section. The estimated quantity of the steam used in different processing operations was used for the apportionment of steam cost.

e) Refrigeration

Refrigeration unit consists of cold stores and chilled water tanks. Chilled water is used for chilling milk and milk products during processing. These groups of expenditure included expenditure on electricity, refrigerant gases, water, store expenses, interest and depreciation on installation and building and maintenance costs .The total refrigeration costs were apportioned to different product lines on the basis of heat absorbed or extracted by different products for cooling.

f) Maintenance and repairs

The salaries of staff employed to render maintenance and repair services, cost of spare parts fitted, electricity used included in this cost, where the machinery is used exclusively for a particular product, the cost of spare parts fitted were allocated directly to the product. In multi product use, machinery cost was apportioned according to quantity of milk used for different products. Maintenance charges were also apportioned on milk input basis.

g) Stationery and stores

The main items included in this group constituted salaries and other benefits provided to store officials, depreciation on stores building, stationery items, general store items, brushes, liveries, miscellaneous store items and wastages accruable to handling of store items. The cost was apportioned on the basis of value of items used directly for the particular product.

h) Labour

Direct wages was apportioned on man-hour basis to specific operations.

i) Packing material

Direct allocation was done for the cost of packing material like polyfilm cost, butter parchment paper cost etc. to different products.

j) House keeping (Detergents)

The cost of detergents like caustic soda, teepol, washing soda, nitric acid and alkalies were apportioned on the basis of quantity of detergent used for specific operations.

k) Quality control

All the expenditures incurred on chemicals, testing material, glassware, other miscellaneous items used in the quality control laboratory, electricity and labour charges constituted the quality control expenses and the total expenditure was apportioned to different products on the basis of their number of samples tested.

l) Salaries and administrative expenses

Salaries and other allowances paid to permanent staff employed by the plant were included in this cost component. Salaries and allowances paid to the staff in different products manufacturing sections, quality control, repair and maintenance, administration, stores and remaining sections were separately available. Salaries and allowances of sectional heads and administrative section people were allocated to all the products manufactured in the section on the basis of value of each product processed. Salary of product manufacturing section people was apportioned based on quantity and value of product produced.

m) Depreciation on building

The depreciation values on various buildings of all product manufacturing sections were taken from books and accounts section of

respective dairy plants. Depreciation of the buildings was apportioned to different products on the basis of space occupied by the machinery for the manufacturing of different products.

n) Depreciation on equipment and machinery

Depreciation is the annual cost of wear and tear on the equipments and machineries. In the present case, the depreciation values on equipments and machineries were taken from books and accounts section of respective dairy plants. Equipments and machinery depreciation charges were worked out on machine hour basis.

o) Interest on buildings

The interest was charged at 6.25 per cent per annum on all sections of dairy plant buildings based on original cost value. So, calculated interest on the buildings was apportioned to different products on the basis of space occupied by the machinery for the manufacturing of different products.

p) Interest on plant equipment and machinery

Interest is a logical item of cost for any production unit. The interest was charged at 6.25 per cent per annum on the value of equipment and machinery, electric installation and all other equipments. Equipments and machinery interest charges were worked out on machine hour basis.

q) Milk and milk solids losses

In processing and manufacturing of milk and milk products a certain fat and SNF losses in different production operations are unavoidable. The total fat and SNF losses were multiplied by their respective prices to arrive at the total losses.

r) Miscellaneous costs

This cost group included those items of expenditure, which were not identifiable and allocable to the above-mentioned cost components (e.g., insurance, bank charges, etc.). The total milk solids in different products were used to apportion this cost group.

The processing and manufacturing cost of milk products in Co-operative and Private sector milk plants was worked out by using tabular analysis for the financial year 2001-02.

3.3.3 Distribution Cost

Distribution cost of dairy products comprised of following cost components:

a) Selling expenses

It included expenses on advertisement, sales promotion and rent on booths, parlours.

b) Administrative expenses

It comprised of salary paid to marketing and sales personnel, stationery, telephone charges and taxi charges.

c) Sales commission

Sales commission paid to wholesalers, retailers and commission agents for delivery of milk and milk products to consumers was also recorded and considered.

d) Transportation cost

It included the contractors' payment made to transporters for transportation of milk and milk products to booths, parlours and sales outlets and also cost of transportation incurred to owned vehicles of the dairy plant for selling of dairy products.

e) Storage cost

This included expenses incurred for storage of milk and milk products under refrigerated condition.

f) Labour wages

This included expenses incurred for loading and unloading of milk and milk products in the dairy plant.

g) Sales tax

The expenses towards sales tax was calculated on the basis of certain percentage of tax paid to government for selling milk products to consumers by dairy plant.

h) Depreciation and Interest on transport vehicles

Depreciation values on transport vehicles were taken from books and accounts section of respective dairy plants. The interest was charged at 6.25 per cent per annum on the value of transport vehicles.

I) Miscellaneous cost

It included the postage charges, bank charges etc.

Total distribution cost was apportioned to milk and milk products based on total sales value of milk and milk products. Distribution cost was worked out to dairy products by using tabular analysis for the year 2001-02.

3.3.4 Marketing Cost

Marketing cost is the actual cost incurred by each agency involved in the marketing channel. (or)

The total cost, incurred on marketing by producer - seller and by the various intermediaries involved in the sale and purchase of the commodity till the commodity reaches the ultimate consumer (Acharya, 1999)

$$C = C_f + Cm_1 + Cm_2 + Cm_3 + \ldots + Cm_i$$

Where

C = Total cost of marketing of the commodity

C_f = Cost incurred by the producer from the time the product leaves the dairy plant

Cm_i = Cost incurred by the i^{th} middleman in the process of buying and selling the product

In dairy plant total marketing cost comprised of procurement cost of milk, processing cost and distribution cost of dairy products.

3.3.4.1 Marketing margin of a middleman

This is the difference between the total payments (costs +purchase price) and receipts (sale price) of the middleman (i^{th} agency) (Acharya, 1999)

Average Gross Margin of i^{th} Middleman (Am_i) formula was used.

$$Am_i = \frac{Tr_i - Tp_i}{Q\ h_i}$$

Where

Tr_i = Total receipt of i^{th} middleman

Tp_i = Total payments of the i^{th} middleman

Qh_i = Total quantity of produce handled.

Marketing margin of a dairy plant was the difference between the selling price of the product per unit and total cost incurred for marketing the product per unit.

3.3.4.2 Marketing efficiency

Marketing efficiency indicates that the ratio of the value added for the goods to the marketing cost. (Shepherd, 1965)

$$ME = \left(\frac{V}{I} - 1\right)$$

where

V = Value added for the milk products.

I = Total marketing cost incurred.

ME = Index of marketing efficiency

Value added: The difference between the costs of goods purchased by a firm and price for which it sells those goods. This difference represents the value added by the productive activities of the firm. (Kohls and Uhl, 1967)

Value added = Selling price of the product – Raw material cost

Raw material cost = Cost of total solids (Fat and SNF) utilized for manufacturing different dairy products.

Total marketing cost comprised of milk procurement cost, processing cost and distribution cost of dairy products.

Marketing cost, marketing margin and marketing efficiency of dairy products by dairy plants for the year 2001-02 were worked out by using Tabular analysis.

3.3.5 Identification of constraints faced by dairy plants in procurement of milk, processing, manufacturing and at distribution of dairy products

In preliminary survey, a list of constraints was prepared by collecting first hand information in dairy plants for marketing of milk and milk products. In order to make this list more comprehensive, constraints identified by previous researchers were collected from literature and also obtained from experts and dairy plant personnel. The constraints categorized under the headings at different levels namely milk producer co-operative societies or milk collection centres, milk transporters, chilling centre, processing and manufacturing and distribution of dairy products. It was measured by assessing scores of 3, 2 and 1 for very serious, serious and not so serious respectively as perceived by selected respondents.

Constraints were analyzed by tabular analysis method based on total score and finally ranked based on highest total score value as most important constraint and lowest total score as least important constraint.

CHAPTER - 4

Description of Dairy Plants

4. DESCRIPTION OF THE DAIRY PLANTS

4.1 GENERAL INFORMATION ABOUT STUDY AREA

Coimbatore district is one of the thirty districts of Tamil Nadu. It is situated at the foothills of Nilgiris mountain range. The total population of district is about 42.24 lakhs out of which sixty-five percent live in rural areas. The total geographical area is about 7469.2 sq. km, out of which 1615.42,3585.48 and 1420.27 sq. km are forest, cultivable and irrigated area respectively. Four major rivers flow through the district namely Bhavani, Noyyal, Amaravathi and Aliyar, which benefit the agriculture and dairying activities in the district. Open wells and government canals are major irrigation sources in the district. It has 1,63,615 ha of the net area under irrigation out of which 1,17, 669 ha (71.92%) of land is irrigated by wells and 33,282 ha (20.34%) of land is irrigated by government canals, and 2207 ha (1.35%) of land is irrigated by tanks and the rest 10,457 ha (6.39%) by other sources. (Refer Fig.4.1) The gross irrigated area in the district is 1,81,920 ha. The ratio of net irrigated to net area sown is about 49.77 percent and the ratio of gross area irrigated to gross area sown is slightly higher standing at 51.36 percent. (Tamilnadu Statistics at a glance, 2005)

4.1.1 Agriculture

Agriculture is the prime occupation of the people. The principal crops grown in the district are Paddy, Sorghum, Maize, Pulses, Groundnut, Cotton, Sugarcane, Gingelly and Castor. Banana, Turmeric, Mango, Chillies and Onion are the major horticultural crops grown in the district.

4.1.2 Dairying

Dairying is an important allied activity in this district, which is practiced in combination with crop cultivation. The entire district has a population of 3,57,687 cattle and 96,488 breedable buffaloes (17th Livestock Census, 2002). The district has a wide range of veterinary institutional net work to monitor animal husbandry and dairying activities in the district. (Table.4.1)

Table 4.1 Veterinary institutions in Coimbatore District (2000-2001)

S. No	Vety. Institutions	No' s
1	Poly clinics	1
2	Clinical centres	1
3	Hospitals	15
4	Dispensaries	40
5	Mobile Dispensaries	19
6	Mobile units	2
7	Sub centres	124

Source: Dept. of Vety. Science, Tamilnadu.

Keeping these factors in view and easy access to the data for the researcher from the dairy plants, the dairy plants were selected from Coimbatore district of Tamilnadu purposively.

4.2 CO-OPERATIVE DAIRY PLANT

The selected co-operative dairy plant was started by the Tamil Nadu Dairy Development Corporation in 1978. The Union established its own collection centres and chilling centres for the collection of milk in this area. The commercial production of products namely Butter and Ghee started in 1987. In the initial stage, the plant procured 25,000 litres of milk per day with its two hundred and twenty primary milk producer's co-operative societies. Thereafter, the plant gradually expanded its activities and has now reached a daily milk procurement average of 1,25,000 litres per day. The dairy complex is located in about thirty six acres of land. In the initial stage, the installed capacity of the dairy plant was one lakh litres of milk per day, which was subsequently enhanced to two lakh litres per day.

4.3 PRIVATE DAIRY PLANT

The Private dairy plant was started in 1993. The private plant is having own collection centres and chilling centres that follow Anand-pattern of milk collection in this area. Initially, the plant procured 20,000 litres per day of milk with its one hundred forty milk collection centres. The plant gradually

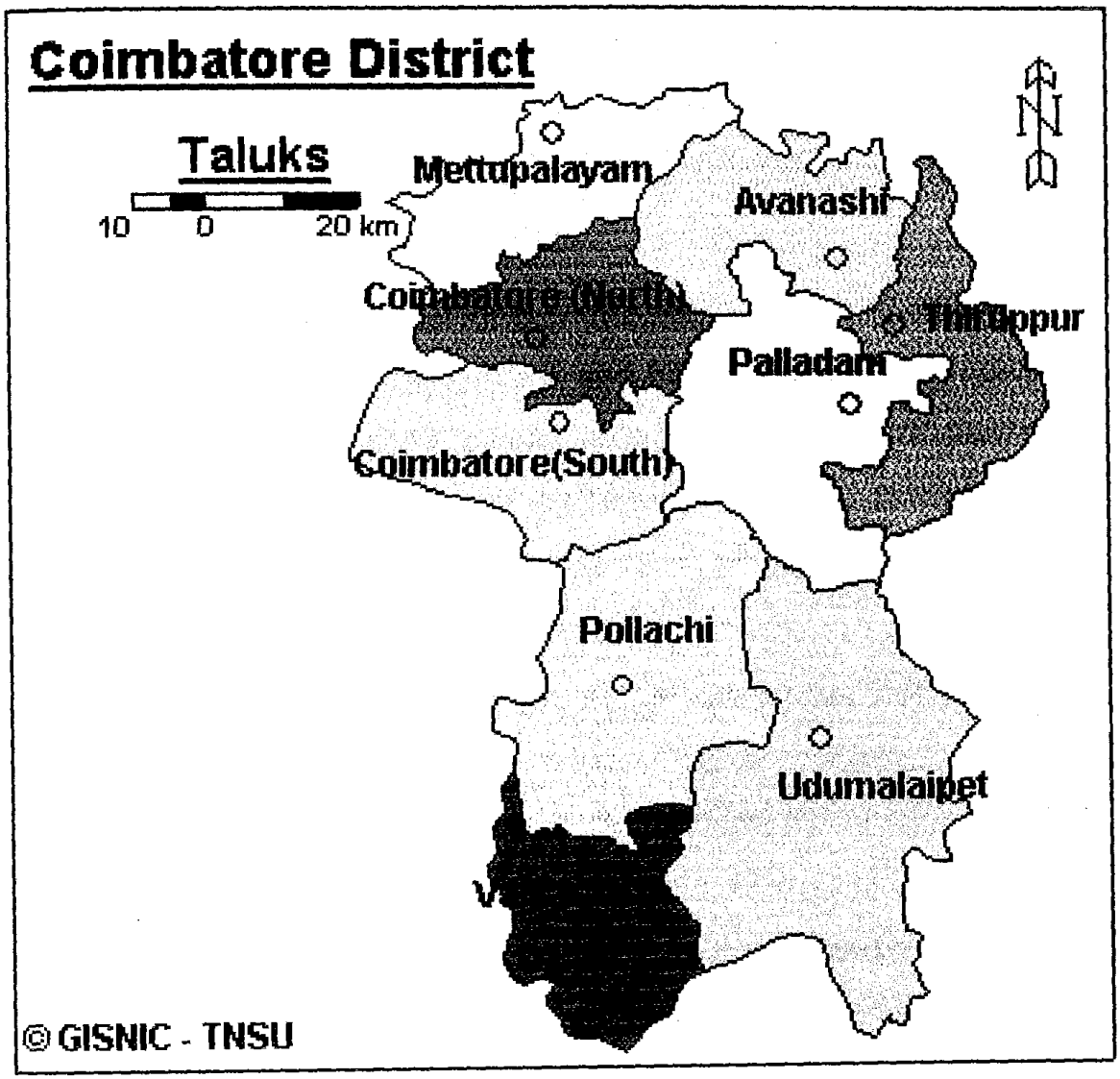

Fig.4.1 Map indicating the location of the study area

extended its activities to increase milk procurement and now reached a daily average of 1,50,000 litres milk procurement per day. The Butter and Ghee production was started commercially in 1998. The dairy plant area is about forty acres of land. In the initial stage, the installed capacity of the dairy plant was one-lakh litres of milk per day, which was later increased to two -lakh litres per day.

Computer facilities are functional at both of these dairy plants. Milk billing, pay bills, transport bills and financial accounting of both the plants are done through the Computers. (Also See Annexure I)

4.4 PROCUREMENT SYSTEM

The milk-shed area for both the plants is spread over the entire district of Coimbatore. The procurement and input operations of co-operative dairy plant are being managed through five milk procurement teams .The milk is collected from milk producers by 525 primary milk producers' co-operative societies. The collected milk is delivered for chilling at the dock of the four chilling centres and at main dairy.

The private dairy plant is procuring the milk through five milk procurement teams. Around 545 milk collection centres are attached with the Private dairy plant. The collected milk is chilled at the four chilling centres and at main dairy.

Milk from the entire milk shed area is collected and transported to both the plants and respective chilling centres through the various routes by lorries, covered lorries and matadors hired by the plants on kilometre basis. Both the dairy plants are diverting the chilled milk from chilling centres to main dairy for pasteurization and further processing.

4.5 SYSTEM OF MILK COLLECTION

The system of milk collection is similar in both the plants. The collection of milk is done from the producer members at the various co-operative societies or milk collection centres both in the morning and evening. The producers are bringing their surplus milk to the society or collection

centre, where it is measured and tested for quality before acceptance. The milk thus collected is filled in cans and sent to chilling centres and dairy plant at prefixed timings through the transport provided by the plants.

4.6 MODE OF TRANSPORTATION

The mode of transportation of raw milk from the collection centres to chilling centres and to the dairy plant is on contract basis by twenty-five milk contractors attached with the co-operative plant and twenty milk contractors attached with private dairy plant through the lorries, covered lorries and matadors. The entire area is organized into forty-one milk collection routes for co-operative dairy plant and forty –three milk collection routes for private dairy plant.

The vehicles collect the milk cans from the various collection centres on the route at the prescribed time both in morning and evening hours. The arrival timings of the hired vehicles of both the plants are so adjusted that there is always a gap of ten to fifteen minutes between each vehicle depending upon the quantity of milk transported by concerned vehicle. After receiving the milk, the empty sterilized cans are handed over to the vehicles for delivering to the collection centres.

The contractor is responsible for running the vehicle on the specified route for the specified period usually a year for both the plants according to the terms and conditions laid down. The contractor is paid on kilometre rate basis at monthly intervals, subject to the deduction on account of spoilage/ sourage of milk due to delivery of milk in the plant.

4.7 MILK RECEPTION

On the arrival of the milk vehicle in both plants, the milk cans are deloaded and the doubtful cans are set aside for conducting the acidity and clot-on-boiling test (C.O.B. test). The cans giving positive C.O.B and high acidity results are kept aside and the milk is declared as spoiled milk. The results of the milk testing for the individual societies or collection centres is recorded on the truck sheets, and are sent by the raw milk reception dock to

the laboratory immediately after all the routes are cleared. Once the quality control completed the recordings, the recorded sheets are sent to dairy accounts branch and milk transporters.

As the milk is accepted on the basis of fat and S.N.F. percentage content of milk, the same is prepared in consolidated form for different societies or collection centres for morning and evening separately. The total receipts of each route in each shift in respect of quantities of milk, fat and S.N.F. are recorded daily.

4.8 PAYMENT SYSTEM

In Co-operative plant, the payment for milk is made to the members of the milk producer co-operative societies at ten days interval through bank. But, in Private dairy plant, the payment for milk is made to the members of the milk collection centres immediately after two days interval through bank.

4.9 PRODUCT MIX OF THE DAIRY PLANTS

The Co-operative Dairy plant has an installed capacity to process two lakh litres of milk per day. The plant is producing three types of market milk (Toned milk, Standardized milk &Full cream milk) around 90,000 –1,00,000 litres per day. The surplus milk after local sales is converted into products namely Butter, Ghee, Flavoured milk and Milk Peda, respectively. These products are sold in the markets in Tamilnadu and all over India through the Tamil Nadu Co-operative Milk Producers Federation Ltd. labeled with "Agmark" and "ISI" grades. These products bear the famous brand name of "AAVIN". On an average, the plant produces 35,000 kg of Butter per month, 30,000 kg of Ghee per month, 2,000 kg of Milk Peda per month and 1,300 litres of Flavoured milk per month. And also, the plant produces Mysorepak, Butter milk and Curd in smaller quantities based on the market demand or order basis. Skimmed milk powder of around 40,000 kg per month is produced for this plant by Erode Co-operative dairy plant on cost basis.

The installed capacity of Private Dairy Plant is two-lakh litres of milk processing per day. The private plant processes around 95,000-1,05,000

litres of milk per day comprising of three types namely Toned milk, Standardized milk and Full Cream milk and the excess milk available after sales is converted into products namely Butter, Ghee, Flavoured milk and Paneer and these are sold in the markets in and around Coimbatore and throughout India by various middlemen namely wholesalers and retailers. On an average, the plant produces 50,000 kg of Butter per month, 30,000 kg of Ghee per month, 7,500 kg of Paneer per month and 10,000 litres of Flavoured milk per month. The plant also produces Curd and Butter milk in minimal quantities based on market demand or order. (Also see annexure V)

4.10 INPUT SUPPLY

The veterinarians of both the dairy plants provide artificial insemination service, emergency veterinary service and other healthcare services to the animals of the milk producers attached with milk collection centres or milk producer co-operative societies. In the milk shed area of Co-operative dairy plant, artificial insemination with exotic, crossbred and Murrah bull semen is undertaken at the sub-centres of the primary societies and the nutritious cattle feed is supplied to the Co-operative society members at nominal rates.

4.11 DISTRIBUTION OF MILK AND MILK PRODUCTS

In Co-operative dairy plant, around 420 commission agents are carrying out distribution of market milk especially through booths via 22 milk supply routes and also through 11 Union parlours and 19 private parlours . Milk products are especially sold through middlemen like Wholesalers (10), Retailers (15) and through Tamil Nadu Co-operative Milk Producers' federation Limited (TCMPF) for other states by clearing and forwarding agents and smaller quantities are sold through Union parlours (11) and private parlours (19). The plant also distributes milk through card sales to consumers, to various institutions and hotels.

In private dairy plant, the distribution of market milk is especially carried out by 510 commission agents at private shops via 25 milk supply routes. Milk products are especially sold through middlemen like Wholesalers (22), Retailers (24) and to other states by six commission agents.

4.12 SALES COMMISSION

The Co-operative dairy plant pays commission for both Toned milk and Standardized milk at the rate of forty paise per litre and eighty paisa per litre for Full cream milk. The wholesaler is paid a commission of 3.5 percent, 12.5-13 percent, 9 percent and 1.5 percent for various dairy products namely Butter, and Ghee, Milk Peda and Flavoured milk on the basis of their selling price, respectively.

