"ECONOMIC APPRAISAL OF DAIRY INDUSTRY IN SATARA DISTRICT OF MAHARASHTRA"

By

Waghmale Harish Kuldeep

(Reg. No. 015/214)

A Thesis submitted to the

MAHATMA PHULE KRISHI VIDYAPEETH,
RAHURI-413 722, DIST. AHMEDNAGAR,
MAHARASHTRA STATE (INDIA)

In partial fulfilment of the requirements for the degree

of

MASTER OF SCIENCE (AGRICULTURE)

in

AGRICULTURAL ECONOMICS

DEPARTMENT OF AGRICULTURAL ECONOMICS,
POST GRADUATE INSTITUTE,
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Approved by

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2017

CANDIDATE'S DECLARATION

I hereby declare that this thesis or a part there of has not been submitted by me or any other person to any other University or Institute for a Degree or Diploma.

Place : MPKV, Rahuri

Dated : / / 2017 *(H. K. Waghmale)*

Dr. D. B. Yadav,
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Maharashtra State (India)

CERTIFICATE

This is to certify that the thesis entitled, **"ECONOMIC APPRAISAL OF DAIRY INDUSTRY IN SATARA DISTRICT OF MAHARASHTRA"**, submitted to the Faculty of Agriculture, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar, Maharashtra State, in partial fulfillment of the requirements for the degree of **MASTER OF SCIENCE (AGRICULTURE)** in **AGRICULTURAL ECONOMICS** embodies the results of a piece of *bonafide* research work carried out by **Mr. HARISH KULDEEP WAGHMALE** under my guidance and supervision and that no part of the thesis has been submitted for any other degree or diploma.

Place: MPKV, Rahuri, (**D. B. YADAV**)
Date : / / 2017. Research Guide

Dr. J. V. Patil,
Associate Dean,
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Rahuri-413 722, Dist. Ahmednagar,
Maharashtra State (India)

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Place : MPKV, Rahuri, (**B.R. Ulmek**)
Date : / / 2017 Associate Dean (PGI)

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Place : Rahuri

Date : / /2017 *(H. K. Waghmale)*

Sr. No.	Abbreviations	Full form
1.	M.S.	Maharashtra state
2.	M.P.K.V	Mahatma Phule Khishi Vidyapeeth
3.	G.C.A.	Gross Cropped Area
4.	SWOT	Strength, Weakness, Opportunities, Threats
5.	PGI	Post Graduate Institute
6.	Kg	Kilogram
7.	Lit.	Liters
8.	AMUL	Anand Milk Union Limited
9.	NDDB	National Dairy Development Board

ABSTRACT

AN ECONOMIC APPRAISAL OF DAIRY INDUSTRY IN SATARA DISTRICT

By

HARISH KULDEEP WAGHMALE

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Research Guide : Dr. D. B. Yadav

Department : Agricultural Economics

The present study was undertaken to examine the progress of different dairy industries, cost structures and problems faced by the co-operative, private and individual dairy units in Satara district. The investigation was based on both macro and micro level data. The time series data were used for estimating the compound growth rates of different indicators of dairy development in Maharashtra as well as in Satara district. The stratified random sampling design was adopted with co-operative and private dairy units as primary units and individual dairy unit as an ultimate unit of sampling. The growth rates were estimated by compound growth rate function and standard cost concept were used for estimation of costs and returns. The break-even analysis was also carriedout to estimate the minimum quantities of processed milk which the dairy unit should handle during the year to cover total cost.

The SWOT analysis was carriedout for knowing strengths, weakness, opportunities and threats of particular dairy unit.

The total livestock population and milk production showed an increasing trend in Satara district and the State as a whole, over the period of time. The total milk production in the State had increased from 6.98 million tons in 2006-07 to 10.15 million tons in the year 2015-16. The number of co-operative and private dairy units in Satara district made spectacular progress in the field of dairy development such as milk collection, processing, distribution and manufacturing of different milk products. The milk collected by various agencies was maximum in private sector while, it was minimum in co-operative sector.

As the size of co-operative and private dairy units increased over the period of time, the total investment in capital assets increased. Financial strength of assets and liabilities increased over the period of time. The average daily milk collection and total milk collection increased substantially over the period of four years. The milk collection increased to the tune of 83.33 per cent which implies tremendous progress by the private dairy units. However, co-operative dairy units did not grow much as compared to private dairy unit showed 6.03 per cent increase in milk collection. The growth rate of milk collected and distributed as whole showed positive results because of increased activities of dairy units.

The per liter cost of purchase of milk (₹ 28.75) was relatively higher in private dairy than co-operative dairy units (₹ 27.05), while per liter cost of collection (₹ 1.18), processing (₹ 1.05), distribution (₹ 0.67) and management cost (₹ 0.89)

were relatively high in co-operative dairy unit than private dairy unit (₹ 1.05, ₹ 0.65, ₹ 0.54 and ₹ 0.75), respectively in the year 2015-16. It was mainly due to efficient management of private dairy unit. The per unit processing and marketing cost of milk products were higher in case of co-operative dairy unit, while it was lower in case of private dairy unit. The per unit cost of marketing management of co-operative dairy unit was higher (₹ 2.48) than private dairy unit (₹ 1.51 per kg) in the year 2015-16. The total income of co-operative and private dairy units from sell of milk and milk products and other receipts showed an increasing trend with increase in business. The benefit cost ratio was relatively higher in private dairy unit (1.41) than co-operative dairy unit (1.14) during the year of 2015-16.