The Private dairy plant pays higher commission than Co-operative plant for both Toned milk and Standardized milk at the rate of fifty paisa per litre and ninety paisa per litre for Full cream milk, and to wholesaler a commission of 5.0 percent, 13-15 percent, 10 percent and 1.5 percent for various dairy products namely Butter, Ghee, Paneer and Flavoured milk of their selling price respectively. The plants also pay a sales tax to Butter, Ghee, Milk Peda, Flavoured milk and Paneer as 8 percent, 6.5 percent, 9.5 percent, 1 percent and 1 percent of their selling prices respectively.

CHAPTER - 5

Results and Discussion

5. RESULTS AND DISCUSSION

This chapter presents the findings of the study based on the objectives stated for investigation and the data collected were analyzed by employing appropriate statistical techniques as given in the chapter on methodology. The results of the study are presented and discussed in this chapter in the following sequential order for both the dairy plants.

5.1 Procurement cost of milk.

5.2 Processing and manufacturing cost of dairy products.

5.3 Distribution cost of dairy products.

5.4 Marketing cost, Marketing Margin and Marketing efficiency of Dairy products.

5.5 Constraints faced by dairy plants in Procurement of milk, Processing, manufacturing and Distribution of dairy products.

5.1 PROCUREMENT COST OF MILK

The procurement cost comprises of cost of collection of milk, cost of transportation, chilling cost and cost of milk reception. The procurement cost components have been worked out and the results are discussed in this section for both the dairy plants.

5.1.1 Cost of Collection of Milk

The milk shed area for both the plants is spread over the entire district of Coimbatore. The milk collection for the dairy plants was done through organizing five hundred and twenty five primary milk producers' co-operative societies which were attached with the Co-operative plant and five hundred and forty five milk collection centres which were attached with the Private dairy plant respectively.

The component-wise cost of collection per litre of milk has been estimated for selected twenty milk producer co-operative societies (MPCS) and twenty milk collection centres attached with Co-operative and Private dairy plants respectively.

Table 5.1 indicates that in Co-operative dairy plant, the overall average cost of collection per litre of milk was found to be 37 paisa per litre. The average quantity of milk collected per society was 10,744 litres of milk per month. The share of fixed cost was 77 per cent and share of variable cost in the total cost was found to be 23 per cent. The salary of staff was maximum with 66 per cent followed by rent paid for societies which was 10 per cent and milko- tester service charges were around 4 per cent.

Table 5.1 Component wise average milk collection cost (Rs/lit)

Particulars	Milk Producers' Co-operative societies		Milk collection centres	
	Amount (Rs)	Per cent Cost	Amount (Rs)	Per cent cost
A. Fixed cost				
Depreciation	124.82	3.16	146.85	3.74
Interest	299.56	7.60	306.80	7.81
Salary of staff	2602.50	65.99	2472.50	62.94
Sub total	3026.87	76.75	2926.15	74.48
B. Variable cost				
Detergents	51.86	1.31	54.51	1.39
EDTA powder	24.88	0.63	26.01	0.66
Emulsifying agent	29.89	0.76	31.41	0.80
Antifoaming agent	47.70	1.21	35.39	0.90
Rent paid for societies	413.04	10.47	414.14	10.54
Books and forms	134.74	3.42	241.51	6.15
Milko tester service charges	172.20	4.37	152.08	3.87
Miscellaneous items	50.90	1.29	47.45	1.21
Sub total	917.16	23.25	1002.48	25.52
Total cost (A+B) (Rs)	3944.03	100.00	3928.63	100.00
Quantity of milk collected (lit)	10744.00		10505.00	
Cost of collection per litre of milk (Rs)	**0.37**		**0.38**	

It is visualized from the table 5.1 that the overall average cost of collection per litre of milk was 38 paisa for milk collection centres of Private dairy plant. The average quantity of milk collected per milk collection centre was around 10,505 litres of milk per month. The share of fixed cost and variable cost in total cost was found to be 75 per cent and 25 per cent respectively. The salary of staff was highest with 63 per cent followed by rent paid for societies was 11 per cent, books and forms was 6 per cent and milko tester service charges was around 4 per cent. Thus, it can be concluded that there was a slight variation in cost of collection of milk between MPCS and milk collection centres.

5.1.1.1 Seasonal variation in the cost of collection of milk

The per litre cost of collection and total quantity of milk collected per season was worked out for selected MPCS and milk collection centres of Co-operative and Private dairy plants.

Table 5.2 shows that per litre cost of collection of milk varied in different seasons. The overall average cost of collection of milk varied from a minimum of 34 paisa in flush season and to a maximum of 39 paisa in lean season for Co-operative dairy plant. The average quantity of milk collected in flush season was 11,522 litres and it was 10,068 litres in lean season for MPCS.

It is evident from table 5.2 that the overall average cost of collection of milk varied from a minimum of 36 paisa in flush season and to a maximum of 39 paisa in lean season for Private dairy plant. The average quantity of milk collected in flush season was 10,832 litres and it was 10,220 litres in lean season for milk collection centres.

It could be revealed from the above analysis that quantity of milk collected varied from season to season and so the cost of collection also varied to societies and milk collection centres in different seasons depending upon the total per day milk collection.

Table 5.2 Season wise cost of collection per litre of milk (Rs)

Particulars	Seasons	Co-operative dairy plant				Private dairy plant			
		Flush	Transitory 1	Lean	Transitory 2	Flush	Transitory 1	Lean	Transitory 2
A. Fixed cost									
Depreciation		124.82	124.82	124.82	124.82	146.85	146.85	146.85	146.85
Interest		299.56	299.56	299.56	299.56	306.80	306.80	306.80	306.80
Salary of staff		2602.50	2602.50	2602.50	2602.50	2472.50	2472.50	2472.50	2472.50
Sub total		3026.87	3026.87	3026.87	3026.87	2926.15	2926.15	2926.15	2926.15
B. Variable cost									
Detergents		53.75	53.00	51.67	49.00	52.63	55.50	55.50	54.40
EDTA powder		25.87	25.23	24.82	23.59	26.54	26.40	25.78	25.30
Emulsifying agent		29.25	30.50	30.16	29.63	30.00	32.00	30.75	32.88
Antifoaming agent		33.37	90.24	34.25	32.93	33.33	36.72	34.97	36.55
Rent paid for societies		414.38	412.50	412.50	412.78	416.88	417.50	412.17	410.00
Books and forms		134.00	135.83	133.25	135.88	207.63	238.08	263.58	256.75
Milkotester service charges		186.13	168.33	167.33	167.00	149.56	155.00	151.75	152.00
Miscellaneous items		54.13	45.45	53.03	51.00	47.88	46.58	45.08	50.25
Sub total		921.61	957.09	894.26	895.66	964.43	1007.78	1019.58	1018.13
Total cost (A+B) (Rs)		3948.48	3983.96	3921.13	3922.53	3890.00	3933.00	3945.00	3944.00
Quantity of milk collected (lit)		11522.00	10802.00	10068.00	10586.00	10832.00	10475.00	10220.00	10496.00
Cost of collection per litre of milk (Rs)		**0.34**	**0.37**	**0.39**	**0.37**	**0.36**	**0.38**	**0.39**	**0.38**

5.1.1.2 Cost of milk collection according to the level of milk collection

The total quantity of milk collected at milk collection centres and MPCS has direct bearing on the cost of milk collection. To find out the level at which the cost of collection would be minimum, the collection centres and MPCS were classified according to volume of milk collected per month viz. up to 3,000 litres, 3,001-6,000 litres, 6,001-9,000 litres, 9,001-12000 litres, 12,001 – 15,000 litres, 15,001 – 18,000 litres, 18,001 – 21,000 litres, 21,001 – 24,000 litres, 24,001 – 27,000 litres and above 27,000 litres of milk. The details of number of societies or collection centres collecting the milk from producers according to level of milk collected have been summarized in Table 5.3.

It is clear from table 5.3 that the cost of milk collection for a litre of milk was negatively correlated with total quantity of milk collected. The cost of milk collection was found to be as high as Rs. 1.42 for those centres where total milk collection in a monthly average was less than 3,000 litres.

The cost decreased to 31 paisa per litre in those MPCS, where the milk collection increased to 12,000-15,000 litres. It was found to be lowest of 22 paisa per litre for the MPCS collecting more than 24,000 litres of milk, confirming the hypotheses of economies of scale.

Table 5.3 shows that the cost of milk collection according to level of milk collection for milk collection centres of the Private dairy plant.

It is obvious from the table, that the cost of milk collection for a litre of milk was inversely proportional to total quantity of milk collected for milk collection centres. The cost of milk collection was as high as Rs. 1.36 for those centres whose total milk collection in a year was less than 3,000 litres.

The cost decreased to 29 paisa per litre in those collection centres where the milk collection increased to 12,000- 15,000 litres. It was found to be minimum of 22 paisa per litre for the collection centres collecting more than 24,000 litres of milk, confirming the hypotheses of economies of scale in milk collection.

Table 5.3 Total and per litre cost of milk collection at different levels of milk collection (component wise)

Level of milk Collection (litres)	Number of Societies	Depreciation on Fixed assets (Rs)	Interest on Fixed assets (Rs)	Salary of Staff (Rs)	Total fixed Cost (Rs)	Total variable Cost (Rs)	Total Cost (Rs)	Quantity of Milk collected per month (lit)	Cost of collection Per litre (Rs)
Co-operative dairy plant									
0-3000	2	87.14	209.13	1925.00	2221.26	859.61	3080.87	2189	1.42
3001-6000	5	92.45	221.89	2250.00	2564.34	832.63	3396.98	4605	0.75
6001-9000	5	124.09	297.81	2350.00	2771.90	863.94	3545.93	7604	0.47
9001-12000	2	139.35	334.45	2800.00	3273.80	915.58	3687.48	10793	0.34
12001-15000	1	150.88	362.10	3000.00	3512.98	903.88	4177.69	13706	0.31
15001-18000	1	166.51	399.63	3100.00	3666.14	932.71	4445.69	16382	0.27
18001-21000	1	176.97	424.73	3350.00	3951.69	955.72	4621.86	19638	0.24
21001-24000	1	184.74	443.38	3900.00	4528.11	1241.48	5193.18	22356	0.23
24001-27000	1	216.67	520.00	4650.00	5386.67	1019.40	5547.52	25204	0.22
>27000	1	216.67	520.00	4650.00	5386.67	1256.67	6643.33	30605	0.22
Private dairy plant									
0-3000	2	90.25	216.59	1400.00	1706.84	878.50	2585.34	1906	1.36
3001-6000	5	115.96	278.30	2340.00	2734.26	965.37	3699.63	4547	0.81
6001-9000	5	108.94	261.47	2220.00	2590.41	932.93	3523.34	7780	0.45
9001-12000	2	120.87	290.08	2300.00	2710.95	934.13	3645.07	10188	0.36
12001-15000	1	135.23	324.56	2600.00	3059.79	1063.58	4123.37	14008	0.29
15001-18000	1	151.70	364.08	2750.00	3265.78	1104.67	4370.45	16213	0.27
18001-21000	1	166.51	399.63	2900.00	3466.14	1278.83	4744.98	19199	0.25
21001-24000	1	176.23	422.96	4100.00	4699.19	1092.33	5791.52	22394	0.25
24001-27000	1	406.53	487.83	4300.00	5194.36	1164.00	6358.36	26534	0.24
>27000	1	406.53	487.83	4300.00	5194.36	1234.00	6428.36	28970	0.22

5.1.1.3 Cost function

The relationship between quantity of milk collected (X) and the cost of collection per litre of milk (Y) was ascertained by fitting suitable regression models for different seasons of Co-operative dairy plant and Private dairy plant is presented in Table 5.4.

The estimated cost function is given in Table 5.4 for different seasons. The cost of milk collection in flush season could be reduced by 0.56 per cent, if quantity of milk collection is increased by 1 per cent. The r^2 value indicates that 50 per cent of total variation in the cost is explained by variation in the level of milk collected.

Table 5.4 Functional relationship between cost of collection per litre of milk (Y) and quantity of milk collected (X)

S. No	Co-operative dairy plant (Fitted model log Y =a+ b log X)					
	Seasons	Sample size(n)	Intercept	Regression coefficient	Standard error	r^2
1	Flush	80	8.97	-0.56*	0.13	0.50
2	Transitory 1	60	10.45	-0.73*	0.03	0.96
3	Lean	60	10.75	-0.77*	0.03	0.97
4	Transitory 2	40	10.71	-0.76*	0.03	0.97
5	All seasons	240	10.40	-0.73*	0.02	0.97
Private dairy plant (Fitted model log Y =a+ b log X)						
1	Flush	80	10.69	-0.76*	0.04	0.96
2	Transitory 1	60	10.74	- 0.76*	0.04	0.96
3	Lean	60	10.80	-0.77 *	0.04	0.96
4	Transitory 2	40	10.71	-0.76*	0.04	0.96
5	All seasons	240	10.09	-0.76*	0.04	0.96

* Significant at 1% level; ** Significant at 5 % level

The analysis revealed that in transitory season I, if quantity of milk collection is increased by 1 per cent, the cost of collection will be reduced by 0.73 per cent. The r^2 value indicates that 96 per cent of total variation in the cost is explained by the variation in the level of milk collected.

In lean season, if quantity of milk collection is increased by 1 per cent, the cost of collection will be reduced by 0.77 per cent. The r^2 value indicates that 97 per cent of total variation in the cost is explained by the variation in the level of milk collected.

In transitory season - 2, if the quantity of milk collection is increased by 1 per cent, the cost of collection will be reduced by 0.76 per cent. The r^2 value indicates that 97 per cent of total variation in the cost is explained by the variation in the level of milk collected.

It could be interpreted that for all seasons, the cost of collection could be reduced by 0.73 per cent, if quantity of milk collection will be increased by 1 per cent. The r^2 value indicates that 97 per cent of the total variation in the cost is explained by the variation in the level of milk collected.

Table 5.4 presents that estimated cost function for different seasons of Private dairy plant.

In flush season, if quantity of milk collection is increased by 1 per cent, the cost of collection of milk will be reduced by 0.76 per cent. The r^2 value indicates that 96 per cent of variation in the total cost is explained by total variation in the quantity of milk collected.

The analysis revealed that in transitory season-1, if quantity of milk collection is increased by 1 per cent, the cost of collection of milk will be reduced by 0.76 per cent. The r^2 value indicates that 96 per cent of variation in the total cost is explained by total variation in the quantity of milk collected.

In lean season, if quantity of milk collection is increased by 1 per cent, the cost of collection of milk will be reduced by 0.77 per cent. The r^2 value indicates that 96 per cent of variation in the total cost is explained by total variation in the quantity of milk collected.

In transitory season – 2, if quantity of milk collection is increased by 1 per cent, the cost of collection of milk will be reduced by 0.76 per cent. The r^2 value indicates that 96 per cent of variation in the total cost is explained by total variation in the quantity of milk collected.

It could be inferred that for all seasons, if quantity of milk collection is increased by 1 per cent, the cost of collection of milk will be reduced by 0.76 per cent. The r^2 value indicates that 96 per cent of variation in the total cost is explained by total variation in the quantity of milk collected.

5.1.2 Cost of Transportation

The cost of transportation of milk depends on the total quantity of milk transported, the payment made to transporter, salary and wages to procurement staff and penalty levied for the spoiled milk.

The cost of transportation has been worked out for three situations viz. (i) from collection centre to plant; (ii) from collection centre to chilling centre; and (iii) chilling centre to plant.

5.1.2.1 Total cost of transportation

Table 5.5 reflects that the cost of transportation was around 60 paisa per litre from collection centres to the plant directly ,while cost of transportation was 61 paisa per litre from collection centres to chilling centres (42 paisa per litre) and the chilling centres to plant (19 paisa per litre). Hence, the average cost of transportation per litre of milk was estimated to be 61 paisa per litre for Co-operative dairy plant.

As against Co-operative plant, Table 5.5 depicts that overall average cost of transportation was around 58 paisa per litre from collection centres to plant directly and cost of transportation was 59 paisa per litre from collection centres to chilling centres(37 paisa per litre) and the chilling centres to plant (22 paisa per litre). Therefore, the average cost of transportation per litre of milk was estimated to be 59 paisa for Private dairy plant.

Table clearly shows that the overall average cost of transportation per litre of milk was 61 paisa and 59 paisa respectively for Co-operative and Private plants. The total cost of transportation was low in the flush season was 58 paisa and to a maximum of 63 paisa in lean season for Co-operative dairy plant. The Private dairy plant had an edge over Co-operative dairy plant in milk transportation cost .It was low in the flush season (58 paisa per litre) and scaled to increase 61 paisa in lean season.

Table 5.5 Total cost of transportation per litre of milk

Particulars	i) From collecti-on centre to plant directly	ii) From collection centre to chilling centre	iii) From chilling centre to plant	iv) Total transportation cost (Collection centre to chilling centre+ from chilling centre to plant)	Average Transportati-on Cost Of milk (Paisa/Litre) (i & iv)
Cost of transportation per litre of milk for the Co -operative plant (Paisa)					
Flush	57	40	18	58	58
Transitory 1	61	42	20	62	62
Lean	62	42	21	63	63
Transitory 2	57	40	18	58	58
Overall average	60	42	19	61	61
Cost of transportation per litre of milk for the Private plant (Paisa)					
Flush	57	36	22	58	58
Transitory 1	60	38	23	61	61
Lean	62	39	21	60	61
Transitory 2	57	37	22	59	58
Overall average	58	37	22	59	60

5.1.2.2 Cost of transportation of milk at different levels of milk transported

The total quantity of milk transported from the collection centres and chilling centres has direct influence on the cost of transportation. To find out the level of milk at which the cost of transportation would be minimum, the different transportation routes were categorized according to volume of milk transported viz. less than 60,000 litres, 60,001-70,000 litres, 70,001-80,000 litres, 80,001-90,000 litres, 90,001-1,00,000 litres, 1,00,001-1,10,000 litres, 1,10,001-1,20,000 litres, 1,20,001 to 1,30,000 litres, 1,30,001-1,40,000 litres and above 1,40,000 litres of milk. The details of number of routes transporting milk from collection centres or MPCS and chilling centres for (both) Co-operative and Private dairy plants have been listed in table 5.6.

Table 5.6 Cost of transportation of per litre of milk at different levels of milk transported

Level of milk transported (litres)	Number of routes	Payment made to transporter (Rs)	Penalty for spoiled milk (Rs)	Manpower cost (Rs)	Total Transportation cost (Rs)	Quantity of milk transported per month (litres)	Transportation cost per litre (Rs/litre)
Co-operative dairy plant							
< 60000	2	26651.72	22.38	7991.46	34620.81	53881	0.64
60001-70000	2	29385.26	29.96	9657.86	39013.16	65092	0.60
70001-80000	1	30884.23	36.58	11092.24	41939.88	74761	0.56
80001-90000	1	34515.14	47.92	12569.85	47037.07	84738	0.56
90001-100000	2	34023.89	23.96	13995.10	47953.87	94288	0.51
100001-110000	3	29087.47	76.44	15605.48	44616.51	105142	0.42
110001-120000	3	25716.43	60.11	17124.59	42780.91	115280	0.37
120001-130000	2	23797.35	30.06	18605.49	42303.79	125366	0.34
130001-140000	3	22958.05	107.14	20049.26	42900.18	135050	0.32
>140000	1	25402.52	39.67	26139.62	51502.47	176133	0.29
Private dairy plant							
<60000	1	26306.26	68.00	5624.90	31863.16	53835	0.59
60001-70000	3	25466.55	80.00	6764.85	32151.40	64604	0.50
70001-80000	1	28069.67	161.33	7916.26	35824.59	75563	0.47
80001-90000	2	31816.05	177.50	8948.19	40586.74	85422	0.48
90001-10000	2	24729.55	122.67	9941.19	34548.08	94871	0.36
100001-110000	2	27474.38	76.67	11118.92	38516.63	106081	0.36
110001-120000	3	29126.81	137.78	12143.50	40632.52	115825	0.35
120001-130000	3	28831.22	195.56	13124.88	41760.55	125213	0.33
130001-140000	2	23709.21	216.67	14187.51	37680.05	135371	0.28
>140000	1	21918.92	360.00	16200.20	37759.11	154571	0.24

It is evident from Table 5.6 that the average cost of transportation for a litre of milk was negatively correlated with average total quantity of milk transported for the Co-operative dairy plant .The cost of transportation was found to be as high as 64 paisa per litre for the total quantity of milk transported in a year was less than 60,000 litres level. The cost decreased to 42 paisa per litre in those transportation routes where milk quantity increased and ranged in the order of 1,00,000 – 1,10,000 litres. It further dipped to 29 paisa per litre when the total quantity of milk transported was more than 1,40,000 litres.

As against Co-operative dairy plant, Table 5.6 clearly illustrates that the cost of transportation was found to be maximum of 59 paisa per litre, when the total quantity of milk transported in a year was less than 60,000 litres. The cost decreased to 35 paisa per litre in certain transportation routes, where quantity of milk transported increased and ranged between 1,10, 001 to 1,20,000 litres. It was found to be least of 24 paisa per litre where the total transportation of milk was more than 1, 40,000 litres per month. Both the Tables are confirming that hypothesis of economies of scale.

5.1.2.3 Sourage and Spoilage of Milk

Milk is a highly perishable commodity; it gets soured and spoiled due to various reasons, if the proper precautions are not taken at the time of collection and transportation of milk. Table 5.7 represents the quantity of milk spoiled due to transporters' fault and due to societies' fault. It may be observed that 0.11 per cent of milk was spoiled due to transporters' and societies' fault in overall milk procured. The total spoilage of milk due to societies' fault was 27,053 litres while due to transporters' fault was 24,376 litres and penalty for spoiled milk due to society fault was Rs. 40 per kg fat and full amount is recovered for contractor's fault.

Table 5.7 reflects that the quantity of milk spoiled due to transporters' fault and collection centres' fault for Private dairy plant. The spoilage of Milk due to transporters' and collection centres' fault in overall milk procured was 0.09 per cent. The total spoilage of milk due to collection centres' fault was

Table 5.7 Quantity of milk soured / curdled (Litres)

Particulars	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Total spoilage/year
Co-operative dairy plant													
Society' s fault	5512	4646	2165	928	442	238	412	315	812	2039	5378	4166	27053
Contractor's fault	4922	4148	1933	829	394	212	516	419	635	1795	4802	3771	24376
Total spoilage/month	10434	8795	4098	1757	836	450	928	734	1447	3834	10179	7937	51429
Quantity of milk procured (lakh litres)	39.54	42.61	40.47	40.72	36.48	31.70	34.49	38.29	39.52	39.80	35.53	40.61	
Percentage spoilage to total milk procured	**0.26**	**0.21**	**0.10**	**0.04**	**0.02**	**0.01**	**0.03**	**0.02**	**0.04**	**0.10**	**0.29**	**0.20**	**0.11**
Private dairy plant													
Collection centre' s fault	3116	3745	2103	712	332	249	515	198	789	1879	4880	3875	22393
Contractor's fault	3745	3846	1865	664	345	313	481	395	642	1950	5700	3886	23832
Total spoilage/month	6861	7591	3968	1376	677	562	996	593	1431	3829	10580	7761	46225
Quantity of milk procured (lakh litres)	44.43	46.12	45.18	45.98	43.08	41.18	42.89	38.88	38.97	38.55	37.54	41.84	
Percentage spoilage to total milk procured	**0.15**	**0.16**	**0.09**	**0.03**	**0.02**	**0.01**	**0.02**	**0.02**	**0.04**	**0.10**	**0.28**	**0.19**	**0.09**

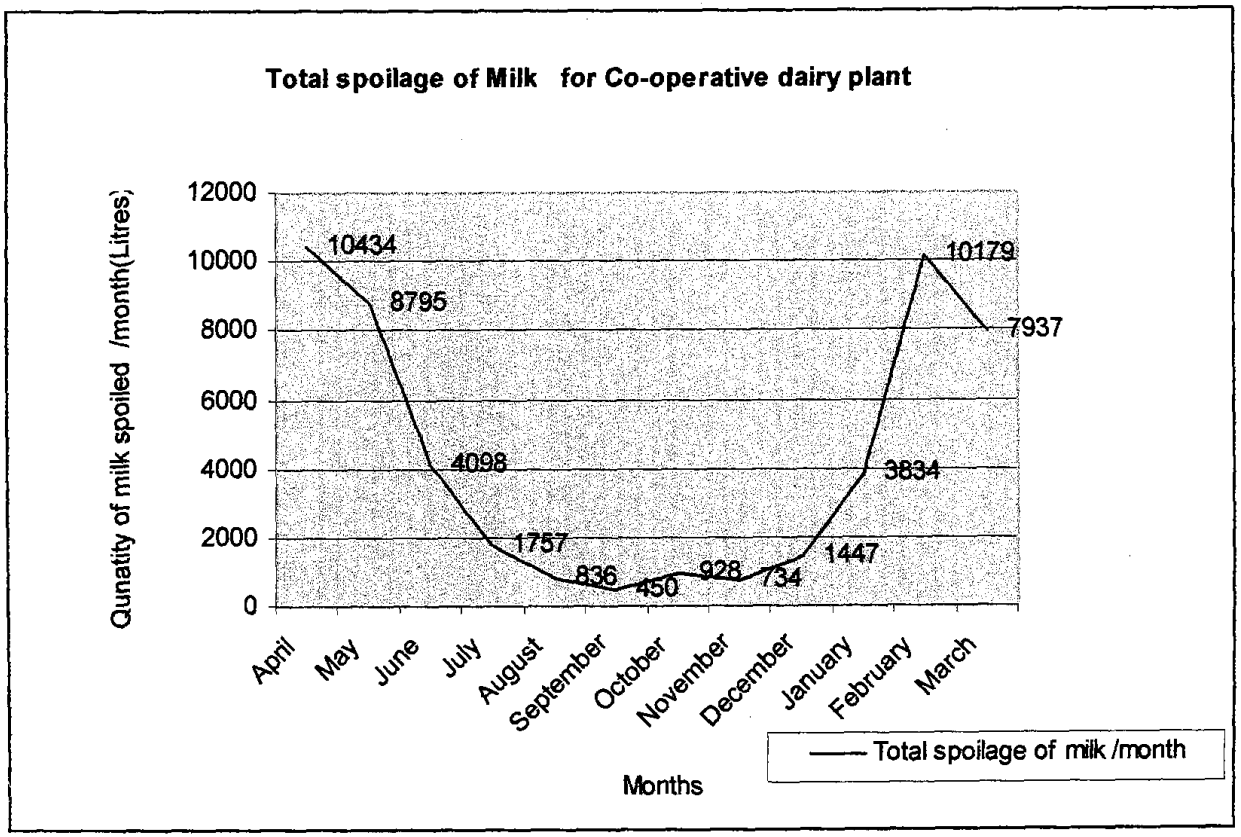

Fig.5.1.Total spoilage of milk for Co-operative Dairy plant

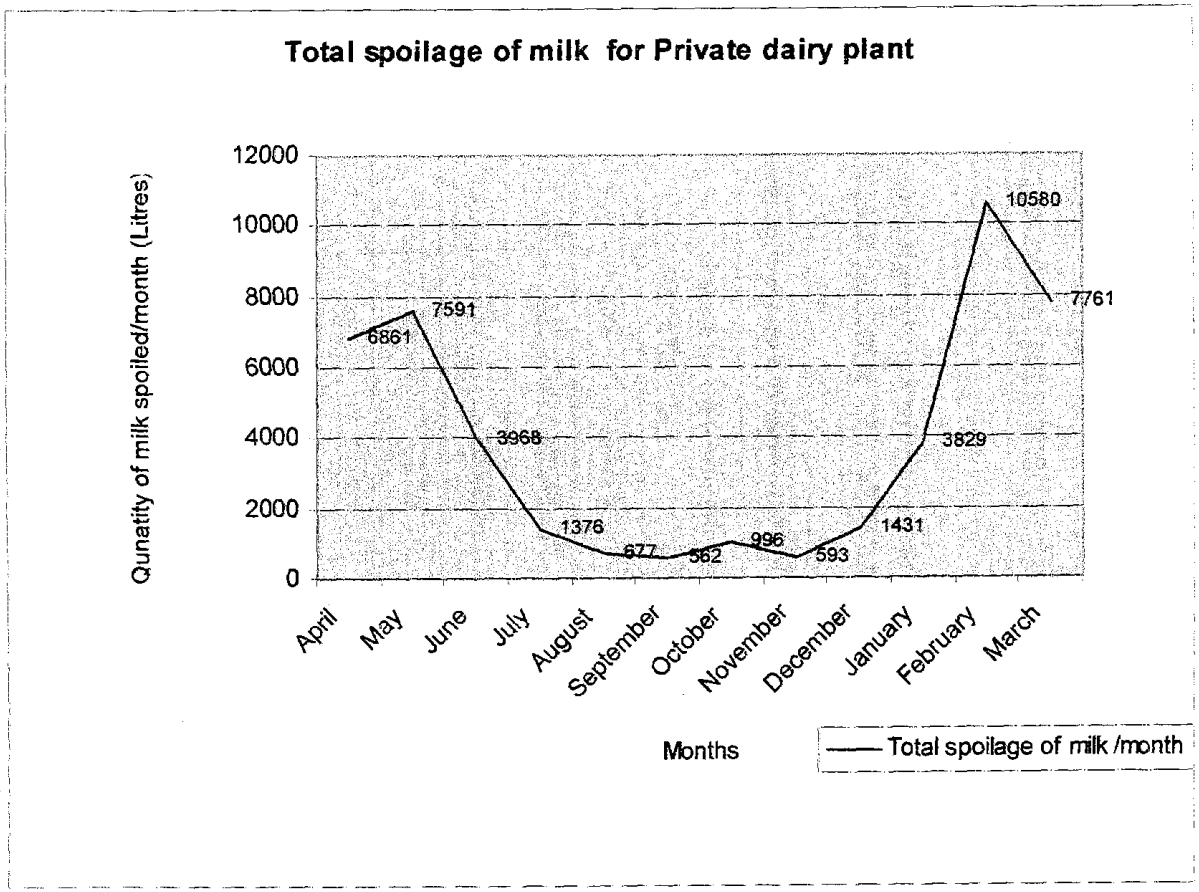

Fig.5.2.Total spoilage of milk for Private Dairy plant

22,393 litres while due to transporters' fault was 23,832 litres and the penalty for spoiled milk due to collection centres' fault was Rs. 45 per kg fat and full amount was recovered for contractor's fault.

From this table, we can conclude that, the percent spoilage to total milk procured was more for Co-operative plant than Private dairy plant. It was also found that percentage of spoilage was higher in summer season than in winter season for both the dairy plants. (Also see figure 5.1and 5.2)

5.1.2.4 Cost function

The mathematical relationship between the cost of transportation of milk (Y) and quantity of milk transported (X) was worked out by fitting suitable models for different seasons and presented in Table 5.8 for Co-operative and Private dairy plants.

Table 5.8 Functional relationship between cost of transportation per litre of milk (Y) and quantity of milk transported (X)

Co-operative dairy plant (Fitted model log Y =a+ b log X)						
S. No	**Seasons**	**Sample size(n)**	**Intercept**	**Regression coefficient**	**Standard error**	**r^2**
1	Flush	80	13.04	-0.81*	0.06	0.91
2	Transitory 1	60	12.56	-0.76*	0.05	0.92
3	Lean	60	12.97	-0.80*	0.06	0.92
4	Transitory 2	40	12.75	-0.78*	0.06	0.91
5	All seasons	240	12.89	-0.79*	0.06	0.90
Private dairy plant (Fitted model log Y =a+ b log X)						
1	Flush	80	13.66	-0.87*	0.05	0.94
2	Transitory 1	60	13.51	- 0.86*	0.04	0.94
3	Lean	60	13.32	-0.84*	0.05	0.95
4	Transitory 2	40	13.27	-0.84*	0.05	0.94
5	All seasons	240	13.50	-0.86*	0.05	0.93

* Significant at 1% level; ** Significant at 5 % level

From Table 5.8, in flush season, if quantity of milk transported is increased by 1 per cent, the cost of transportation of milk will be reduced by 0.81 per cent. The r^2 value indicates that 91 per cent of variation in the total cost of transportation is explained by total variation in the quantity of milk transported.

The analysis reveals that in transitory season-1, if quantity of milk transported is increased by 1 per cent, the cost of transportation of milk will be reduced by 0.76 per cent. The r^2 value indicates that 92 per cent of variation in the total cost of transportation is explained by total variation in the quantity of milk transported.

In the lean season, if quantity of milk transported is increased by 1 per cent, the cost of transportation of milk will be reduced by 0.80 per cent. The r^2 value indicates that 92 per cent of variation in the total cost of transportation is explained by total variation in the quantity of milk transported.

In transitory season – 2, if quantity of milk transported is increased by 1 per cent, the cost of transportation of milk will be reduced by 0.78 per cent. The r^2 value indicates that 91 per cent of variation in the total transportation cost is explained by total variation in the quantity of milk transported.

It could be interpreted that for all seasons, if quantity of milk transported is increased by 1 per cent, the cost of transportation will be reduced by 0.79 per cent. The r^2 value indicates that 90 per cent of variation in the total transportation cost is explained by total variation in the quantity of milk transported.

Table 5.8 shows that estimated cost function for different seasons of Private dairy plant.

From Table 5.8, in flush season, if quantity of milk transported is increased by 1 per cent, the cost of transportation of milk will be reduced by 0.87 per cent. The r^2 value indicates that 94 per cent of variation in the total transportation cost is explained by total variation in the quantity of milk transported.

The analysis reveals that in transitory season-1, if quantity of milk transported is increased by 1 per cent, the cost of transportation of milk will be reduced by 0.86 per cent. The r^2 value indicates that 94 per cent of variation in the total transportation cost is explained by total variation in the quantity of milk transported.

In lean season, if quantity of milk transported is increased by 1 per cent, the cost of transportation of milk will be reduced by 0.84 per cent. The r^2 value indicates that 95 per cent of variation in the total transportation cost is explained by variation in the quantity of milk transported.

In transitory season – 2, if quantity of milk transported is increased by 1 per cent, the cost of transportation of milk will be reduced by 0.84 per cent. The r^2 value indicates that 94 per cent of variation in the total transportation cost is explained by total variation in the quantity of milk transported.

It could be interpreted that for all seasons, if quantity of milk transported is increased by 1 per cent, will lead to reduction in transportation cost by 0.86 per cent. The r^2 value indicates that 93 per cent of variation in the total transportation cost is explained by total variation in the quantity of milk transported.

5.1.3 Cost of chilling of Milk

The cost of chilling per litre of milk has been worked out for four chilling centres namely C_1, C_2, C_3 and C_4 chilling centres, which were attached with Co-operative plant. The average cost of chilling per litre of milk was found to be 28 paisa, 29 paisa, 34 paisa and 33 paisa for C_1, C_2, C_3 and C_4 chilling centres respectively. The overall average cost of chilling per litre was found to be 31 paisa per litre (Table 5.9).

Similarly, Table 5.10 depicts a clear picture of chilling cost for four chilling centres namely P_1, P_2, P_3 and P_4 chilling centres which were attached with Private dairy plant. The average cost of chilling per litre of milk was found to be 27 paisa, 31 paisa, 26 paisa and 39 paisa for P_1, P_2, P_3 and P_4 chilling centres respectively. The overall average cost of chilling per litre of milk was found to be 32 paisa.

Table 5.9. Overall average chilling cost across chilling centres for Co-operative dairy plant (Rs/litre)

Chilling centre name	C_1	C_2	C_3	C_4	Average cost (Rs)
A. Fixed cost					
Depreciation	10937.50	11525.35	9608.75	9542.29	10403.47
Interest	14875.00	20160.85	12311.00	11201.50	14637.09
Salary of staff	105148.00	100313.00	85202.00	94315.00	96244.50
Sub Total	130960.50	131999.20	107121.75	115058.79	121285.06
B. Variable cost					
Cost of electricity	103218.58	97745.17	63279.25	63814.58	82014.40
Cost of fuel	5065.42	4814.67	3086.67	3313.75	4070.13
Cost of repairs & maintenance	2030.08	1877.00	3488.75	1308.83	2176.17
Cost of stationery	438.83	418.83	268.92	285.83	353.10
Cost of consumables	4318.58	4098.50	2625.42	5287.92	4082.61
Telephone charges	454.92	445.58	399.33	451.75	437.90
Sub total	115526.42	109399.75	73148.33	74462.67	93134.29
Total cost (A+B) (Rs)	246486.92	241398.95	180270.08	189521.46	214419.35
Total quantity of milk chilled (litres)	870006	821375	529143	580916	700360
Chilling cost per litre (Rs/litre)	**0.28**	**0.29**	**0.34**	**0.33**	**0.31**

Table 5.10 Overall average chilling cost across chilling centres for Private dairy plant (Rs/litre)

Chilling centre name	P_1	P_2	P_3	P_4	Average cost (Rs)
Particulars					
A. Fixed cost					
Depreciation	9375.00	10239.58	10215.69	9090.69	9730.24
Interest	19125.00	19075.00	20392.66	17567.66	19040.08
Salary of staff	105328.00	90387.00	109879.00	89957.00	98887.75
Sub Total	133828.00	119701.58	140487.35	116615.35	127658.07
B. Variable cost					
Cost of electricity	97725.46	70066.33	118251.17	44689.71	82683.17
Cost of fuel	4114.21	3497.58	5717.42	2243.08	3893.07
Cost of repairs and maintenance	1717.25	1342.67	1945.67	858.29	1465.97
Cost of stationery	406.67	291.83	859.92	187.08	436.38
Cost of consumables	3927.25	2957.83	4118.00	1865.67	3217.19
Telephone charges	432.50	454.58	651.67	310.38	462.28
Sub total	108323.33	78610.83	131543.83	50154.21	92158.05
Total cost (A+B) (Rs)	242151.33	198312.42	272031.19	166769.56	219816.13
Total quantity of milk chilled (litres)	897035.00	643502.00	1069308.00	430827.00	760168.00
Cost of chilling per litre (Rs)	**0.27**	**0.31**	**0.26**	**0.39**	**0.32**

5.1.3.1 Seasonal variation in the cost of chilling of milk

The cost of chilling per litre of milk and quantity of milk chilled was worked out for four chilling centres namely C_1, C_2, C_3 and C_4 chilling centres which were attached with Co-operative plant and as well chilling cost of four chilling centres namely P_1, P_2, P_3 and P_4 chilling centres was worked out for Private dairy plant.

Table 5.11 reveals that per litre cost of chilling showed a seasonal variation in various seasons for Co-operative dairy. The chilling cost was lowest in the flush season at 27 paisa per litre and was observed to be of 32 paisa per litre in the lean season.

Table 5.11 Season wise chilling cost for chilling centres (Co-operative dairy plant)

Seasons	Flush	Transitory1	Lean	Transitory2	Average cost(Rs)
Particulars					
A. Fixed cost					
Depreciation	10403.47	10403.47	10403.47	10403.47	10403.47
Interest	14637.09	14637.09	14637.09	14637.09	14637.09
Salary of staff	96244.50	96244.50	96244.50	96244.50	96244.50
Sub Total	121285.10	121285.10	121285.10	121285.10	121285.10
B. Variable cost					
Cost of electricity	86445.75	71052.67	88878.34	96648.79	85756.39
Cost of fuel	4027.63	4747.92	6556.84	4420.25	4938.16
Cost of repairs & maintenance	1958.63	1117.33	3253.83	2630.71	2240.13
Cost of stationery	407.25	329.92	231.42	1011.17	494.94
Cost of consumables	3527.25	6015.92	5629.00	3175.13	4586.83
Telephone charges	408.44	455.50	466.67	621.33	487.99
Miscellaneous cost	0.00	0.00	0.00	0.00	0.00
Sub total	96774.95	83719.26	105016.10	108507.40	98504.43
Total cost (A+B)(Rs)	218060.00	205004.30	226301.20	229792.40	219789.48
Total quantity of milk chilled (litres)	796833	653940	707789	813064	742906
Chilling cost per litre (Rs/litre)	**0.27**	**0.31**	**0.32**	**0.28**	**0.31**

Table 5.12 shows that the Private dairy plant-chilling centres also exhibited a seasonal variation in chilling cost. The chilling cost was least at 28 paisa in the flush season and to a maximum of 33 paisa in the lean season. It can be inferred that, chilling centres of Co-operative and Private dairy plants only exhibited a minor seasonal variation in chilling cost of milk.

Table 5.12 Season wise chilling cost for chilling centres (Private dairy plant)

Seasons	Flush	Transitory 1	Lean	Transitory 2	Average cost(Rs)
Particulars					
A. Fixed cost					
Depreciation	9730.24	9730.24	9730.24	9730.24	9730.24
Interest	19040.08	19040.08	19040.08	19040.08	19040.08
Salary of staff	98887.75	98887.75	98887.75	98887.75	98887.75
Sub Total	127658.07	127658.07	127658.07	127658.07	127658.07
B. Variable cost					
Cost of electricity	82510.50	88592.08	75727.00	84599.38	82857.24
Cost of fuel	3632.66	5016.34	3017.00	4043.13	3927.28
Cost of repairs and maintenance	1740.44	1299.71	216.08	3041.25	1574.37
Cost of stationery	364.94	386.75	197.75	1011.63	490.27
Cost of consumables	3225.63	3743.08	3056.33	2652.75	3169.45
Telephone charges	427.38	470.79	415.00	590.25	475.86
Miscellaneous cost	0.00	0.00	0.00	0.00	0.00
Sub total	91901.53	99508.75	82629.17	95938.38	92494.46
Total cost (A+B)(Rs)	219559.60	227166.83	210287.24	223596.45	220152.53
Total quantity of milk chilled (litres)	819281.00	771729.00	698901.00	716500.00	751602.00
Cost of chilling per litre (Rs)	**0.28**	**0.31**	**0.33**	**0.33**	**0.31**

5.1.3.2 Cost function

The mathematical relationship between cost of chilling of milk (Y) and the quantity of milk chilled (X) was worked out by fitting regression models for chilling centres of both the selected dairy plants. The results are presented in Table 5.13.

Table 5.13 Relationship between cost of chilling per litre of milk (Y) and the quantity of milk chilled (X)

S. No	Co-operative dairy plant (Fitted model Y =a+bx)					
	Chilling centre name	Sample size(N)	Intercept	Regression coefficient	Standard error	r^2
1	C_1	12	41.01	−0.007*	0.001	0.72
2	C_2	12	51.09	−0.020*	0.001	0.52
3	C_3	12	41.81	−0.010*	0.001	0.62
4	C_4	12	41.35	−0.009*	0.001	0.64
Private dairy plant (Fitted model log Y =a+ b log X)						
1	P_1	12	14.53	−0.82*	0.20	0.62
2	P_2	12	12.90	−0.70*	0.15	0.68
3	P_3	12	12.31	−0.65*	0.17	0.61
4	P_4	12	13.52	−0.76*	0.11	0.84

* Significant at 1% level; ** Significant at 5 % level

The results of C_1 Chilling Centre revealed that if the quantity of milk chilled per year increases by 1000 litres, the cost of chilling could be reduced by 7 paisa per litre. The r^2 value indicates that 72 per cent of the total variation in the cost is explained by the variation in the level of milk chilled.

Table indicates that at C_2 Chilling Centre, the cost of chilling could be reduced by 20 paisa per litre for every 1000 litres increase in quantity of milk chilled per year. The r^2 value indicates that 52 per cent of the total variation in the cost is explained by total variation in the level of milk chilled.

It may be inferred from Table, that at C_3 Chilling Centre, the cost of chilling could be reduced by 10 paisa per litre for every 1000 litres increase in quantity of milk chilled per year. The r^2value indicates that 62 per cent of the total variation in the cost is explained by total variation in the level of milk chilled.

It may be observed from Table, at C_4 Chilling Centre, the cost of chilling could be reduced by 9 paisa per litre for every 1000 litres increase in quantity of milk chilled per year. The r^2 value indicates that 64 per cent of the total variation in the cost is explained by total variation in the level of milk chilled.

Table 5.13 presents that estimated cost function for different chilling centres of Private dairy plant.

The results of P_1 Chilling Centre revealed that if quantity of milk chilled is increased by 1 per cent per year, the chilling cost of milk will be reduced by 0.82 per cent. The r^2 value indicates that 62 per cent of the total variation in the cost is explained by the variation in the level of milk chilled.