The per liter cost of milk production was worked out to ₹ 18.27 and ₹ 26.63 for cow and buffalo milk, respectively. The benefit cost ratio was higher for buffalo as compared to cow herd. The input-output ratio of milk production ranged between 2.43 and 2.65 for different categories of sample herds.

The problems viz., irregularity of electricity supply, high collection cost, administrative cost and overhead charges, heavy competition in collection of milk, marketing cost increased due to distant markets places and high cost of packaging materials etc. were the major problems of dairy units. Non availability of pure breed in local market, difficulties in obtaining loans, malpractice followed by agents in market, low prices, high wage rate of labor, high cost of feed

and fodder etc. were the major problems faced by the milk producers.

To overcome these problems, requires joint efforts of Government, co-operative societies, private dairy sectors and milk producers for making the full awareness about adopting the modern technologies with collaboration with Department of Animal Husbandry, the Agricultural Universities and Veterinary University which benefits dairy sector in better way.

To increase the milk production for future demand it should necessary to have long term breeding policy for livestock animals. To increase the quality of milk and avoid wastage of surplus milk production, there should be more number of milk processing units will be established. The surplus milk should be used to produce more amounts of milk products to increase the returns from milk and also increasing the shelf life of products.

In case of individual dairy units, owners should adopt the nutrient management policy to get maximum benefits from available resources. Increase in the green fodder, concentrates in definite proportion should ultimately results in higher milk production.

Government should decide the MSP for milk and milk products to avoid the fluctuations in the milk prices. Milk producer should also go for organic milk production which is newly emerging field in milk production.

1. INTRODUCTION

1.1 General

India is predominantly an agrarian economy about 55 per cent of its population is engaged in agriculture and allied activities (Census 2011) and it contributes 17.4 per cent to the country's gross value added. The allied activities includes subsidiary occupation like dairy animal rearing, poultry keeping, goat and sheep rearing, vermicomposting, sericulture, bee keeping etc. It provides a continuous income and employment to landless agricultural labors, farmers and unemployed youth. Livestock is an integral part of agricultural production system in India and plays an important role in national economy as well as in socio-economic development of rural households. The role of livestock sub-sector is crucial in respect of nutrition, employment and income in the economy of rural people of the country.

1.2 Importance of milk and milk products in human diet

Although milk from the cow is processed, it is not an engineered or fabricated food. It is about 87 per cent water and 13 per cent solids. The fat portion of the milk contains fat soluble vitamins. The solids other than fat include proteins, carbohydrates, water soluble vitamins and minerals. These nutrients in milk help to make it nature most nearly perfect food.

Milk products contain high quality proteins. The whey proteins constitute about 18 per cent of protein content of milk. Casein, a protein found only in milk, contains all of the

essential amino acids. It accounts 82 per cent of total proteins in milk and is use as standard for evaluating protein of other foods. Protein is needed to build and repair body tissue and to form an antibody which circulates in the blood and help to fight an infection.

Milk also contains nutrients like calcium, phosphorus, magnesium and potassium. The calcium found in milk is readily absorbed by the body. Phosphorus plays a role in calcium absorption and utilization. Phosphorus is needed in the proper ratio to calcium to form bone. Milk provides these two minerals in approximately in the same ratio found in bone. Milk is also significant source of riboflavin (vitamin B2) which helps to promote healthy skin and eyes, as well as vitamins A and D.

Fermented milk products of various types such as Dahi, Lassi, Shrikhand, etc. are highly nutritious and easily digestible because of breakdown of proteins in to peptides and free amino acids as a result of microbial action.-

One serving of milk has about 250 mg of calcium. It is difficult to obtain adequate calcium without milk and milk products in the diet. About 73 per cent of calcium available in food supply is provided by milk and milk products. ICMR recommended the 250 gms of milk per capita per day in human diet.

1.3 Present status of dairy industry in India

India has been holding the position of leading milk producing nation in the world for the last several years with sustainable increase in the annual milk production where in

the research developments played a crucial role. The total bovine population of the India reached up to 299.98 million and stands first position in bovine population in the world. The cattle contribution is about 190.90 millions, the buffaloes are 108.70 million. The cattle population in India is decreased from 199.08 million to 190.90 million and buffalo population got increased from 105.34 million to 108.70 million in 2012 census.

Demand of milk in the country is expected to reach up to 210 million tons by 2021-22. The dairy sector has grown substantially over the years. As a results of prudent policy intervention, India ranks first among the world's milk producing nations, achieving an annual output of 155.5 million tons in the year 2015-16, as compare to 146.3 million tons during the year 2014-15 recording a growth of 6.29 per cent. This represents a sustained growth in the availability of milk and milk products for growing population.