It is visualized from table that at P_2 Chilling Centre, if quantity of milk chilled is increased by 1 per cent per year, the chilling cost of milk will be reduced by 0.70 per cent. The r^2 value indicates that 68 per cent of the total variation in the cost is explained by the variation in the level of milk chilled.

It may be inferred from the table, at P_3 Chilling Centre, that if quantity of milk chilled is increased by 1 per cent per year, the chilling cost of milk will be reduced by 0.65 per cent. The r^2 value indicates that 61 per cent of the total variation in the cost is explained by the variation in the level of milk chilled.

It may be observed from the table, at P_4 Chilling Centre, that if quantity of milk chilled is increased by 1 per cent per year, the chilling cost of milk will be reduced by 0.76 per cent. The r^2 value indicates that 84 per cent of the total variation in the cost is explained by the variation in the level of milk chilled.

5.1.4 Cost of Milk Reception

The milk collected at the collection centres and chilling centres is transported to the plant, received, tested and finally chilled. The cost of receiving the milk at Co-operative and Private dairy plants has been calculated and is presented in Tables 5.14 and 5.16.

The overall cost of reception for a litre of milk at Co-operative dairy plant was observed to be 18 paisa. (Table 5.14) The share of fixed cost was around 25 per cent and variable cost in the total cost was found to be 75 per cent. The share of fixed cost components like depreciation and interest was 10 per cent and salary of staff was around 15 per cent.

Table 5.14 Cost of milk reception at Co-operative dairy plant

Particulars	*Amount (Rs)*	*Per cent Cost*	*Per unit Cost (Rs/litre)*
A. Fixed cost			
Depreciation	7008.25	3.72	0.01
Interest	11819.80	6.27	0.01
Salary of staff	28362.00	15.05	0.03
Sub Total	47190.05	25.04	0.05
B. Variable cost			
Cost of water consumed	71508.53	37.95	0.07
Cost of electricity	1614.32	0.86	0.00
Cost of can cleaning	11300.98	6.00	0.01
Cost of spares	885.33	0.47	0.00
Cost of repairs	424.73	0.23	0.00
Cost of consumables	895.40	0.48	0.00
Labour wages	54630.00	28.99	0.05
Miscellaneous cost	0.00	0.00	0.00
Sub total	141259.30	74.96	0.14
Total cost (A+B)(Rs)	188449.35	100.00	**0.18**
Total quantity of milk received (litres)	1032235.00		
Cost of milk reception per litre (Rs)	**0.18**		

The major component of cost in the variable cost was cost of water (38 per cent), followed by labour wages was 29 per cent and cost of can cleaning was 6 per cent. The remaining items share was a total of around 1 per cent in total variable cost. It varied from a minimum of 17 paisa to 19 paisa across seasons (Table 5.15). The cost of milk reception did not show any seasonal variation. It was almost same for all the seasons.

Table 5.15 Season wise cost of milk reception at Co-operative dairy plant

Seasons	Flush	Transitory 1	Lean	Transitory 2	Average cost (Rs)
Particulars					
A. Fixed cost					
Depreciation	7008.25	7008.25	7008.25	7008.25	7008.25
Interest	11819.80	11819.80	11819.80	11819.80	11819.80
Salary of staff	28362.00	28362.00	28362.00	28362.00	28362.00
Sub Total	47190.05	47190.05	47190.05	47190.05	47190.05
B. Variable cost					
Cost of water consumed	65109.00	70734.00	76191.67	74634.50	71508.53
Cost of electricity	1586.50	1466.00	1756.67	1652.50	1614.32
Cost of can cleaning	7975.00	11148.00	14185.00	12176.00	11300.98
Cost of spares	1467.25	261.00	774.00	1008.50	885.33
Cost of repairs	132.00	483.33	703.33	398.00	424.73
Cost of consumables	772.25	707.67	1080.00	1039.50	895.40
Labour wages	54900.00	55200.00	55200.00	53100.00	54630.00
Miscellaneous cost	0.00	0.00	0.00	0.00	0.00
Sub total	131942.00	140000.00	149890.67	144009.00	141259.30
Total cost (A+B)(Rs)	179132.05	187190.05	197080.72	191199.05	188449.35
Total quantity of milk received (litres)	992558.00	982324.00	1138576.00	1017120.00	1032235.00
Cost of milk reception per litre (Rs.)	**0.18**	**0.19**	**0.17**	**0.19**	**0.18**

Table 5.16 clearly reveals that the cost of milk reception for Private dairy plant. The overall cost of reception was less compared to Co-operative plant as 12 paisa per litre. The fixed cost share was around 35 per cent and variable cost was around 65 per cent in total cost of milk reception. The fixed cost components were salary of staff (21 per cent), depreciation and interest was 12 per cent in total fixed cost. The major cost components in variable cost was found to be cost of water (54 per cent), cost of can cleaning (8 per cent), cost of electricity (1 per cent) and remaining items constituted 2 per cent of the variable cost.

Table 5.16 Cost of milk reception at Private dairy plant

Particulars	Amount (Rs)	Percent cost	Per unit Cost (Rs/litre)
A. Fixed cost			
Depreciation	7008.25	5.14	0.01
Interest	11819.80	8.67	0.01
Salary of staff	28362.00	20.81	0.02
Sub Total	47190.05	34.62	0.04
B. Variable cost			
Cost of water consumed	73228.45	53.73	0.06
Cost of electricity	1626.80	1.19	0.00
Cost of can cleaning	11411.95	8.37	0.01
Cost of spares	784.38	0.58	0.00
Cost of lubricants	274.00	0.20	0.00
Cost of repairs and maintenance	303.90	0.22	0.00
Cost of stationery	428.08	0.31	0.00
Cost of consumables	818.48	0.60	0.00
Miscellaneous cost	223.87	0.16	0.00
Sub total	89099.92	65.38	0.08
Total cost (A+B)(Rs	136289.97	100.00	**0.12**
Total quantity of milk received (lit)	1157145.00		
Cost of milk reception per litre (Rs)	**0.12**		

It can be concluded that cost of milk reception per litre was less to Private dairy plant than Co-operative dairy plant. It was due to lower amount of milk received and higher labour wages paid in Co-operative plant. This varied from a minimum of 11 paisa and to a maximum of 13 paisa across seasons. It was exhibiting minor variation in the cost for all seasons (Table 5.17).

Table 5.17 Season wise cost of milk reception at Private dairy plant

Particulars	Seasons				
	Flush	Transitory 1	Lean	Transitory 2	Average cost
A. Fixed cost					
1. Depreciation	7008.25	7008.25	7008.25	7008.25	7008.25
2. Interest	11819.80	11819.80	11819.80	11819.80	11819.80
3. Salary of staff	28362.00	28362.00	28362.00	28362.00	28362.00
Sub total	47190.05	47190.05	47190.05	47190.05	47190.05
B. Variable cost					
4. Cost of water consumed	74735.25	77862.33	73307.33	66457.00	73228.45
5. Cost of electricity	1723.75	1611.33	1685.67	1469.50	1626.80
6. Cost of can cleaning	9123.25	12235.33	13577.67	10825.00	11411.95
7. Cost of spares	1388.25	120.00	700.00	896.50	784.38
8. Cost of lubricants	342.50	314.00	171.67	262.50	274.00
9. Cost of repairs and maintenance	30.00	168.33	685.33	353.50	303.90
10. Cost of stationery	477.50	645.67	356.67	215.00	428.08
11. Cost of consumables	601.50	861.33	912.33	920.00	818.48
12. Miscellaneous cost	574.50	0.00	282.67	0.00	223.87
Sub total	88996.50	93818.33	91679.33	81399.00	89099.92
Total cost (A+B)(Rs)	136186.55	141008.38	138869.38	128589.05	136289.97
Total quantity of milk received (lit)	1266165.00	1163089.00	1084905.00	1103582.00	1157145.00
Cost of milk reception per litre (Rs)	**0.11**	**0.12**	**0.13**	**0.12**	**0.12**

5.1.5 Cost of Milk Procurement

The procurement cost comprises of cost of collection of milk, cost of transportation, chilling cost and cost of milk reception.

Table 5.18 shows that the overall average procurement cost per litre was found to be Rs. 1.48 for the Co-operative dairy plant. The procurement

cost also varied across seasons. In flush season, the cost of procurement was estimated to be Rs. 1.38 per litre. In transitory season II, and I it increased to Rs. 1.52 and Rs. 1.47 per litre respectively. However, in lean season it was found to be highest at Rs. 1.53 per litre. The component of collection, transportation, chilling and reception cost was 37 paisa, 61 paisa, 32 paisa and 18 paisa per litre respectively in the procurement cost. These results reinforce the findings of Rawat *et. al.* (1984), Khokar (1985), Rangasamy, N (2001) that seasonal variation in cost of milk procurement exits and increase in quantity of milk procurement could help in reducing the cost of milk procurement.

Table 5.18 Total procurement cost of milk per litre (Paisa)

Co-operative dairy plant					
Seasons	**Collection cost**	**Transportation cost**	**Chilling cost**	**Reception cost**	**Total procurement cost**
Flush	34	58	28	18	138
Transitory 1	37	62	32	19	152
Lean	39	63	36	17	153
Transitory 2	37	58	33	19	147
Average	37	61	32	18	148
Private dairy plant					
Flush	36	58	28	11	133
Transitory 1	38	61	31	12	142
Lean	39	61	32	13	145
Transitory 2	38	58	33	12	141
Average	38	60	31	12	141

As against Co-operative plant, Table 5.18 gives that the overall average procurement cost per litre was found to be Rs. 1.41 for Private plant. The procurement cost varied from a minimum of Rs. 1.33 in the flush season and to a maximum of Rs. 1.45 in lean season. In transitory season I, II, the average cost of procurement cost was Rs. 1.42 and Rs. 1.41 respectively. The component of collection, transportation, chilling and reception cost was 38 paisa, 60 paisa, 31 paisa and 12 paisa per litre respectively in the procurement cost of Private dairy plant.

It can be concluded that the procurement cost of Co-operative dairy was higher than the Private dairy plant; it could be attributed to increase in reception cost of milk and marginal increase in transportation cost of milk in the Co-operative dairy plant which resulted into the increased procurement cost of milk in Co-operative plant.

5.2.1 COMPARATIVE ANALYSIS OF COST OF PRODUCTION OF VARIOUS DAIRY PRODUCTS AT THE CO-OPERATIVE AND THE PRIVATE DAIRY PLANTS

The cost of manufacture of all major dairy products was estimated during the study period. The detailed break-up of components of cost of various products into fixed and variable, total and per unit cost are presented and discussed in subsequent sections in a comparative manner for Co-operative and Private dairy plants.

5.2.1 Cost of Production of Toned Milk

Toned milk is one of the major products for both the dairy plants. A comparative picture of this product of both the plants is displayed in Table 5.19. During the study period, the Co-operative dairy plant processed 10,13,472 litres (monthly average) of Toned milk and incurred a total expenditure of 1 crore and 12 lakhs resulting in cost of production of Rs. 11.06 per litre of milk. In total cost structure, fixed costs were 1.36 per cent and the rest 98.64 per cent were variable costs. Component wise cost analysis for Co-operative dairy plant revealed that raw material alone accounted for about 90.05 per cent of total expenditure. Expenditure on packaging material and packing was next in importance (4.28 per cent) followed by salaries of staff (1.10 per cent). The remaining items constituted less than 6 per cent.

The Private dairy plant processed around 8, 91, 768 litres of milk with a total expenditure of Rs. 9 crore and 9 lakhs and resulting into cost of production of Rs. 11.12 per litre of milk. In total cost structure, fixed costs were 1.31 per cent and the rest 98.69 per cent were variable costs. Component wise cost analysis revealed that raw material cost alone accounted for about 92.58 per cent of total expenditure.

Table 5.19 Cost of production of Toned milk

Particulars	Co-operative dairy plant			Private dairy plant		
	Amount (Rs))	Percent cost	Per unit cost (Rs/litre)	Amount (Rs)	Percent cost	Per unit cost (Rs/litre)
A. Fixed cost						
Depreciation	3648.50	0.03	0.01	4994.04	0.05	0.01
Interest	25831.17	0.23	0.03	24970.20	0.25	0.03
Salary of staff	123137.46	1.10	0.12	99880.80	1.01	0.11
Sub total	152617.13	1.36	0.16	129845.04	1.31	0.15
B. Variable cost						
Cost of raw material (including procurement cost)	10095048.07	90.05	9.96	9175724.50	92.58	10.29
Cost of water consumed	29129.72	0.26	0.03	24803.13	0.25	0.03
Cost of electricity	21985.34	0.20	0.02	17195.63	0.17	0.02
Cost of steam	96063.13	0.86	0.09	75151.85	0.76	0.08
Cost of refrigeration	106217.35	0.95	0.10	74866.25	0.76	0.08
Cost of repairs and maintenance	33549.58	0.30	0.03	30697.35	0.31	0.03
Cost of Packing material and packing cost	479368.90	4.28	0.47	263914.36	2.66	0.30
Cost of quality control	59261.29	0.53	0.06	26089.54	0.26	0.03
Milk and milk solids losses	55695.97	0.50	0.05	70971.66	0.72	0.08
Cost of consumables	12122.55	0.11	0.01	8964.50	0.09	0.01
Stationery &stores	66473.80	0.57	0.07	7130.08	0.07	0.01
Labour wages	3425.19	0.03	0.00	2982.17	0.03	0.01
Miscellaneous cost	247.94	0.00	0.00	2314.50	0.02	0.01
Sub total	11058588.78	98.64	10.90	9780805.50	98.69	10.97
Total cost (A+B)(Rs)	11211205.91	100.00	**11.06**	9910650.54	100.0000	**11.12**
Total quantity of milk prepared (litres)	1013472.00			891768.00		
Cost of production per litre (Rs)	**11.06**			**11.12**		

Expenditure on packaging material and packing was the next cost component around 2.66 per cent followed by salaries of staff (1.0 per cent). The remaining items constituted less than 4 per cent to total expenditure. This analysis revealed that increased milk processing quantity of Co-operative dairy plant resulted into less cost of production of Toned milk as around 6 paisa per litre than Private dairy plant. Moreover, the (32 paisa) increase in raw material cost of Private dairy plant attributed to this (6 paisa) increase in production cost of Toned milk per litre.

5.2.2 Cost of Production of Standardized Milk

Standardized milk is another major liquid milk product for both the dairy plants. During the period of study, the Co-operative plant processed 17,40,719 (monthly average) litres of Standardized milk with a total expenditure of Rs 2.24 crore resulting in production cost of Rs. 12.86 per litre of milk (Table 5.20). In the total cost structure, fixed costs were 1.17 per cent and the rest 98.83 per cent were the variable costs. Component wise cost analysis for Co-operative plant reveals that expenditure on raw material alone accounted for about Rs. 11.77 per litre of milk production constituting about 91.47 per cent of total expenditure. Cost of packaging material and packing was next expenditure item in importance (4.21 per cent) followed by salaries of staff (0.94 per cent). The remaining items constituted less than 6 per cent.

The Private dairy plant processed around 17,66,397 litres of milk with a total expenditure of Rs 2.15 crore (Table 5.20) and resulting in cost of production of Rs. 12.20 per litre of milk. In the total cost structure, fixed costs were 1.22 per cent and the rest 98.78 per cent were the variable costs. Component wise cost analysis revealed that raw material cost in this case also was a major expenditure item contributing 93.24 per cent to the total cost. The expenditure on packing and packing material was around 2.78 per cent followed by salary of staff (0.98 per cent). The remaining items contributed less than 3 per cent of total cost.

The foregoing analysis reveals that Private dairy plant has cost advantage over Co-operative dairy plant in processing of Standardized milk. The Private dairy plant could produce Standardized milk at 5.40 per cent lower cost than Co-operative dairy plant.

Table 5.20 Cost of production of Standardized milk

Particulars	Co-operative dairy plant			Private dairy plant		
	Amount (Rs)	Percent cost	Per unit cost (Rs/litre)	Amount (Rs)	Percent cost	Per unit cost (Rs/litre)
A. Fixed cost						
Depreciation	6266.59	0.03	0.01	5992.00	0.03	0.01
Interest	44367.08	0.20	0.03	45753.02	0.21	0.03
Salary of staff	211498.35	0.94	0.11	210395.00	0.98	0.12
Sub total	262132.02	1.17	0.15	262140.02	1.22	0.16
B. Variable cost						
Cost of raw material (including procurement cost)	20481037.70	91.47	11.77	20091351.23	93.24	11.37
Cost of water consumed	35086.89	0.16	0.02	31012.25	0.14	0.02
Cost of electricity	36877.14	0.16	0.02	34868.07	0.16	0.02
Cost of steam	164967.87	0.74	0.09	155132.13	0.72	0.09
Cost of refrigeration	183212.40	0.82	0.11	144840.18	0.67	0.08
Cost of repairs and maintenance	57447.15	0.26	0.03	47977.85	0.22	0.03
Cost of Packing material and packing cost	940257.80	4.21	0.54	598646.42	2.78	0.34
Cost of quality control	54429.75	0.24	0.03	49858.32	0.23	0.03
Milk and milk solids losses	88277.86	0.39	0.05	86576.04	0.40	0.05
Cost of consumables	20839.47	0.09	0.01	19240.11	0.09	0.01
Stationery &stores	59589.43	0.27	0.03	17766.26	0.08	0.01
Labour wages	5492.08	0.02	0.00	5340.25	0.02	0.01
Miscellaneous cost	0.00	0.00	0.00	4155.83	0.02	0.01
Sub total	22127515.51	98.83	12.71	21286764.93	98.78	12.04
Total cost (A+B)(Rs)	22389647.53	100.00	**12.86**	21548896.96	100.0000	**12.20**
Total quantity of milk prepared (litres)	1740719.00			1766397.00		
Cost of production per litre (Rs)	**12.86**			**12.20**		

5.2.3 Cost of Production of Full cream Milk

Table 5.21 reflects that the cost of production of Full cream milk was Rs. 14.06 per litre of milk for Co-operative plant. The monthly average production for the study period was around 2,18,840 litres. For Co-operative plant, the fixed cost was 1.07 per cent and variable cost was 98.93 per cent in total cost of production. Component wise cost analysis for Co-operative plant revealed that raw material alone accounted for about 91.71 per cent of total expenditure. The cost of packaging material and packing was around 3.62 per cent followed by salary of staff was 0.86 per cent. The remaining items contributed less than 4 per cent of total cost of production.

A perusal of Table 5.21 reveals that production cost was Rs. 13.59 per litre of milk for Private dairy plant. The monthly average production for the study period was around 2,02,040 litres. The fixed costs were only 1.07 per cent whereas variable costs were as high as 98.93 per cent. It is evident from the Table that raw material cost alone accounted for 94.51 per cent of total cost followed by packing cost of 2.34 per cent and 0.82 per cent of salaries of staff. Rest all other costs constituted less than 3 per cent of total costs. In Private dairy plant, cost of production was low due to lower amount of packing cost than Co-operative dairy plant.

5.2.4 Cost of Production of Flavoured Milk

The compositional cost of production figures for Flavoured milk is given in Table 5.22 for Co-operative and Private dairy respectively. It was the newly introduced product in both the dairy plants.

The cost of production of Flavoured milk was found to be Rs 43.35 per litre of milk. The monthly average production for the study period was around 1,400 litres. The fixed costs were only 29 per cent whereas variable costs were as high as 71 per cent. It is observed from the Table that salary of staff was 26.79 per cent, followed by 26.47 per cent for bottling and corking cost, 24.01 per cent of raw material cost, 7.11 per cent cost on labeling and 5.75 per cent of bulk packing cost. The remaining items contributed less than 10 per cent of total cost of production.

Table 5.21 Cost Production of Full Cream milk

Particulars	Co-operative dairy plant			Private dairy plant		
	Amount (Rs)	Percent cost	Per unit cost (Rs/litre)	Amount (Rs)	Percent cost	Per unit cost (Rs/litre)
A. Fixed cost						
Depreciation	787.82	0.03	0.00	1131.46	0.04	0.01
Interest	5577.75	0.18	0.03	5657.29	0.21	0.03
Salary of staff	26589.19	0.86	0.12	22629.15	0.82	0.11
Sub total	32954.76	1.07	0.15	29417.89	1.07	0.15
B. Variable cost						
Cost of raw material (including procurement cost)	2821697.25	91.71	12.89	2594956.44	94.52	12.87
Cost of water consumed	4651.57	0.15	0.02	3349.90	0.12	0.02
Cost of electricity	4775.78	0.16	0.02	3162.28	0.12	0.02
Cost of steam	21060.56	0.68	0.10	13579.13	0.49	0.07
Cost of refrigeration	38048.15	1.24	0.17	15011.08	0.55	0.07
Cost of repairs and maintenance	12498.73	0.41	0.06	3886.52	0.14	0.02
Cost of Packing material and packing cost	111543.90	3.62	0.51	64307.06	2.34	0.32
Cost of quality control	6892.27	0.22	0.03	4653.89	0.17	0.02
Milk and milk solids losses	12074.35	0.39	0.06	7501.70	0.27	0.04
Cost of consumables	2550.03	0.08	0.01	2347.52	0.09	0.01
Stationery &stores	7437.77	0.24	0.03	2263.70	0.08	0.01
Labour wages	659.25	0.02	0.00	633.58	0.02	0.00
Miscellaneous cost	32.92	0.00	0.00	360.82	0.01	0.00
Sub total	3043922.49	98.93	13.91	2716013.61	98.93	13.44
Total cost (A+B)(Rs)	3076877.25	100.00	**14.06**	2745431.50	100.00	**13.59**
Total quantity of milk prepared (litres)	218840.00			202040.00		

Table 5.22 Cost of production of Flavoured milk

Particulars	Co-operative dairy plant			Private dairy plant		
	Amount (Rs)	Percent cost	Per unit cost (Rs/litre)	Amount (Rs)	Percent cost	Per unit cost (Rs/litre)
A. Fixed cost						
Depreciation	615.00	1.01	0.44	768.75	0.28	0.07
Interest	735.00	1.21	0.52	918.75	0.33	0.09
Salary of staff	16315.00	26.79	11.61	20393.75	7.39	1.93
Sub Total	17665.00	29.00	12.57	22081.25	8.00	2.09
B. Variable cost						
Raw material cost (including procurement cost)	14621.93	24.01	10.41	102643.20	37.19	9.72
Consumables	1854.63	3.05	1.32	11110.92	4.03	1.05
Steam cost	1277.13	2.10	0.91	9796.97	3.55	0.93
Refrigeration cost	319.90	0.53	0.23	1578.58	0.57	0.15
Electricity	285.08	0.47	0.20	1315.50	0.48	0.12
Bottling and Corking cost	16118.96	26.47	11.47	92085.00	33.36	8.72
Quality control	211.83	0.35	0.15	1140.00	0.41	0.11
Repairs	205.08	0.34	0.15	1216.08	0.44	0.12
Labour wages	281.17	0.46	0.20	1488.75	0.54	0.14
Labelling cost	4331.83	7.11	3.08	18319.17	6.64	1.73
Bulk Packing cost	3500.00	5.75	2.49	9718.00	3.52	0.92
Production loss	183.33	0.30	0.13	3501.08	1.27	0.33
Miscellaneous cost	49.17	0.08	0.03	0.00	0.00	0.00
Sub total	43240.04	71.00	30.78	253913.25	92.00	24.04
Total cost (A+B)(Rs)	60905.04	100.00	**43.35**	275994.50	100.00	**26.14**
Total quantity milk prepared (litres)	1405.00			10560.00		
Cost of production per litre (Rs)	**43.35**			**26.14**		

Table reveals that cost of production of Flavoured milk was comparatively very low to Private dairy plant and it was Rs. 26.14 per litre of milk. The monthly average production of Flavoured milk was around 10,560 litres of milk for Private dairy plant. The fixed costs were only 8 per cent whereas variable costs were as high as 92 per cent. The contribution of different cost components to the total cost was found to be raw material (37.19 per cent), bottling and corking cost (33.36 per cent), labeling cost (6.64 per cent), bulk packing cost (3.5 per cent), salary of staff (7.4 per cent) and the remaining items contributed less than 10 per cent of total cost of production of Flavoured milk. In Private dairy plant cost of production was low due to increase in quantity of milk produced and decrease in fixed cost of production (especially salary of staff) than Co-operative dairy plant.

5.2.5 Cost of Production of Butter

Manufacturing of Butter had a cost of production of Rs. 81.6 per kg for Co-operative plant. (Table 5.23) During the study period, the average production of Butter was around 35,400 kg per month. The relative share of fixed cost and variable costs to total cost was 1.45 per cent and 98.55 per cent respectively. The component wise cost analysis revealed that raw material cost (86 per cent), packing cost (6.53 per cent), and electricity cost was 2.60 per cent. The remaining items contributed less than 5 per cent of total cost.

A perusal of Table reflects that cost of production of Butter was very low compared to the Co-operative dairy plant at Rs. 67.44 per kg. The average production of Butter was around 55,000-kg per month. The fixed cost share and variable cost share was 1.61 per cent and 98.38 per cent respectively in the total cost. The component wise cost analysis revealed that raw material cost (90 per cent) and packing cost (4 per cent). The remaining items contributed less than 6 per cent of total cost of production. The Butter production cost was very low in Private dairy plant was due to increase in quantity of product manufactured and decrease in cost of packing material.

Table 5.23 Cost of production of Butter

Particulars	Co-operative dairy plant			Private dairy plant		
	Amount (Rs)	Percent cost	Per unit cost (Rs/Kg)	Amount (Rs)	Percent cost	Per unit cost (Rs/Kg)
A. Fixed cost						
Depreciation	1942.00	0.07	0.05	2718.80	0.08	0.05
Interest	23946.00	0.83	0.68	33524.40	0.92	0.62
Salary of staff	16158.00	0.56	0.46	22621.20	0.62	0.42
Sub Total	42046.00	1.45	1.19	58864.40	1.62	1.09
B. Variable cost						
Raw material cost (including procurement cost)	2492228.36	86.13	70.34	3305961.42	90.73	61.19
Consumables	8554.58	0.30	0.24	1286.25	0.04	0.02
Steam cost	32472.83	1.12	0.92	34020.17	0.93	0.63
Refrigeration cost	19143.75	0.66	0.54	23943.38	0.66	0.44
Electricity	75300.00	2.60	2.13	40053.03	1.10	0.74
Water	638.00	0.02	0.02	755.83	0.02	0.01
Quality control	4251.75	0.15	0.12	4866.75	0.13	0.09
Repairs and maintenance charges.	391.25	0.01	0.01	2504.60	0.07	0.05
Labour wages	7086.42	0.24	0.20	4757.67	0.13	0.09
Packing cost	189085.50	6.53	5.34	132868.33	3.65	2.46
Storage cost	9434.67	0.33	0.27	6357.00	0.17	0.12
Production loss	11030.67	0.38	0.31	27308.67	0.75	0.51
Miscellaneous cost	1851.92	0.06	0.05			
Sub total	2851469.70	98.55	80.48	3584683.09	98.38	66.35
Total cost (A+B)(Rs)	2893515.70	100.00	**81.66**	3643547.49	100.00	**67.44**
Total quantity of product prepared (Kg)	35431.00			54024.00		
Cost of production per kg (Rs)	**81.66**			**67.44**		

Table 5.24 Cost of production of Ghee

Particulars	Co-operative dairy plant			Private dairy plant		
	Amount (Rs)	Percent cost	Per unit cost (Rs/Kg)	Amount (Rs)	Percent cost	Per unit cost (Rs/Kg)
A. Fixed cost						
Depreciation	3748.00	0.13	0.13	4685.00	0.16	0.16
Interest	8748.00	0.31	0.30	10935.00	0.37	0.37
Salary of staff	15440.00	0.54	0.53	19300.00	0.66	0.64
Sub Total	27936.00	0.98	0.97	34920.00	1.19	1.17
B. Variable cost						
Raw material cost (including procurement cost)	2562688.57	89.98	88.65	2607242.10	88.95	86.38
Consumables	1216.67	0.04	0.04	1259.17	0.04	0.06
Steam cost	76971.67	2.70	2.66	79193.42	2.70	2.62
Electricity	9978.50	0.35	0.35	16213.47	0.55	0.54
Water	1312.25	0.05	0.05	2069.17	0.07	0.07
Quality control	1879.00	0.07	0.07	2361.67	0.08	0.08
Repairs and maintenance charges.	1455.83	0.05	0.05	2563.67	0.09	0.08
Packing cost	155033.67	5.44	5.36	169099.91	5.77	5.60
Production loss	7795.67	0.27	0.27	10181.56	0.35	0.34
Miscellaneous cost	1953.25	0.07	0.07	6162.88	0.21	0.22
Sub total	2820285.07	99.02	97.57	2896347.00	98.81	95.99
Total cost (A+B)(Rs)	2848221.07	100.00	**98.53**	2931267.00	100.00	**97.16**
Total quantity of product prepared (Kg)	28906.00			30183.00		
Cost of production per kg (Rs)	**98.53**			**97.16**		

5.2.6 Cost of Production of Ghee

Ghee is one of the major products for both the dairy plants. Table 5.24 shows the relative cost of production of Ghee in both the plants.

It can be seen from the table that average cost of production of Ghee in Co-operative dairy plant was found to be Rs. 98.53 per kg. The fixed costs were around 1 per cent whereas variable costs were as high as 99 per cent. In the production of Ghee, raw material constituted about 90 per cent to total cost followed by packing cost was 5.4 per cent, steam cost which was 2.7 per cent. Rest all costs were individually less than 1 per cent and their aggregate figure was also meagre aggregating to less than 2 per cent.

The cost of production of Ghee for Private dairy plant was Rs. 97.16 per kg. The bifurcation of total costs into fixed and variable cost reveals that their relative shares were 1.19 per cent and 98.8 per cent respectively. Break-up of production cost into its constituents showed that expenses on raw material was 89 per cent followed by packing cost was 5.76 per cent, steam cost was 2.7 per cent and. The monthly average production of Ghee was around 28,000 to 30,000 kg for both the plants.

5.2.7 Cost of Production of Milk Peda

Table 5.25 gives the economic analysis of Milk peda manufacturing. The table revealed that Milk peda production cost was around Rs. 80 per kg. The average production of Milk peda was around 2,400-kg per month. The relative contribution of fixed and variable costs to the total cost was 16.48 per cent and 83.52 per cent respectively.

The share of different cost components in total cost revealed that raw material cost was 56 per cent; salary of staff was 16.48 per cent followed by steam cost 14 per cent and packing cost was 6 per cent. The remaining items contributed less than 8 per cent to the total cost. This product has been newly added to existing product line.

Table 5.25 Cost of production of Milk Peda

Particulars	Amount (Rs)	Percent cost	Per unit cost (Rs/Kg)
A. Fixed cost			
Depreciation	707.40	0.38	0.30
Interest	848.00	0.45	0.36
Salary of staff	29508.00	15.65	12.52
Sub Total	31063.40	16.48	13.18
B. Variable cost			
Raw material cost (including procurement cost)	106337.31	56.42	45.11
Consumables	8562.92	4.54	3.63
Steam cost	26391.25	14.00	11.19
Electricity	1060.92	0.56	0.45
Labour wages	471.58	0.25	0.20
Packing cost	10885.92	5.78	4.62
Quality control	732.00	0.39	0.31
Repair and maintenance charges.	2592.50	1.38	1.10
Production loss	393.33	0.21	0.17
Sub total	157427.73	83.52	66.78
Total cost (A+B)(Rs)	188491.13	100.00	**79.95**
Total quantity of product prepared (Kg)	2357.00		
Cost of production per kg (Rs)	**79.95**		

5.2.8 Cost of Production of Paneer

It is evident from the table 5.26 that the cost of Paneer production was Rs. 62 per kg out of which raw material alone accounted for major share at Rs. 50.56 per kg of product. The average production of Paneer was around 8,000 kg per month.The relative contribution of fixed and variable costs to total cost were 14 per cent and 86 per cent respectively. Salary of staff was Rs. 8.30 per kg followed by packaging cost which was around Rs. 0.83 per kg. All other items constituting the total costs were in aggregate less than Rs 2 per kg of the product. The results obtained in the present study are in conformity with the findings of Kalra &Singh (1985), Kumar (1987), Chahal (1991), Murali (2001) and Narnaware (2002) who obtained similar results in their studies on processing and manufacturing cost of different dairy products in different dairy plants.

Table 5.26 Cost of production of Paneer

Particulars	Amount (Rs)	Percent cost	Per unit cost (Rs/Kg)
A. Fixed cost			
Depreciation	1591.65	0.32	0.20
Interest	1908.00	0.39	0.24
Salary of staff	66393.00	13.40	8.31
Sub total	69892.65	14.11	8.75
B. Variable cost			
Raw material cost (including procurement cost)	404022.99	81.57	50.57
Electricity cost	129.50	0.03	0.02
Water	2019.75	0.41	0.25
Steam	3451.33	0.70	0.43
Refrigeration	1839.17	0.37	0.23
Store maintenance	4997.42	1.01	0.63
Packaging cost	6615.08	1.34	0.83
Quality control	2118.58	0.43	0.27
Miscellaneous	220.50	0.05	0.03
Sub total	425414.33	85.89	53.25
Total cost (A+B)(Rs)	495306.98	100.0000	**62.00**
Quantity of product prepared (kg)	7989.00		
Cost of production per kg (Rs)	**62.00**		

5.3 COMPARATIVE ANALYSIS OF DISTRIBUTION COST OF DAIRY PRODUCTS FOR CO-OPERATIVE AND PRIVATE DAIRY PLANTS

The milk and milk products distribution function was done by both the dairy plants through their sales outlets. The distribution costs of all major dairy products were estimated during the study period. The detailed break-up of distribution cost components of various products into fixed and variable, total, per cent and per unit cost are presented and discussed in subsequent sections in comparative manner for Co-operative and Private dairy plants.

Table 5.27 Distribution cost of Toned milk

Particulars	Co-operative dairy plant			Private dairy plant		
	Amount (Rs)	Percent cost	Per unit cost (Rs/Kg)	Amount (Rs)	Percent cost	Per unit cost (Rs/Kg)
A. Fixed cost						
Depreciation	3109.79	0.36	0.01	3576.26	0.35	0.01
Interest	8087.14	0.93	0.01	9300.21	0.91	0.01
Salary of staff	283038.72	32.61	0.27	325494.53	31.68	0.36
Sub total	294235.65	33.90	0.29	338371.00	32.94	0.38
B. Variable cost						
Sales commission	256814.92	29.59	0.25	417191.00	40.62	0.47
Sales promotion	20440.99	2.36	0.02	17187.50	1.67	0.02
Advertisement expenditure	1157.27	0.13	0.00	1054.25	0.10	0.01
Cost of transportation	51042.71	5.88	0.05	70007.33	6.81	0.08
Rental charges	7012.70	0.81	0.01	.....	.....	.....
Hire lorry charges	192165.75	22.14	0.19	151651.42	14.76	0.17
Cost of storage	21188.26	2.44	0.02	16826.92	1.64	0.02
Cost of stationery	4712.01	0.54	0.00	3188.42	0.31	0.01
Labour wages	8082.38	0.93	0.01	6555.92	0.64	0.01
Taxi charges.	4073.63	0.47	0.00	2647.23	0.26	0.01
Miscellaneous cost	7024.53	0.81	0.01	2467.75	0.24	0.01
Sub total	573715.13	66.10	0.57	688777.73	67.06	0.77
Total cost (A+B)(Rs)	867950.79	100.00	**0.86**	1027148.73	100.00	**1.15**
Total quantity Of product sold (lit)	1013722.00			891768.00		
Cost of distribution per litre (Rs)	**0.86**			**1.15**		

5.3.1 Distribution Cost of Toned Milk

The total cost incurred for the distribution of one litre of Toned milk was 86 paisa for Co-operative dairy plant. The average quantity of Toned milk distribution was around 10,13,722 litres per month. The fixed cost and variable cost were 34 per cent and 66 per cent for Co-operative dairy plant respectively. Among the major components of distribution, the maximum share was on the salaries of staff accounting for at 33 per cent, that followed by sales commission (30 per cent), hire lorry charges (22 per cent), and cost of transportation (6 per cent) and cost of storage was 2.44 per cent. The remaining items contributed less than 5 per cent in total cost. (Table 5.27).

The total expenditure incurred for (Table 5.27) distribution of Toned milk of Private dairy was higher than Co-operative plant as Rs. 1.15 per litre. The average distribution of Toned milk for Private dairy plant was around 8,91,000 litres per month. The fixed cost and variable cost were 33 per cent and 67 per cent respectively for Private dairy plant. Among the major cost components, maximum share was sales commission around 41 per cent. Next major component was salary of staff (33 per cent) followed by hire lorry charges (15 per cent) and cost of transportation (7 per cent). The remaining items share was only around 4 per cent in total distribution cost. This analysis reveals that increased quantity of Toned milk distribution reduced the cost of distribution by 30 paise per litre in case of Co-operative dairy plant. Further, the Private dairy plant was paying excess sales commission than Co-operative dairy plant by around 22 paise per litre in total cost of distribution.

5.3.2 Distribution Cost of Standardized Milk

Table 5.28 shows that the total distribution cost incurred for Standardized milk was 85 paisa per litre for Co-operative plant. The average distribution quantity was around 17,41,600 litres per month. The fixed cost and variable cost were 33 per cent and 67 per cent for Co-operative dairy plant respectively. The share of different cost components in total cost revealed that salary of staff was 32 per cent, followed by sales commission (32 per cent), hire lorry charges (21 per cent), cost of storage (2 per cent) and

Table 5.28 Distribution cost of Standardized milk

Particulars	Co-operative dairy plant			Private dairy plant		
	Amount (Rs)	Percent cost	Per unit cost (Rs/Kg)	Amount (Rs)	Percent cost	Per unit cost (Rs/Kg)
A. Fixed cost						
Depreciation	5118.70	0.35	0.00	5374.63	0.29	0.01
Interest	13311.37	0.90	0.01	13976.94	0.76	0.01
Salary of staff	465879.71	31.58	0.27	489173.70	26.60	0.27
Sub total	484309.79	32.82	0.28	508525.28	27.65	0.29
B. Variable cost						
Sales commission	464502.82	31.48	0.27	879393.29	47.82	0.50
Sales promotion	29249.50	1.98	0.02	31076.58	1.69	0.02
Advertisement expenditure	1323.09	0.09	0.00	1322.58	0.07	0.01
Cost of transportation	108497.99	7.35	0.06	74492.58	4.05	0.04
Rental charges	12309.76	0.83	0.01	.....	.....	.....
Hire lorry charges	304855.31	20.66	0.18	276923.08	15.06	0.16
Cost of storage	34814.07	2.36	0.02	32085.75	1.74	0.02
Cost of stationery	9289.31	0.63	0.01	5820.00	0.32	0.01
Labour wages	14084.13	0.95	0.01	20524.33	1.11	0.01
Taxi charges.	5502.30	0.37	0.00	5564.55	0.30	0.01
Miscellaneous cost	6694.39	0.45	0.00	3414.54	0.19	0.01
Sub total	991122.66	67.18	0.57	1330617.30	72.35	0.76
Total cost (A+B)(Rs)	1475432.44	100.00	**0.85**	1839142.58	100.00	**1.05**
Total quantity Of product sold (lit)	1741590.00			1758756.00		
Cost of distribution per litre (Rs)	**0.85**			**1.05**		

Table 5.29 Distribution cost of Full cream milk

Particulars	Co-operative dairy plant			Private dairy plant		
	Amount (Rs)	Percent cost	Per unit cost (Rs/Kg)	Amount (Rs)	Percent cost	Per unit cost (Rs/Kg)
A. Fixed cost						
Depreciation	673.51	0.25	0.00	774.53	0.25	0.01
Interest	1751.49	0.64	0.01	2014.21	0.66	0.01
Salary of staff	61299.57	22.40	0.28	70494.50	23.11	0.34
Sub total	63724.56	23.29	0.29	73283.24	24.02	0.36
B. Variable cost						
Sales commission	142638.78	52.13	0.65	181549.58	59.51	0.90
Sales promotion	4898.00	1.79	0.02	5466.25	1.79	0.02
Advertisement expenditure	333.29	0.12	0.00	108.58	0.04	0.01
Cost of transportation	9784.37	3.58	0.04	6830.42	2.24	0.04
Rental charges	5904.66	2.16	0.03	.....	.....	.....
Hire lorry charges	39072.74	14.28	0.18	29730.17	9.74	0.11
Cost of storage	3468.04	1.27	0.02	2949.17	0.97	0.01
Cost of stationery	990.15	0.36	0.00	1991.75	0.65	0.01
Labour wages	1942.11	0.71	0.01	1368.33	0.45	0.01
Taxi charges.	886.07	0.32	0.00	879.25	0.29	0.01
Miscellaneous cost	674.43	0.25	0.00	931.00	0.31	0.01
Sub total	209918.20	76.71	0.96	231804.50	75.98	1.15
Total cost (A+B)(Rs)	273642.76	100.00	**1.25**	305087.74	100.00	**1.51**
Total quantity Of product sold (lit)	219548.00			202055.00		

cost of transportation (7 per cent). The remaining items contributed less than 5 per cent of total cost.

The table also indicated that the distribution cost of Standardized milk was Rs. 1.05 per litre for Private dairy plant. The average quantity of Standardized milk distributed was around 17,58,000 litres per month. The fixed cost was 28 per cent and variable cost was 73 per cent in total cost of distribution of Standardized milk. Component wise cost analysis revealed that the major share of expenditure was sales commission (48 per cent), next major component was salary of staff (28 per cent) followed by hire lorry charges (15 per cent), cost of transportation (4 per cent) and the other expenses aggregating to total of 5 per cent in the total distribution cost.

The comparative cost analysis revealed that the distribution cost was lesser for Co-operative dairy plant by 20 paisa per litre than Private plant. This may be due to higher amount of sales commission (16 per cent per litre) paid by Private dairy plant in the total distribution cost.

5.3.3 Distribution Cost of Full cream Milk

It can be seen from Table 5.29 that average distribution cost was Rs. 1.25 litre for Co-operative plant. The quantity of milk distributed was around 2,20,000 litres per month. Break-up of total distribution cost showed that the share of fixed cost was 23 per cent and variable cost was 77 per cent. The relative share of different cost components was sales commission (52 per cent), followed by salary of staff (22 per cent), hire lorry charges (14 per cent) and cost of transportation (4 per cent). The expenditure on remaining items was around 6 per cent in total cost of distribution.

It is evident from Table 5.29 that the distribution cost was Rs. 1.51 per litre of milk for Private dairy plant. The total quantity of Full cream milk distributed was around 2,02,000 litres per month. The bifurcation of total costs into fixed and variable costs were 24 per cent and 76 per cent respectively. The relative share of different cost components in total cost was 60 per cent for sales commission, followed by salary of staff (23 per cent), hire lorry charges (10 per cent), cost of transportation (2 per cent) and remaining items constituted 6 per cent in total distribution cost.

Table 5.30 Distribution cost of Flavoured milk

Particulars	Co-operative dairy plant			Private dairy plant		
	Amount (Rs)	Percent cost	Per unit cost (Rs/litre	Amount (Rs)	Percent cost	Per unit cost (Rs/litre
A. Fixed cost						
Depreciation	268.00	2.85	0.19	469.00	1.10	0.06
Interest	437.00	4.65	0.31	764.75	1.80	0.09
Salary of staff	3831.22	40.76	2.73	6704.64	15.79	0.80
Sub total	4536.22	48.26	3.23	7938.39	18.69	0.95
B. Variable cost						
Sales commission	2105.33	22.40	1.50	20830.21	49.05	2.50
Advertisement expenditure	195.10	2.08	0.14	718.83	1.69	0.09
Cost of transportation	429.16	4.57	0.31	3395.00	7.99	0.41
Cost of storage	280.68	2.99	0.20	416.58	0.98	0.05
Telephone charges	135.64	1.44	0.10	462.83	1.09	0.06
Labour wages	314.64	3.35	0.22	376.33	0.89	0.05
Sales tax	1403.58	14.93	1.00	8332.08	19.62	1.00
Miscellaneous cost	0.00	0.00	0.00	0.00	0.00	0.00
Sub total	4864.14	51.74	3.47	34531.88	81.31	4.14
Total cost (A+B)(Rs)	9400.36	100.00	**6.70**	42470.27	100.00	**5.10**
Total quantity Of product sold (lit)	1403.00			8332.00		
Cost of distribution per litre (Rs)	**6.70**			**5.10**		

Comparative cost analysis revealed that the distribution cost was lesser for Co-operative plant by 25 paisa per litre than the Private plant. This could be due to 7 per cent higher amount of sales commission paid per litre to commission agents by Private plant and increase in quantity of milk distributed by Co-operative plant.

5.3.4 Distribution Cost of Flavoured Milk

The results presented in Table 5.30 revealed that distribution cost of Flavoured milk was Rs. 6.70 per litre of milk. The average quantity distributed by Co-operative plant was around 1,400 litres per month. Break-up of distribution cost into its major cost showed that fixed cost was 48 per cent and variable cost was 52 per cent. The component wise cost analysis showed that the salary of staff (41 per cent), followed by share of sales commission was 22 per cent, sales tax (15 per cent), transportation cost (5 per cent), and cost of storage was 3 per cent. The results depicted in table 5.30 shows that the cost of distribution per litre milk was Rs. 5.10 for Private dairy plant. The average quantity for distribution was 8,300 litres per month. The share of fixed cost was 19 per cent and variable cost was 81 per cent in total distribution cost of Flavoured milk. The sales commission (49 per cent), followed by sales tax (20 per cent), salary of staff was 16 per cent, transportation cost (8 per cent), and advertisement expenditure was around 2 per cent.

Comparative cost analysis revealed that the distribution cost was less for Private dairy plant by Rs 1.60 per litre of milk. It was due to less amount of salary paid and higher quantity of milk distributed by Private dairy plant than the Co-operative plant and also due to 26 per cent higher amount of sales commission paid per litre to commission agents by Private plant.

5.3.5 Distribution Cost of Butter

The data in table 5.31 shows that the cost of distribution of Butter per kg was 14.51 for Co-operative plant.

Table 5.31 Distribution cost of Butter

Particulars	Co-operative dairy plant		
	Amount (Rs)	Percent cost	Per unit cost (Rs/Kg)
A. Fixed cost			
Depreciation	206.36	1.38	0.20
Interest	336.49	2.26	0.33
Salary of staff	5900.08	39.58	5.74
Sub total	6442.93	43.22	6.27
B. Variable cost			
Sales commission	1970.28	13.22	1.92
Advertisement expenditure	384.14	2.58	0.37
Cost of transportation	786.80	5.28	0.77
Cost of storage	331.59	2.22	0.32
Telephone charges	164.48	1.10	0.16
Labour wages	335.73	2.25	0.33
Sales tax	4490.41	30.12	4.37
Miscellaneous cost	0.00	0.00	0.00
Sub total	8463.43	56.78	8.24
Total cost (A+B)(Rs)	14906.36	100.00	**14.51**
Total quantity Of product sold (Kg)	1027.00		
Cost of distribution per kg (Rs)	**14.51**		

The average quantity of product sold was 1,027 kg per month. The break-up of total cost into fixed cost was 43 per cent and variable cost was 57 per cent. The relative share of different cost components showed that the salary of staff was 40 per cent, followed by sales tax (30 per cent), sales commission (13 per cent), transportation cost (5 per cent) and advertisement expenditure (3 per cent). The remaining items of expenditure were around 9 per cent in total cost.

Table 5.32 reflects that the distribution cost of Butter was Rs. 17.39 per kg in case of Private dairy plant. The average quantity sold per month was 15,000 kg.

Table 5.32 Distribution cost of Butter

Particulars	Private dairy plant		
	Amount (Rs	Percent cost	Per unit cost (Rs/Kg)
A. Fixed cost			
Depreciation	574.06	0.22	0.04
Interest	936.05	0.36	0.06
Salary of staff	16412.96	6.37	1.11
Sub total	17923.07	6.95	1.21
B. Variable cost			
Sales commission	88950.00	34.47	6.00
Sales promotion	305.83	0.12	0.02
Advertisement expenditure	5636.00	2.18	0.36
Cost of transportation	8895.00	3.45	0.60
Cost of storage	2223.92	0.86	0.15
Cost of stationery	359.75	0.14	0.02
Labour wages	1146.58	0.44	0.08
Sales tax	132595.00	51.39	8.94
Sub total	240112.08	93.05	16.18
Total cost (A+B)(Rs)	258035.15	100.00	**17.39**
Total quantity Of product sold (kg)	14825.00		
Cost of distribution per kg (Rs)	**17.39**		

The break-up of total cost into fixed cost was 7 per cent and variable cost was 93 per cent. The relative share of cost components was sales tax (52 per cent), salary of staff (6 per cent), sales commission (35 per cent), advertisement expenditure (2 per cent) and transportation cost (3 per cent). The remaining items share was around 3 per cent. The distribution cost was higher for Private plant by Rs. 2.88 per kg due to higher sales commission paid by Private plant than Co-operative plant.

Table 5.33 Distribution cost of Ghee

Particulars	Co-operative dairy plant			Private dairy plant		
	Amount (Rs)	Percent cost	Per unit cost (Rs/Kg)	Amount (Rs)	Percent cost	Per unit cost (Rs/Kg)
A. Fixed cost						
Depreciation	187.60	0.16	0.05	675.36	0.07	0.03
Interest	305.90	0.27	0.08	1101.24	0.12	0.04
Salary of staff	5363.71	4.70	1.45	19309.36	2.08	0.68
Sub total	5857.21	5.13	1.59	21085.96	2.27	0.75
B. Variable cost						
Sales commission	67277.67	58.90	18.24	595437.50	64.17	21.00
Advertisement expenditure	1432.50	1.25	0.39	729.17	0.08	0.03
Cost of transportation	3623.99	3.17	0.98	11009.08	1.19	0.39
Cost of stationery	358.66	0.31	0.10	697.58	0.08	0.02
Labour wages	1028.62	0.90	0.28	1217.08	0.14	0.04
Sales tax	34636.54	30.33	9.39	297718.75	32.09	10.50
Sub total	108357.98	94.87	29.37	906809.17	97.73	31.98
Total cost (A+B)(Rs)	114215.19	100.00	**30.96**	927895.13	100.00	**32.73**
Total quantity Of product sold (Kg)	3688.00			28354.00		
Cost of distribution per kg (Rs)	**30.96**			**32.73**		

5.3.6 Distribution Cost of Ghee

It was observed from Table 5.33 that the distribution cost of Ghee was Rs. 31 per kg. The average quantity of Ghee distributed was around 3,700 kg per month for Co-operative plant. The fixed cost was 5 per cent and variable cost was 95 per cent in total distribution cost of Ghee. The relative share of different cost components showed that the sales commission was 59 per cent followed by sales tax (30 per cent), salary of staff (5 per cent) and transportation cost (3 per cent). The remaining items total share was 4 per cent in total cost.

It is visualized from Table 5.33 that the distribution cost of Ghee was Rs. 33 per kg. The average quantity of product distributed was around 28,000 kg per month for Private plant. The fixed cost and variable cost was 2 per cent and 98 per cent respectively in total cost of Ghee distribution. The different cost components share in total cost was sales commission (64 per cent), sales tax (32 per cent), salary of staff (2 per cent) and transportation cost (1 per cent) and the share of remaining items cost was around 2 per cent in total cost.

This analysis revealed that distribution cost was lesser by Rs. 1.77 per kg for Co-operative plant than Private plant. This decrease in total distribution cost per litre was attributed to less sales commission (around 5 per cent per litre) for Co-operative plant than Private dairy plant.

5.3.7 Distribution cost of Milk peda at Co-operative dairy plant

A glance at Table 5.34 shows that the Milk peda distribution cost was Rs. 22.18 per kg for Co-operative plant and average quantity of product sold was 2,400 kg per month.

Table 5.34 Distribution cost of Milk peda

Particulars	Co-operative dairy plant		
	Amount (Rs)	Percent cost	Per unit cost (Rs/Kg)
A. Fixed cost			
Depreciation	159.46	0.30	0.07
Interest	260.02	0.50	0.11
Salary of staff	4559.16	8.72	1.93
Sub total	4978.63	9.52	2.11
B.Variable cost			
Sales commission	21498.14	41.12	9.12
Advertisement expenditure	565.87	1.08	0.24
Cost of transportation	1391.24	2.66	0.59
Telephone charges	305.18	0.58	0.13
Labour wages	582.50	1.11	0.25
Sales tax	22962.85	43.92	9.74
Miscellaneous cost	0.00	0.00	0.00
Sub total	47305.78	90.48	20.07
Total cost (A+B)(Rs)	52284.41	100.00	**22.18**
Total quantity Of product sold (Kg)	2357.00		
Cost of distribution per kg (Rs)	**22.18**		

The relative contribution of fixed and variable costs to total cost was 10 per cent and 90 per cent respectively. The component wise cost was sales tax (44 per cent), followed by sales commission (41 per cent), salary of staff (9 per cent) and transportation cost (3 per cent). The remaining items total share was around 3 per cent in total cost.

5.3.8 Distribution cost of Paneer

A perusal of Table 5.35 reveals that Paneer distribution for Private dairy plant cost was around Rs. 20 per kg. The average quantity of Paneer sold was 8,000 kg per month.

Table 5.35 Distribution cost of Paneer

Particulars	Private dairy plant		
	Amount (Rs)	Percent cost	Per unit cost (Rs/Kg)
A. Fixed cost			
Depreciation	510.27	0.31	0.06
Interest	832.05	0.51	0.10
Salary of staff	14589.30	8.94	1.83
Sub total	15931.62	9.76	1.99
B. Variable cost			
Sales commission	72363.75	44.35	9.06
Advertisement Expenditure	2227.25	1.37	0.28
Cost of transportation	5743.25	3.52	0.72
Telephone charges	563.75	0.35	0.07
Labour charges	1636.08	1.00	0.20
Sales tax	64715.33	39.66	8.10
Sub total	147249.42	90.24	18.44
Total cost (A+B)(Rs)	163181.03	100.00	**20.43**
Total quantity Of product sold (kg)	7989.00		
Cost of distribution per kg (Rs)	**20.43**		

Segregation of total cost into fixed and variable costs were 10 per cent and 90 per cent respectively. In the distribution cost, the sales commission was highest 45 per cent followed by sales tax (40 per cent), salary of staff (9 per cent) and transportation cost was around 4 per cent. All other components of cost were less than 2 per cent. The results obtained in the present study were in conformity with the findings of Anand (1979) and Chahal (1991) who obtained similar results for distribution cost of milk in dairy plants.

5.4 MARKETING COST, MARKETING MARGIN AND MARKETING EFFICIENCY OF VARIOUS DAIRY PRODUCTS FOR CO-OPERATIVE AND PRIVATE DAIRY PLANTS

The present section is addressed to an analysis of the parameters namely marketing cost, marketing margin and marketing efficiency of dairy products for both the selected dairy plants.

5.4.1 Toned Milk

Tables 5.36 and 5.37 shows the marketing cost, marketing margin and marketing efficiency for Co-operative and Private dairy plants for Toned milk.

These tables revealed that marketing cost for Co-operative plant was Rs 3.32 comprised of procurement cost of Rs. 1.36 (11.41 per cent), processing cost of Rs. 1.10 (9.23 per cent) and distribution cost of Rs. 0.86 (7.21 per cent) of total costs incurred whereas marketing cost for Private dairy plant was Rs. 3.32 comprised of procurement cost Rs. 1.35 (11.02 per cent), processing cost Rs. 0.82 (6.69 per cent) and distribution cost of Rs. 1.15 (9.39 per cent) of total costs incurred.

This analysis indicated that Co-operative plant was earning marketing margin of Rs. 0.58 per litre of product and it was higher than Private dairy plant margin being Rs. 0.25 per litre only.

The marketing efficiency of Co-operative dairy plant was (0.17) more than Private dairy plant (0.08). This may be due to the fact that Co-operative plant was earning more margins for a unit quantity of Toned milk than Private dairy plant. Thus, it was clear that Toned milk production was more profitable for Co-operative dairy plant than Private dairy plant.

5.4.2 Standardized Milk

Tables 5.36 and 5.37 depict a clear picture of marketing cost for Co-operative plant was Rs. 3.48 and comprised of procurement cost of Rs. 1.54 (11.23 per cent), processing cost of Rs. 1.09 (7.95 per cent) and distribution cost of Rs. 0.85 (6.20 per cent) of the total costs incurred whereas marketing cost for Private dairy was Rs. 3.34 comprised of procurement cost of Rs. 1.46

Table 5.36 Marketing cost, Marketing Margin &Marketing efficiency (Co-operative dairy plant)

NAME	(i)Raw material cost (Rs)	(ii)Procurement cost of raw material/unit	(iii)Processing cost/unit quantity	(iv)Distribution cost/unit (Rs)	(V)Production cost/unit= (i+ii+iii) (Rs)	(vi)Total costs/unit=(iv+v) (Rs)
Toned milk	8.60 (72.15)	1.36(11.41)	1.10(9.23)	0.86(7.21)	11.06(92.79)	11.92(100.00)
Standardized milk	10.23 (74.62)	1.54(11.23)	1.09(7.95)	0.85(6.20)	12.86(93.80)	13.71(100.00)
Full cream milk	11.19 (73.09)	1.70(11.10)	1.17(7.64)	1.25(8.16)	14.06(91.84)	15.31(100.00)
Flavoured milk	9.15 (18.28)	1.26(2.52)	32.94(65.81)	6.70(13.39)	43.35(86.61)	50.05(100.00)
Butter	68.51(71.24)	1.83(1.90)	11.32(11.77)	14.51(15.09)	81.66(84.91)	96.17(100.00)
Ghee	86.60(66.88)	2.05(1.58)	9.88(7.63)	30.96(23.91)	98.53(76.09)	129.49(100.00)
Milk peda	43.92(43.00)	1.19(1.17)	34.84(34.11)	22.18(21.72)	79.95(78.28)	102.13(100.00)

(vii)Selling price/unit (Rs)	(viii)Marketing Margin =(vii-vi)(Rs)	(ix)Total Marketing cost =(ii+iii+iv)(Rs)	(x)Marketing cost and Margin=(viii+ix) (Rs) (Value added)	(xi)Marketing efficiency =[(x/ix)-1] =((V/I)-1]
12.50	0.58(4.87)	3.32(27.85)	3.90	0.1747
14.50	0.79(5.76)	3.48(25.38)	4.27	0.2270
16.00	0.69(4.51)	4.12(26.91)	4.81	0.1675
50.00	-0.05(0.10)	40.90(81.72)	40.85	-0.0012
110.00	13.83(14.38)	27.66(28.76)	41.49	0.5000
145.00	15.51(11.98)	42.89(33.12)	58.40	0.3616
100.00	-2.13(2.09)	58.21(57.00)	56.08	-0.0366

*Figures in brackets shows percentage to total cost

Table 5.37 Marketing cost, Marketing Margin &Marketing efficiency (Private dairy plant)

Product Name	(i)Raw material cost (Rs)	(ii)Procurement cost of raw material/unit	(iii)Processing cost/unit quantity	(iv)Distribution cost/unit (Rs)	(V)Production cost/unit= (i+ii+iii) (Rs)	(vi)Total costs/unit =(iv+v) (Rs)
Toned milk	8.93(72.90)	1.35(11.02)	0.82(6.69)	1.15(9.39)	11.10(90.61)	12.25(100.00)
Standardized milk	9.91(74.79)	1.46(11.02)	0.83(6.26)	1.05(7.92)	12.20(92.08)	13.25(100.00)
Full cream milk	11.22(74.30)	1.62(10.73)	0.75(4.97)	1.51(10.00)	13.59(90.00)	15.10(100.00)
Flavoured milk	8.52(29.23)	1.20(4.11)	14.32(49.14)	5.10(17.50)	24.04(82.49)	29.14(100.00)
Butter	56.93(67.11)	4.26(5.02)	6.25(7.37)	17.39(20.50)	67.44(79.50)	84.83(100.00)
Ghee	83.99(64.66)	2.38(1.83)	10.79(8.31)	32.73(25.20)	97.16(74.80)	129.89(100.00)
Paneer	48.90(59.32)	1.66(2.01)	11.44(13.88)	20.43(24.78)	62.00(75.22)	82.43(100.00)

(vii)Selling price/unit (Rs)	(viii)Marketing Margin = (vii-vi)(Rs)	(ix)Total Marketing cost =(ii+iii+iv)(Rs)	(x)Marketing cost and Margin=(viii+ix) (Rs) (Value added)	xi) Marketing efficiency =[(x/ix)-1] =((V/I)-1]
12.50	0.25(2.04)	3.32(27.10)	3.57	0.08
14.50	1.25(9.43)	3.34(25.21)	4.59	0.37
16.00	0.90(5.96)	3.88(25.70)	4.78	0.23
52.50	23.36(80.16)	20.62(70.76)	43.98	1.13
120.00	35.17(41.46)	27.90(32.89)	63.07	1.26
150.00	20.11(15.48)	45.90(35.34)	66.01	0.44
110.00	27.57(33.45)	33.53(40.68)	61.10	0.82

*Figures in brackets shows percentage to total cost

(11.02 per cent), processing cost of Rs. 0.83 (6.26 per cent) and distribution cost of Rs. 1.05 (7.92 per cent) of the total cost incurred in marketing.

This analysis revealed that Private plant was earning more market margins (Rs. 1.25) for a litre of Standardized milk than Co-operative dairy (Rs. 0.79). The marketing efficiency of Co-operative dairy (0.37) was more than Private dairy (0.23). It was due to lower marketing costs and more marketing margin for Private dairy than Co-operative dairy. Hence, it was clear that Standardized milk production was more profitable for Private dairy plant.

5.4.3 Full cream Milk

It is evident from the Tables 5.36 and 5.37 that marketing cost for Co-operative plant was Rs. 4.12 which consisted of procurement cost of Rs. 1.70 (11.10 per cent), processing cost of Rs. 1.17 (7.64 per cent) and distribution cost of Rs. 1.25 (8.16 per cent) of total costs incurred for Full cream milk whereas marketing cost for Private dairy was Rs.3.88 which comprised of procurement cost of Rs. 1.62 (10.73 per cent), processing cost of Rs. 0.75 (4.97 per cent) and distribution cost of Rs.1.51 (10 per cent) of the total costs incurred.

The marketing margin was Rs. 0.90 per litre of Full cream milk for Private dairy and was higher than Co-operative dairy (Rs. 0.69). The marketing efficiency of Co-operative dairy was 0.17 which was lower than Private dairy (0.23). This decrease for Co-operative dairy was attributed to more marketing cost and less marketing margin. It could be concluded that Full cream milk production was more profitable in case of Private dairy plant.

5.4.4 Flavoured Milk

It may be observed from Tables 5.36 and 5.37 that marketing cost for Co-operative plant was Rs. 40.90 per litre of milk which comprised of Procurement cost of Rs. 1.26 (2.52 per cent), processing cost of Rs. 32.94 (65.8 per cent) and distribution cost of Rs. 6.70 (13.4 per cent) for Flavoured milk whereas marketing cost for Private dairy was Rs. 20.62, which included procurement cost of Rs. 1.20 (4.11 per cent), processing cost of Rs. 14.32 (49.14 per cent) and distribution cost of Rs. 5.10 (17.50 per cent).

Marketing margin of Private dairy was R. 23.36, which was very much higher than Co-operative dairy's negative margin of Rs. -0.05 for this product. The marketing efficiency of Co-operative dairy was -0.0012 and for Private dairy it was 1.13. It is clear from the table that Flavoured milk production was profitable for Private dairy due to higher marketing margin and marketing efficiency.

5.4.5 Butter

Tables 5.36 and 5.37 depict that total marketing cost for Butter in case of Co-operative dairy was Rs. 27.66 of which included procurement cost of Rs. 1.83(1.90 per cent), processing cost of Rs. 11.32 (11.77 per cent) and distribution cost of Rs. 14.51(15.09 per cent).

The marketing cost of Butter for Private dairy was Rs.27.90 and included procurement cost of Rs. 4.26 (5.02 per cent), processing cost of Rs. 6.25 (7.37 per cent) and distribution cost of Rs. 17.39 (20.50 per cent).

The marketing margin was Rs. 35.17 for Private dairy and for Co-operative dairy it was Rs. 13.83. The marketing efficiency was 1.26 for Private dairy and was much higher than Co-operative dairy (0.50). It was observed form this analysis that, Butter production was highly profitable to Private dairy as compared to Co-operative dairy plant.

5.4.6 Ghee

Tables 5.36 and 5.37 shows the marketing cost for Ghee was Rs.42.89 for Co-operative dairy which comprised of procurement cost of Rs. 2.05 (1.58 per cent), processing cost of Rs. 9.88 (7.63 per cent), distribution cost of Rs. 30.96 (23.91 per cent). In case of Private dairy, marketing cost was 45.90 which was higher than Co-operative dairy and it comprised of procurement cost of Rs. 2.38, processing cost of Rs. 10.79 and distribution cost of Rs. 32.73.

The marketing margin and marketing efficiency for Co-operative dairy were Rs. 15.51 and 0.36 respectively whereas the marketing margin was Rs. 20.11 and marketing efficiency was 0.44 for Private dairy plant and concluded

that Ghee production was more profitable for Private dairy plant than Co-operative dairy.

5.4.7 Milk Peda

It can be observed from table 5.36 clearly represents that the marketing cost, marketing margin and marketing efficiency for Co-operative dairy were Rs 58.21, Rs -2.13 and –0.04 respectively. This product was earning loss to the Co-operative dairy and contributed a negative marketing margin and marketing efficiency. The components of marketing cost were procurement cost of Rs. 1.19 (1.17 per cent), processing cost of Rs. 34.84 (34.11 per cent) and distribution cost of Rs. 22.18 (21.72 per cent) respectively.

5.4.8 Paneer

An examination of Table 5.37 revealed that for Private dairy plant the marketing cost, marketing margin and marketing efficiency were Rs 33.53, Rs 27.57 and 0.82 respectively. The marketing cost comprised of procurement cost of Rs. 1.66 (2.01 per cent), processing cost of Rs. 11.44 (13.88 per cent) and distribution cost of Rs. 20.43 (24.78 per cent) respectively. This product earned high profit to Private dairy plant.

This results obtained in the present study were in agreement with the findings of Anand (1979) who worked out marketing cost for different dairy products. Pawar & Sawant (1979), Chahal (1991), Saha (1996), and Devaraja (2001) also worked out marketing cost of liquid milk in different dairy plants and confirmed that in between Co-operative and Private dairy plants, the later was more efficient in marketing of dairy products.

5.5 CONSTRAINTS FACED BY CO-OPERATIVE AND PRIVATE DAIRY PLANTS IN PROCUREMENT OF MILK, PROCESSING, MANUFACTURING AND AT DISTRIBUTION OF DAIRY PRODUCTS.

In this section, an attempt has been made to study the important constraints faced by the dairy plants. For this the constraints were ranked and

discussed under Co-operative society and milk collection centres level, chilling centre level, processing and manufacturing level and at sales and distribution level.

These constraints were ranked on the basis of total score value. The first rank reflects the very serious constraint and last rank reflects the least serious (or) not so serious constraint.

5.5.1 Constraints at Procurement Level.

5.5.1.1 Constraints at milk producers' Co-operative society and milk collection centre level

The constraints faced by MPCS or milk collection centres are presented in Tables 5.38 and 5.39 in the order of seriousness.

Table 5.38 Constraints at Milk Co-operative society

S. No.	Particulars	Total score	Rank
1	Some members of Co-operative society are pouring milk to Private milk vendor.	39.00	I
2	Irregular payments by Co-operative society level and advance payments made by Private milk vendors	38.00	II
3	Some of the Co-operative societies are collecting the milk at very low quantity.	37.00	III
4	Lack of infrastructure in the society to collect the milk at door step level	32.00	IV
5	Lesser emphasis on clean milk production at Co -operative society	30.00	V
6	Dairy Co-operative society being far away from milk producers' home	24.00	VI
7	Poor quality of milk	23.00	VII
8	Lack of fund for circulation in society	23.00	VII
9	Milk losses due to spoiling, sourage and other reasons.	22.00	VIII
10	Negligence and dishonesty of employees in Co- operative society	22.00	VIII
11	Lack of co-operation and coordination between society and plant	21.00	IX
12	Facilities provided by Co- operative society are not reaching the dairy farmers in time	21.00	IX

The table 5.38 clearly exhibits that members of Co-operative society (MPCS) were pouring the milk to Private milk vendors was a very serious constraint and ranked as first and the least serious constraint was facilities provided to members of Co-operative societies were not reaching in time for Co-operative plant. Some of the Co-operative societies were collecting very low quantity of milk and was ranked second most serious constraint.

Table 5.39 Constraints at Milk Collection centre

S. No.	Particulars	Total score	Rank
1	Some of the collection centers are collecting the milk at very low quantity.	37.00	I
2	Lesser emphasis on clean milk production at collection centres.	36.00	II
3	Lack of infrastructure in the collection centre to collect the milk at door step level	36.00	III
4	Poor quality of milk	33.00	IV
5	Collection centre being far away from milk producers' home	32.00	V
6	Member of collection centre is pouring the milk to other milk vendor.	29.00	VI
7	Lack of co-operation and coordination between collection centre and plant	27.00	VII
8	Lack of fund for circulation in collection centre.	27.00	VII
9	Facilities provided by collection centres are not reaching the dairy farmers in time.	24.00	VIII
10	Irregular payments by Collection centre and advance payments made by Private milk vendors	22.00	IX
11	Milk losses due to spoiling, sourage and other reasons.	22.00	IX
12	Negligence and dishonesty of employees in collection centre	21.00	X

It can be observed from Table 5.39 that some of the collection centres are collecting low quantity of milk was the very serious constraint and the problem of negligence and dishonesty of employees was the least serious constraint at milk collection centre for Private plant.

5.5.1.2 Constraints at milk transporters level

Table 5.40 Constraints at Milk Transporters level (Co-operative dairy plant)

Particulars	Total score	Rank
1. Under utilization of transport vehicles.	29.00	I
2. Milk tankers are not utilizing their full capacity.	28.00	II
3. Poor route planning leads to increased transportation cost	27.00	III
4. Poor roads for transporting the milk	25.00	IV
5. Excessive procurement staff.	21.00	V
6. Payment problem with contractors	13.00	VI
7. Spoilage of milk due to late arrivals or break do wn of vehicles	12.00	VII

Table 5.41 Constraints at Milk Transporters level (Private dairy plant)

Particulars	Total score	Rank
1. Under utilization of transport vehicles.	29.00	I
2. Milk tankers are not utilizing their full capacity.	28.00	II
3. Poor roads for transporting the milk	24.00	III
4. Poor route planning leads to increased transportation cost	19.00	IV
5. Excessive procurement staff.	19.00	IV
6. Payment problem with contractors	14.00	V
7. Spoilage of milk due to late arrivals or break down of vehicles	11.00	VI

Under utilization of transport vehicles was the most serious constraint and the problem of spoilage of milk was the least important constraint for Co-operative dairy plant. (Table 5.40)

Under utilization of transport vehicles was ranked first with the highest score and the spoilage of milk due to late arrivals was the less serious constraint with least score for Private dairy plant. (Table 5.41)

5.5.1.3 Constraints at chilling centre level

Among the various constraints at chilling centre level, under capacity of utilization of chilling centre was the most serious constraint with highest score from selected respondents and poor hygiene and sanitary standards was the least serious constraint with least score for Co-operative dairy (Table 5.42).

Table 5.42 Constraints at Chilling centre level (Co-operative dairy plant)

	Particulars	Total score	Rank
1.	Under capacity utilization of chilling centre	59.00	I
2.	Lack of skilled persons in the chilling centre	58.00	II
3.	Inadequate infrastructural facilities	47.00	III
4.	Lack of quality control measures	46.00	IV
5.	Increased expenditure for repairs and maintenance.	43.00	V
6.	Excess labour	34.00	VI
7.	High cost of chilling due to increased price of raw materials.	26.00	VII
8.	Low salary of employees	24.00	VIII
9.	Energy loss in terms of electricity, steam, refrigeration etc.	23.00	IX
10.	Spoilage of milk	23.00	IX
11.	Frequent power failure	22.00	X
12.	Wastage of resources like water, chemicals and detergents etc.	22.00	X
13.	Poor hygiene and sanitary standards in chilling centre	21.00	XI

Majority of respondents reported that under utilization of chilling centre was the most serious constraint (Table 5.43) and the frequent power failure was the least serious constraint for chilling centres of Private dairy plant.

Table 5.43 Constraints at Chilling centre level (Private dairy plant)

Particulars	Total score	Rank
1. Under capacity utilization of chilling centre	59.00	I
2. Lack of skilled persons in the chilling center	53.00	II
3. Lack of quality control measures	46.00	III
4. Increased expenditure for repairs and maintenance.	42.00	IV
5. Inadequate infrastructural facilities	37.00	V
6. Low salary of employees	35.00	VI
7. Excess labour	26.00	VII
8. Spoilage of milk	24.00	VIII
9. Wastage of resources like water, chemicals & deterge nts etc.	23.00	IX
10. High cost of chilling due to increased price of raw materials.	22.00	X
11. Energy loss in terms of electricity, steam, refrigeration etc.	22.00	X
12. Poor hygiene and sanitary standards in chilling centre	22.00	X
13. Frequent power failure	21.00	XI

5.5.2 Constraints at Processing and Manufacturing Level

It can be inferred from the Table 5.44 that among the various constraints, the under capacity utilization of plant was ranked as first with highest score followed by increased expenditure for repairs and maintenance and the low salary of employees was ranked with least score as least serious constraint.

The other constraints like lack of research and development facilities, inadequate infrastructure, lack of skilled persons, lack of quality control were having constraining impact on milk processing and manufacturing level in case of Co-operative dairy plant.

The constraints faced by Private dairy are presented in Table 5.45 in the order of seriousness.

Table 5.44 Constraints at Milk plant level in Processing, Manufacturing and at Milk reception dock. (Co-operative dairy plant)

Particulars	Total score	Rank
1. Under capacity utilization of plants	29.00	I
2. Increased expenditure for repairs and maintenance.	29.00	II
3. Lack of research and development facilities	28.00	III
4. Inadequate infrastructural facilities	28.00	IV
5. Lack of skilled persons in the area like quality control, processing and maintenance of machineries	28.00	IV
6. Old milk plant machineries and equipments	28.00	IV
7. Milk and milk solids losses	27.00	V
8. Lack of quality control measures	26.00	VI
9. Bureaucratic control of dairy plants makes it as an institute with slow pace.	26.00	VI
10. Excess labour	25.00	VII
11. Increase in price of raw milk due to competition	22.00	VIII
12. Spoilage of milk and milk products due to poor keeping quality.	20.00	IX
13. Poor quality packing materials	18.00	X
14. Wastage of resources like water, chemicals & detergents etc.	17.00	XI
15. High cost of processing due to increased price of raw materials.	16.00	XII
16. Poor hygiene and sanitary standards in processing and manufacturing section.	16.00	XII
17. Weak relationship between management and workers	16.00	XII
18. Frequent power failure	14.00	XIII
19. Energy loss in terms of electricity, steam, refrigeration etc.	13.00	XIV
20. Low salary of employees.	12.00	XV

Table 5.45. Constraints at Milk plant level in Processing, Manufacturing and at Milk reception dock (Private dairy plant)

Particulars	Total score	Rank
1. Under capacity utilization of plants	29.00	I
2. Lack of skilled persons in the area like quality control, processing and maintenance of machineries	29.00	I
3. Increase in price of raw milk due to competition	28.00	II
4. Lack of research and development facilities	28.00	II
5. Inadequate infrastructural facilities	26.00	III
6. Low salary of employees.	26.00	III
7. High cost of processing due to increased price of raw materials.	25.00	IV
8. Old milk plant machineries and equipments	24.00	V
9. Milk and milk solids losses	22.00	VI
10. Energy loss in terms of electricity, steam, refrigeration etc.	14.00	VII
11. Excess labour	14.00	VII
12. Lack of quality control measures	13.00	VIII
13. Weak relationship between management and workers	13.00	VIII
14. Increased expenditure for repairs and maintenance.	12.00	IX
15. Bureaucratic control of dairy plants makes it as an institute with slow pace.	12.00	IX
16. Frequent power failure	12.00	IX
17. Poor quality packing materials	12.00	IX
18. Wastage of resources like water, chemicals and detergents etc.	11.00	X
19. Spoilage of milk and milk products due to poor keeping quality.	11.00	X
20. Poor hygiene and sanitary standards in processing and manufacturing section.	11.00	X

Among the processing and manufacturing constraints, under capacity utilization of plant was ranked as very serious constraint with highest score and poor hygienic and sanitary standards in processing section was identified the least important constraint.

Among all the constraints, constraints like lack of skilled personnel in the different sections, lack of research and development, lack of

infrastructure, low salary of employees, old milk plant machineries and equipments were influencing the processing and manufacturing of dairy products for Private dairy to a considerable extent.

5.5.3 Constraints at Sales and Distribution Level

A perusal of Table 5.46 reveals that highly competitive market condition was observed as the most serious constraint with highest total score and failure of popularizing their brand was the least important constraint with least total score for Co-operative dairy.

Table 5.46 Constraints for marketing personnel at Sales and Distribution (Co-operative dairy plant)

Particulars	Total score	Rank
1. Highly competitive market condition	29.00	I
2. Higher sales commission-to-commission agents, wholesalers and retailers.	28.00	II
3. Excess marketing staff.	28.00	II
4. Lack of product diversification.	27.00	III
5. Increased selling expenses.	27.00	III
6. Localized distribution of dairy products.	27.00	III
7. Increased maintenance charges in booths and parlours	24.00	IV
8. Low incentives and salary to marketing staff.	19.00	V
9. Poor storage facilities at sales outlets.	18.00	VI
10. Payment problem with contractors	18.00	VI
11. Lack of outlets for retail sale.	17.00	VII
12. Spoilage of milk and milk products due to poor keeping quality in the sales outlets.	15.00	VIII
13. Lack of advertisement.	13.00	IX
14. Failure of popularizing their brand.	12.00	X

The other constraints like higher sales commission, lack of product diversification, increased selling expenses, increased maintenance charges, payment problem with contractors were having constraining influence on sales and distribution level.

It is significant to observe from Table 5.47 that highly competitive market condition and higher sales commission to the commission agents,

wholesalers and retailers were the most serious constraints with highest total score and increased maintenance charges in parlours was the least serious constraint with least constraint in case of Private dairy plant.

Table 5.47 Constraints for marketing personnel at Sales and Distribution (Private dairy plant)

Particulars	Total score	Rank
1. Higher sales commission-to-commission agents, wholesalers and retailers	29.00	I
2. Highly competitive market condition	29.00	I
3. Lack of outlets for retail sale.	26.00	II
4. Low incentives and salary to marketing staff.	23.00	III
5. Lack of product diversification.	22.00	IV
6. Failure of popularizing their brand.	21.00	V
7. Localized distribution of dairy products.	21.00	V
8. Excess marketing staff.	13.00	VI
9. Lack of advertisement.	12.00	VII
10. Poor storage facilities at sales outlets.	12.00	VII
11. Spoilage of milk and milk products due to poor keeping quality in the sales outlets.	12.00	VII
12. Increased selling expenses.	12.00	VII
13. Increased maintenance charges in parlours.	11.00	VIII

The other constraints faced by marketing personnel in sales and distribution were lack of outlets for retail sale, low incentives and salary to marketing staff, lack of product diversification and excess marketing staff for Private dairy plant.

5.5.4 Constraint Index

Table 5.48 clearly reveals that processing and manufacturing section of Co-operative dairy plant was facing most difficult situation for processing and manufacturing of milk and milk products. Sales and distribution was next in rank, as the higher sales commission and highly competitive market condition were influencing Co-operative dairy plant .The procurement of milk was the

last in rank due to lower quantity of milk procurement than installed capacity and has competition from Private sector in milk procurement.

Table 5.48 Constraint Index for Co-operative and Private dairy plants

S. No.	Operation	Total obtainable score	Total obtained score	Percentage	Rank
Co-operative dairy plant					
1	Procurement	1710	935	54.67	III
2	Processing and manufacturing	600	438	73.00	I
3	Sales and Distribution	420	302	72.00	II
Private dairy plant					
1	Procurement	1710	922	53.91	III
2	Processing and manufacturing	600	372	62.00	I
3	Sales and Distribution	420	243	58.00	II

In processing and manufacturing, under utilization of plant capacity combined with several other constraints leads to serious constraining influence to Co-operative dairy plant. The constraints like irregular payments to milk producers, under utilization of plant capacity, higher sales commission-to-commission agents, lack of retail outlets for sale of products observed in the present study were supported by the findings of Anand(1986), Shroti (1989), and Choudary , A.R. (2002).

Table 5.48 presents that Private dairy plant was also facing serious constraining influence due to under utilization of plant capacity and several other constraints impeding the processing and manufacturing of dairy products. Sales and distribution section was ranked second with 58 per cent constraint index. This may be due to higher sales commission paid by commission agents, wholesalers and retailers, highly competitive market condition and several other factors influencing the sales and distribution of dairy products for Private dairy. The least important constraint index was for procurement section with 54 per cent. It may be due to lower quantity of milk procurement and other factors influencing the milk procurement of Private dairy.

CHAPTER - 6

Summary and Conclusions

6. SUMMARY AND CONCLUSIONS

Dairying has been playing a pivotal role in the farming system of our country and is being considered as a means for sustainable rural development in generating gainful employment and supplementing the income of farming community. The dairy industry in India has gone through a sea change, transforming itself from import dependent industry to a self-reliant industry.

The success of dairy industry revolves around a triangle, i.e., procurement, processing and marketing of dairy products. All these three components are highly indispensable for development of dairy industry. The economic efficiency of a dairy plant is heavily depends on the efficiency of these operations, namely procurement of milk, processing and marketing of dairy products.

However, the milk and milk products marketing is still dominated by unorganized sector in India. It has been found that the organized sector in India handles about 14 per cent of total milk produced. After liberalization, dairy plants are facing cut-throat competition from Private players for market share. In general, the private players are using their resources efficiently and reducing their total operational costs as compared to Co-operative sector dairy plants. The increased operational cost leads to decrease in the marketing efficiency of Co-operative dairy plants. However, the marketing efficiency of dairy plants depends on the cost of procurement, processing and distribution cost of dairy products, constraints faced by dairy plants and also factors like installed capacity of the plant, organizational setup, location of milk producer cooperative societies or collection centres, chilling centres, milkshed area, chilling centres, modes of transportation employed, number of routes, processing technology, distribution agencies, handling losses and spoilage of milk.

Keeping the above facts in view, the present study was conducted to enlighten the various aspects of "**Economic Analysis of Milk and Milk Products Marketing by Co-operative and Private Sector Dairy Plants in Tamil Nadu** ,, with the following specific objectives:

1. To work out the cost of procurement of milk.
2. To study the processing and manufacturing cost of dairy products.
3. To estimate the marketing cost, marketing margin and marketing efficiency of dairy products.
4. To identify the constraints faced by dairy plants in procurement of milk, processing, manufacturing and distribution of dairy products.

To compare the marketing aspects of Co-operative and Private dairy plants, one milk plant from Co-operative sector and one milk plant from Private sector were selected purposively in Coimbatore district of Tamilnadu.The Co-operative milk plant was established in 1978. The initial installed capacity of the plant was 1 lakh litres per day, which has been subsequently enhanced to 2 lakh litres per day. The milk was collected through five hundred and forty five milk producer co-operative societies on 41 milk collection routes and chilled at four chilling centres and covering entire Coimbatore district. The average daily milk procurement of the plant was 1,25,000 litres. On an average, the plant produced around 90,000-1,00,000 litres per day of market milk namely Toned milk, Standardized milk and Full cream milk. The surplus milk was converted into various dairy products namely Butter, Ghee, Flavoured milk, and Milk peda. On an average, the plant produced 35,000 kg of Butter, 30,000 kg of Ghee, 2,000 kg of Milk peda and 1,300 litres of Flavoured milk per month. Also, the plant produced Mysore pak, Butter milk and Curd in smaller quantities based on order basis or market demand. The market milk was distributed by four hundred and twenty commission agents especially through milk booths and parlours. Milk products were especially sold through wholesalers, retailers and clearing and forwarding agents.

The Private dairy plant was started in 1993. The installed capacity of the plant was 2 lakh litres per day. The average daily milk procurement was 1,50,000 litres. The milk was collected through five hundred and twenty five milk collection centres and chilling of milk was done at four chilling centres and it was transported through forty-three milk collection routes. The plant was processing around 95,000 – 1,05,000 litres of market milk per day in three types namely Toned milk, Standardized milk and Full cream milk. The excess milk was converted into products namely Butter, Ghee, Flavoured milk and Paneer. The plant produced 50,000 kg Butter, 30,000 kg Ghee, 7,500 kg of Paneer and 10,000 litres of Flavoured milk per month. The plant also produced Curd and Butter milk in summer season in smaller quantities based on market demand. The market milk was distributed through five hundred and ten commission agents at private shops and milk products were especially sold through wholesalers, retailers and commission agents.

Cost of milk procurement was ascertained by taking into account the cost of collection, transportation cost, chilling cost and cost of reception of milk at the reception dock. For the purpose of working out collection cost per litre of milk for Co-operative and Private dairy plants, twenty milk producer Co-operative societies and twenty milk collection centres were selected by probability proportion to sample size method based on quantity of milk collected. For ascertaining transportation cost, twenty routes from Co-operative plant and twenty routes from Private plant were selected by probability proportion to sample size method based on quantity of milk transported. To work out chilling cost, all the chilling centres which were attached to Co-operative and Private dairy plants were selected. To study the seasonal variation in the procurement cost of milk, the year was decomposed into four distinct seasons viz. Flush (April-July), Transitory season 1 (August-October), Lean season (November-January) and transitory season II (February-March).

In order to work out processing and distribution cost, the major dairy products like Toned milk, Standardized milk, Full cream milk, Flavoured milk, Butter, Ghee, Milk peda and Paneer were taken for this study from both the plants.

To identify the major constraints faced by the dairy plants in procurement, processing and distribution of milk and products, the number of respondents were also selected based on probability proportion to sample size method.

The data were collected for the financial year 2001-02 from the respective sections (procurement, processing, manufacturing and distribution sections) of selected dairy plants. The collected data were processed and analyzed to ascertain procurement cost, processing and manufacturing cost and distribution cost of different dairy products by using tabular and regression analysis techniques. Marketing cost, marketing margin, marketing efficiency of different dairy products were worked out by using tabular analysis. Marketing efficiency was worked out by using Shepherd's formula.

Constraints were analyzed by tabular analysis method based on total score and finally ranked based on the highest total score value as most important constraint and the lowest total score as least important constraint.

The results revealed that the overall average procurement cost per litre was found to be Rs. 1.48 for Co-operative plant. The procurement cost also varied across seasons. In flush season, the cost of procurement was estimated to be Rs. 1.38 per litre. In transitory season I and II, it increased to Rs. 1.52 and Rs. 1.47 per litre respectively. However, in lean season it was found to be highest of Rs. 1.53 per litre. The cost component of collection, transportation, chilling and reception cost was 37 paisa, 61 paisa, 32 paisa and 18 paisa respectively in the procurement cost. The overall average procurement cost per litre was found to be Rs. 1.41 for Private plant. The procurement cost varied from a minimum of Rs. 1.33 in flush season and to a maximum of Rs. 1.45 in lean season. In transitory season I, II, the cost of procurement cost was Rs. 1.42 and Rs. 1.41 respectively. The component of collection, transportation, chilling and reception cost was 38 paisa, 60 paisa, 31 paisa and 12 paisa respectively in the total procurement cost by Private dairy plant. The procurement cost of Co-operative dairy was higher than Private dairy plant; it may be due to lower quantity of milk procured and increased reception cost of milk by Co-operative plant.

The production cost of various products namely Toned milk, Standardized milk, Full cream milk Flavoured milk, Butter, Ghee and Milk Peda were Rs. 11.06 per litre, Rs. 12.86 per litre, Rs. 14.06 per litre, Rs. 43.35 per litre, Rs. 81.66 per kg, Rs. 98.53 per kg and Rs. 79.95 per kg respectively for Co-operative plant. Similarly, the production cost of various dairy products namely Toned milk, Standardized milk, Full cream milk ,Flavoured milk, Butter, Ghee and Paneer were Rs. 11.10 per litre, Rs. 12.20 per litre, Rs. 13.59 per litre, Rs. 24.04 per litre, Rs. 67.44 per kg, Rs. 97.16 per kg and Rs. 62 per kg respectively for Private dairy plant. The production cost of Toned milk for Co-operative plant was slightly lower than Private plant; the reason was the manufactured quantity of Toned milk was higher. But, for all other products, the production cost of Co-operative plant was higher than Private plant owing to lesser quantity of products manufactured by co-operative plant.

The distribution cost of dairy products namely Toned milk, Standardized milk, Full cream milk, Flavoured milk, Butter, Ghee and Milk Peda were Rs. 0.86 per litre, Rs. 0.85 per litre, Rs. 1.25 per litre, Rs. 6.70 per litre, Rs. 14.51 per kg, Rs. 30.96 per kg and Rs. 22.18 per kg respectively for Co-operative plant. In case of Private plant, the distribution cost of dairy products namely Toned milk, Standardized milk, Full cream milk, Flavoured milk, Butter, Ghee and Paneer were Rs. 1.15 per litre, Rs. 1.05 per litre, Rs. 1.51 per litre, Rs. 5.10 per litre, Rs. 17.39 per kg, Rs. 32.73 per kg, and Rs. 20.43 per kg respectively. The distribution cost of all the dairy products for Private dairy plant was higher than Co-operative dairy plant except for Flavoured milk. It was due to higher sales commission paid by Private dairy plant to their commission agents, wholesalers, retailers and other selling agents.

The total marketing cost comprised of procurement cost, processing cost and distribution cost of dairy products. The marketing cost of Co-operative plant for various products namely Toned milk, Standardized milk, Full cream milk, Flavoured milk, Butter, Ghee and Milk Peda were Rs. 3.32 per litre, Rs. 3.48 per litre, Rs. 4.12 per litre, Rs. 40.90 per litre, Rs. 27.66 per

kg, Rs. 42.89 per kg and Rs. 58.21 per kg respectively. For Private dairy plant, the marketing cost of various dairy products namely Toned milk, Standardized milk, Full cream milk, Flavoured milk, Butter, Ghee and Paneer were worked out to be Rs. 3.32 per litre, Rs. 3.34 per litre, Rs. 3.88 per litre, Rs. 20.62 per litre, Rs. 27.90 per kg, Rs. 45.90 per kg and Rs. 33.53 per kg respectively. The marketing cost for Toned milk was same for both the dairy plants whereas it was higher in the Co-operative plant for Standardized milk, Full cream milk and Flavoured milk. Marketing cost was lower in the Co-operative plant as compared to Private dairy plant for Butter and Ghee.

In Private dairy plant, all the dairy products were earning more marketing margin than Co-operative plant except Toned milk. As a result, the Private plant was earning more profit than Co-operative plant .The marketing margin of dairy products for Private plant namely Toned milk, Standardized milk, Full cream milk, Flavoured milk, Butter, Ghee and Paneer were worked out to be Rs. 0.25 per litre, Rs. 1.25 per litre, Rs. 0.90 per litre, Rs. 23.36 per litre, Rs. 35.17 per kg, Rs. 20.11 per kg and Rs. 27.57 per kg respectively. The marketing margin of dairy products namely Toned milk, Standardized milk, Full cream milk, Flavoured milk, Butter, Ghee and Milk Peda were estimated to be Rs. 0.58 per litre, Rs. 0.79 per litre, Rs. 0.69 per litre, Rs. -0.05 per litre, Rs. 13.83 per kg, Rs. 15.51 per kg, Rs. -2.13 per kg respectively for co-operative dairy plant.

The marketing efficiency of Co-operative plant for all dairy products was comparatively less to Private plant except for Toned milk. The marketing margin being more for Private plant. It led to increase the marketing efficiency of Private dairy plant for all the products except in case of Toned milk.

The marketing efficiency of dairy products for Private plant namely Toned milk, Standardized milk, Full cream milk, Flavoured milk, Butter, Ghee and Paneer were 0.08, 0.37, 0.23, 1.13, 1.26, 0.44 and 0.82 respectively. The marketing efficiency of dairy products for Co-operative dairy plant namely Toned milk, Standardized milk, Full cream milk, Flavoured milk, Butter, Ghee and Milk peda were 0.17, 0.22, 0.17, -0.0012, 0.50, 0.36 and -0.03 respectively.

and Milk peda were 0.17, 0.22, 0.17, -0.0012, 0.50, 0.36 and -0.03 respectively.

Some of the members of co-operative society were selling the milk to private milk vendors and some of the collection centres were collecting the inadequate quantity of milk were the very serious problems faced by Co-operative and Private dairy plants respectively. Under utilization of transport vehicles at milk transporters level, under capacity utilization of chilling centres and also under capacity utilization of plant at milk processing and manufacturing level was the most serious constraints faced by both the plants. At distribution level, higher sales commission to commission agents, wholesalers and retailers, and highly competitive market environment was the most serious problems faced by both the plants.

6.2 POLICY IMPLICATIONS

Based on the insight provided by the study, the following policy implications are being suggested that could make to the co-operative sector dairy plant more efficient at milk procurement, processing and manufacturing, and sales and distribution level.

6.2.1 Milk Procurement level

1. Milk is a highly perishable commodity and their production takes place in millions of rural dairy farms. Development of efficient milk collection centres and transportation networks at farmers level by co-operative dairy plant would help strengthen the linkages between dairy farmers and dairy industry.
2. To make the Co-operative dairy plant more competitive, it should make regular payments to its milk producer members.
3. Efforts should be made to establish bulk milk coolers in rural areas would facilitate reduction in transportation cost.
4. Imparting training about clean milk production to dairy farmers at Milk Producers' Co-operative Society level will improve the quality of milk procured.

6.2.2 Processing and Manufacturing Level

1. Co-operative plant should utilize full plant capacity to reduce processing and manufacturing cost of dairy products.
2. Replace old milk plant machineries and equipments to reduce repairs and maintenance cost in Co-operative dairy plant.
3. Recruit qualified persons in the Co-operative dairy plant.
4. Importance should be given to manufacture higher quantity of value added dairy products without compromising quality to earn more profits similar to Private dairy plant.
5. Co-operative dairy plant should bring down their operational cost by avoiding superfluous expenses and reorient its product mix according to changing market environment.

6.2.3 Sales and Distribution level

1. Reduce excess marketing staff in distribution section of Co-operative dairy plant to reduce distribution cost.
2. More importance should be given to advertisement and sales promotion strategies.
3. Focus should be given to consumer oriented market research and development.

In order to minimize the identified constraints and develop the co-operative dairy industry in a sustainable manner, co-operative dairy plants should formulate a long-term vision and strategy. Encouraging value addition in dairy products without compromising quality, promoting marketing of their dairy products through effective sales promotion and advertisement strategy and also focusing on consumer oriented market research and development are some of the suggested strategies.

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APPENDICES

Appendix I. Details of Size of Business and Installed capacity of Selected Co-operative and Private Dairy plants. (2001-2002)

S.No	Particulars	Co-operative Dairy plant	Private Dairy plant
1.	Installed capacity (lakh litres per day)	2	2
2.	Quantity of Milk Procured (litres per day)	1,25,950	1,38,277
3.	Capacity utilization (%)	63.0	69.0
4.	Fluid Milk sold(litres/day)		
	a) Toned milk	31,567	29,733
	b)Standardised milk	58,005	58,633
	c)Full cream milk	7,267	6,766
	d) Flavoured milk	46	290
5	Qty. of Milk separated for manufacturing milk products.	31,467	30,233
7.	Production loss in manufacturing milk products (of total qty. of milk used)	1.33 %	1.15%
8.	Quantity of milk spoiled in milk procurement, handling and transport (in overall milk procured)	0.11%	0.09%

Appendix II. Investment in Capital assets of selected Co-operative and Private Dairy plants.

S.No	Particulars	Co-operative Dairy plant (Rs in Crore)	Private Dairy Plant (Rs in Crore)
1	Land	4.0	4.5
2	Building	10.0	13.0
3	Vehicles.	2.0	3.0
4	Machinery and Equipment	4.5	5.2
5	Total investment	20.5	25.7

Appendix III. Cost structure of Milk and Milk Products handling (2001-2002)

S.No	Particulars	Co-operative Dairy plant (Rs in Crores)	Private Dairy plant (Rs in Crores)
1	Cost of Raw material	40.82	45.42
2.	Milk Procurement cost	5.47	5.33
3.	Processing and Manufacturing cost of Dairy products	4.90	3.97
6.	Distribution cost of Dairy products	4.91	6.39
	Total cost	56.10	61.11

Appendix IV.Milk utilization pattern (Total solids basis)

Particulars	Percent contribution (based on TS used)	
Total solids used for all products (kgs)	**Co-operative dairy plant**	**Private dairy plant**
1.Milk procurement (ts in kg)	475129.33	521530.17
Product mix		
1.Toned milk	23.91	21.66
2.Standardised milk	47.57	45.84
3.Full cream milk	6.90	5.66
4.Butter production	6.30	19.32
5.Ghee preparation	5.75	5.71
6.Flavoured milk	0.03	0.21
8.Milk peda	0.27	0.00
9Panir	0.00	0.44
10.SMP production	7.92	0.00
Production loss	1.33	1.15
Total %	100.00	100.00

Appendix V.Product mix of Dairy plants (Quantity wise)

S.No	Product name	Co- operative plant (Monthly average)	Private plant (Monthly average)
1	TONED MILK (litres)	1013472	891768
2	STANDARDISED MILK (litres)	1740719	1766397
3	FULL CREAM MILK (litres)	218840	202040
4	FLAVOURED MILK (litres)	1405	10560
5	BUTTER (Kg)	35431	54024
6	GHEE (Kg)	28906	30183
7	MILK PEDA (kg)	2000	---------
8	PANEER (kg)	----------	7500

Appendix VI. Selling price of Milk and Milk products (Rs.)

S.No	Product name	Selling Price (Rs)	
		Co-operative plant	Private plant
1	TONED MILK (litre)	12.50	12.50
2	STANDARDISED MILK (litre)	14.50	14.50
3	FULL CREAM MILK (litre)	16.00	16.00
4	FLAVOURED MILK (200ml)	10.00	10.50
5	BUTTER (Kg)	110.00	120.00
6	GHEE (Kg)	145.00	150.00
7	MILK PEDA (kg)	100.00	------
8	PANEER (kg)	--------	110.00

Appendix VII. Break-even analysis of dairy products

Name of product	Total fixed Cost (Rs)	Variable cost/unit (Rs)	Sale price /unit (Rs)	Break even Output (units)	Actual output (units)	Margin of safety(Units)
Co-operative dairy plant						
Toned milk (litre)	152617.13	10.90	12.50	95385.71	12161670.00	12066284.29
Standardised milk (litre)	262132.02	12.71	14.50	146442.47	20888633.00	20742190.53
Full cream milk (litre)	32954.76	13.91	16.00	15767.83	2626081.00	2610313.17
Flavoured milk (litre)	17665.00	30.78	10.00	850.10	16860.00	17710.10
Butter (kg)	42046.00	80.48	110.00	1424.32	425180.00	423755.68
Ghee (kg)	27936.00	97.57	145.00	588.99	346878.00	346289.01
Milk peda (kg)	31063.40	79.95	100.00	1549.30	28290.00	26740.70
	Private dairy plant					
Toned milk (litre)	129845.04	10.97	12.50	84749.72	10701217.00	10616467.28
Standardised milk (litre)	262140.02	12.05	14.50	107035.25	21196774.00	21089738.75
Full cream milk (litre)	29417.89	13.44	16.00	11504.40	2424484.00	2412979.60
Flavoured milk (litre)	22081.25	24.04	10.50	1630.82	105240.00	106870.82
Butter (kg)	58864.40	66.35	120.00	1097.25	648294.00	647196.75
Ghee (kg)	34920.00	95.96	150.00	646.16	362202.00	361555.84
Paneer (kg)	69892.65	53.25	110.00	1231.50	95875.00	94643.50

Appendix VIII. Cost & Returns of Dairy products for Co-operative and Private dairy plants. (Rs in lakhs)

Particulars	Co-operative Dairy plant								
Name of product	Fixed Cost	Variable Cost	Total Cost	Total Output	Sale Price	Total Returns	Gross margin	Net returns	Rate of return
TONED MILK (litre)	1.53	110.59	112.11	12161670.00	12.50	1520.21	1409.62	1408.10	12.56
STANDARDISED MILK (litre)	2.62	221.28	223.90	20888633.00	14.50	3028.85	2807.58	2804.96	12.53
FULL CREAM MILK (litre)	0.33	30.44	30.77	2626081.00	16.00	420.17	389.73	389.40	12.66
FLAVOURED MILK (litre)	0.18	0.43	0.61	16860.00	10.00	1.69	1.25	1.08	1.77
BUTTER (Kg)	0.42	28.51	28.94	425180.00	110.00	467.70	439.18	438.76	15.16
GHEE (Kg)	0.28	28.20	28.48	346878.00	145.00	502.97	474.77	474.49	16.66
MILK PEDA (kg)	0.31	1.57	1.88	28290.00	100.00	28.29	26.72	26.41	14.01
	Private Dairy plant								
TONED MILK (litre)	1.30	97.81	99.11	10701217.00	12.50	1337.65	1239.84	1238.55	12.50
STANDARDISED MILK (litre)	2.62	212.87	215.49	21196774.00	14.50	3073.53	2860.66	2858.04	13.26
FULL CREAM MILK (litre)	0.29	27.16	27.45	2424484.00	16.00	387.92	360.76	360.46	13.13
FLAVOURED MILK (litre)	0.22	2.54	2.76	105240.00	10.50	11.05	8.51	8.29	3.00
BUTTER (Kg)	0.59	35.85	36.44	648294.00	120.00	777.95	742.11	741.52	20.35
GHEE (Kg)	0.35	28.96	29.31	362202.00	150.00	543.30	514.34	513.99	17.53
PANEER (Kg)	0.70	4.25	4.95	95875.00	110.00	105.46	101.21	100.51	20.29

Appendix ix: Processing cost of Toned milk

Particularas	Co-operative dairy plant			Private dairy plant		
	Amount (Rs)	Percent cost	Per unit cost (Rs/litre)	Amount (Rs)	Percent cost	Per unit cost (Rs/litre)
A. Fixed cost						
Depreciation	3648.50	0.33	0.01	4994.04	0.68	0.01
Interest	25831.17	2.31	0.02	24970.20	3.40	0.03
Salary of staff	123137.46	11.03	0.12	99880.80	13.59	0.11
Sub total	152617.13	13.67	0.15	129845.04	17.67	0.15
B. Variable cost						
Cost of water consumed	29129.72	2.61	0.03	24803.13	3.37	0.03
Cost of electricity	21985.34	1.97	0.02	17195.63	2.34	0.02
Cost of steam	96063.13	8.61	0.09	75151.85	10.23	0.08
Cost of refrigeration	106217.35	9.52	0.10	74866.25	10.19	0.08
Cost of repairs and maintenance	33549.58	3.01	0.03	30697.35	4.18	0.03
Cost of Packing material and packing cost	479368.9	42.95	0.47	263914.36	35.91	0.30
Cost of quality control	59261.29	5.31	0.06	26089.54	3.55	0.03
Milk and milk solids losses	55695.97	4.99	0.06	70971.66	9.66	0.08
Cost of consumables	12122.55	1.09	0.01	8964.50	1.22	0.01
Stationery &stores	66473.80	5.96	0.07	7130.08	0.97	0.01
Labour wages	3425.19	0.31	0.01	2982.17	0.41	0.00
Miscellaneous cost	247.94	0.02	0.01	2314.50	0.31	0.00
Sub total	963540.71	86.33	0.95	605081.01	82.33	0.67
Total cost (A+B)(Rs)	1116157.0	100.00	**1.10**	734926.05	100.00	**0.82**
Total quantity of milk prepared (litres)	1013472.00			891768.00		
Cost of processing per litre (Rs)	**1.10**			**0.82**		

Appendix x. Processing cost of Standardized milk

Particulars	Co-operative dairy plant			Private dairy plant		
	Amount (Rs)	Percent cost	Per unit cost (Rs/litre)	Amount (Rs)	Percent cost	Per unit cost (Rs/litre)
A. Fixed cost						
Depreciation	6266.59	0.33	0.01	5992.00	0.41	0.00
Interest	44367.08	2.32	0.02	45753.00	3.14	0.03
Salary of staff	211498.35	11.08	0.12	210395.00	14.43	0.12
Sub total	262132.02	13.73	0.15	262140.02	17.98	0.15
B. Variable cost						
Cost of water consumed	35086.89	1.84	0.02	31012.25	2.13	0.02
Cost of electricity	36877.14	1.93	0.02	34868.07	2.39	0.02
Cost of steam	164967.87	8.64	0.09	155132.13	10.64	0.09
Cost of refrigeration	183212.40	9.60	0.11	144840.18	9.94	0.08
Cost of repairs and maintenance	57447.15	3.01	0.03	47977.85	3.29	0.03
Cost of Packing material & Packing cost	940257.80	49.26	0.54	598646.42	41.07	0.34
Cost of quality control	54429.75	2.85	0.03	49858.32	3.42	0.03
Milk and milk solids losses	88277.86	4.63	0.05	86576.04	5.94	0.05
Cost of consumables	20839.47	1.09	0.01	19240.11	1.32	0.01
Stationery &stores	59589.43	3.12	0.03	17766.26	1.22	0.01
Labour wages	5492.08	0.29	0.01	5340.25	0.37	0.00
Miscellaneous cost	0.00	0.00	0.00	4155.83	0.29	0.00
Sub total	1646477.85	86.27	0.94	1195413.70	82.02	0.68
Total cost (A+B)(Rs)	1908609.87	100.00	**1.09**	1457545.72	100.00	**0.83**
Total quantity of milk prepared (litres)	1740719.00			1766397.00		
Cost of processing per litre (Rs)	**1.09**			**0.83**		

Appendix xi. Processing cost of Full cream milk

Particulars	Co-operative dairy plant			Private dairy plant		
	Amount (Rs)	Percent cost	Per unit cost (Rs/litre)	Amount (Rs)	Percent cost	Per unit cost (Rs/litre)
A. Fixed cost						
Depreciation	787.82	0.31	0.01	1131.46	0.75	0.01
Interest	5577.75	2.19	0.03	5657.29	3.76	0.03
Salary of staff	26589.19	10.42	0.12	22629.15	15.04	0.11
Sub total	32954.76	12.91	0.15	29417.89	19.55	0.15
B. Variable cost						
Cost of water consumed	4651.57	1.82	0.02	3349.90	2.23	0.02
Cost of electricity	4775.78	1.87	0.02	3162.28	2.10	0.02
Cost of steam	21060.56	8.25	0.10	13579.13	9.02	0.07
Cost of refrigeration	38048.15	14.91	0.17	15011.08	9.98	0.07
Cost of repairs and maintenance	12498.73	4.90	0.06	3886.52	2.58	0.02
Cost of Packing material and packing cost	111543.90	43.72	0.51	64307.06	42.74	0.32
Cost of quality control	6892.27	2.70	0.03	4653.89	3.09	0.02
Milk and milk solids losses	12074.35	4.73	0.06	7501.70	4.99	0.04
Cost of consumables	2550.03	1.00	0.01	2347.52	1.56	0.01
Stationery &stores	7437.77	2.91	0.03	2263.70	1.50	0.01
Labour wages	659.25	0.26	0.01	633.58	0.42	0.00
Miscellaneous cost	32.92	0.01	0.01	360.82	0.24	0.00
Sub total	222225.24	87.09	1.02	121057.17	80.45	0.60
Total cost (A+B)(Rs)	255180.00	100.00	**1.17**	150475.06	100.00	**0.75**
Total quantity of milk prepared (litres)	218840.00			202040.00		
Cost of processing per litre (Rs)	**1.17**			**0.75**		

Appendix xii. Processing cost for Flavoured milk

Particulars	Co-operative dairy plant			Private dairy plant		
	Amount (Rs)	Percent cost	Per unit cost (Rs/litre)	Amount (Rs)	Percent cost	Per unit cost (Rs/litre)
A. Fixed cost						
Depreciation	615.00	1.33	0.44	768.75	0.44	0.07
Interest	735.00	1.59	0.52	918.75	0.53	0.09
Salary of staff	16315.00	35.25	11.61	20393.75	11.76	1.93
Sub Total	17665.00	38.17	12.57	22081.25	12.74	2.09
B. Variable cost						
Consumables	1854.63	4.01	1.32	11110.92	6.41	1.05
Steam cost	1277.13	2.76	0.91	9796.97	5.65	0.93
Refrigeration cost	319.90	0.69	0.23	1578.58	0.91	0.15
Electricity	285.08	0.62	0.20	1315.50	0.76	0.12
Bottling and Corking cost	16118.96	34.83	11.47	92085.00	53.12	8.72
Quality control	211.83	0.46	0.15	1140.00	0.66	0.11
Repairs	205.08	0.44	0.15	1216.08	0.70	0.12
Labour wages	281.17	0.61	0.20	1488.75	0.86	0.14
Labelling cost	4331.83	9.36	3.08	18319.17	10.57	1.73
Bulk Packing cost	3500.00	7.56	2.49	9718.00	5.61	0.92
Production loss	183.33	0.40	0.13	3501.08	2.02	0.33
Miscellaneous cost	49.17	0.11	0.04	0.00	0.00	0.00
Sub total	28618.11	61.83	20.37	151270.05	87.26	12.23
Total cost (A+B)(Rs)	46283.11	100.00	**32.94**	173351.30	100.00	**14.42**
Total quantity milk prepared (litres)	1405.00			10560.0		
Cost of processing per litre (Rs)	**32.94**			**14.32**		