Dairying has become an important secondary source of income for millions of rural family and has assumed the most important role in providing employment and income generating opportunities particularly for women and marginal farmers. The per capita availability of milk was at a level of 337 gms per day during the year 2015-16, which was more than the world average of 229 gms per day.

Most of the milk in the country is produced by small, marginal farmers and landless labors. About 15.46 million farmers have been brought under the ambit of 1,62,186 village level dairy corporative societies up to march 2015. The co-

operative milk unions procured an average of 41.2 million kg of milk per day during the year 2015-16 as compare to 39.2 million kg in the year 2014-15 with a growth rate of 5.10 per cent. The sale of liquid milk by co-operative sector has reached 32.8 million tons registering a growth of 7.69 per cent over the previous year.

The performance of Indian dairy sector over the last three decades has been extremely impressive. This can be attributed to successful implementation of the "Operation Flood" programme and other dairy development programmes implemented by state and central governments. Before operation flood came into being, India was a net importer of dairy products, mainly milk powder.

Despite being the one of the largest milk producing countries in the world, India accounts for a negligible share in worldwide dairy trade. The ever increasing rise in domestic demand for dairy products and a large demand-supply gap could lay India to be a net importer of dairy product in near future.

1.4 Dairy development in India

Since independence, the government of India have planned number of dairy development programmes *viz.*, Cattle breeding programme with foreign collaboration, Progeny Testing Scheme, Fodder Development Projects, Operation Flood Programme I, II and III etc. beside the government has establish Central Cattle Breeding Farms, Animal Health Centers and Artificial Insemination Centers for producing better cattle breeds. However, due to poor allocation of funds

to plans, dairying has not improved to the level of its expectation.

In 1946, Khaira district co-operative milk federation of the milk producer was established in Gujarat state. As a problem of surplus milk during certain month of the year become serious, this federation undertook expansion activity and established AMUL Dairy in the year 1995. There are four types of milk producer's co-operative societies adopted by AMUL,

1) Primary milk producer's society.
2) District co-operative milk federation or Taluka co-operative union.
3) State level co-operative milk federation.
4) National co-operative dairy board.

Two streams have been observed in co-operative dairies one is clearly known as Anand pattern and other one is co-operative but not strictly of Anand type.

With this success of Anand pattern, the institute named "National Dairy Development Board" (NDDB) was established in the year 1965 by Government of India under the chairmanship of Dr. Varghese Kurien, father of "White Revolution in India". The main aim of NDDB is to fulfilling the desire of the then prime minister of India the late Lal Bahadur Shastri to extend the success of the Khaira co-operative milk producers union (AMUL) to the other part of India.

Operation flood launched in 1970, it was a project of India's NDDB, which was the world's biggest dairy

development programme. It transformed India from milk deficient nation into the world's largest milk producer, suppressing USA in 1998, about 17 per cent of global output in 2010-11. In 30 years it doubled milk available per person and made dairy farming India's largest self-sustainable rural employment generator. It was launched to help farmers for directing their own development, placing control over the resources they create in their own hands. All these were achieved not merely by mass production, but by production by the masses. The Anand pattern experiment at AMUL, a single co-operative dairy was the engine behind the success of the programme. This whole concept is known as "White Revolution" in the Indian History.

The efforts of the department in the dairy sector were concentrated on promotion of dairy activities including nonoperation flood areas with emphasis on building up co-operative infrastructure, revitalization of sick dairy co-operative milk unions and creation of infrastructure in the country for production of quality milk and milk products. The NDDB continues its activities for overall development of sector with collaboration of government through different schemes. Some of the current ongoing schemes for dairy development are,

1) National programme for bovine breeding and dairy development- 2014
2) National Dairy Plan Phase-I – March 2013
3) Dairy Entrepreneurship development – September 2010
4) National Livestock Mission – 2014-15,under that

- Sheep and Goat Development
- Central Sheep Breeding Farm, were included.

1.5 Dairy development in Maharashtra

The aim of providing clean and fresh milk to the citizens of Mumbai, the government of Maharashtra established "Aarey Milk Dairy" at Aarey milk colony, Mumbai in 1951. The government of Maharashtra is separated the Dairy Development Department in 1958 with the view to develop better infrastructure for development of dairy sector in Maharashtra. Under this department the government established 38 dairy units and 81 milk chilling units in the state. These action leads to proper planned development of dairy sector in Maharashtra.

To link the milk producer in the rural sector with the consumer in the urban sector the government develops different facilities like, milk collection centers, transportation, and processing, packaging facilities in the state. For the easy going of collection of milk the government established primary co-operative societies at village level and co-operative milk unions at taluka and district level. This planned progress leads to distribution of excess milk to other cities like Pune, Nagpur, Nashik, etc. in 1960.

In the year 1975-85, NDDB and government jointly planned the operation flood programme which is covered in three phases in the country. In Maharashtra, the dairies were developed at Kurla, Kolhapur and Jalgaon which is run under district co-operative union in 1st phase. In 2nd phase, this programme is spread over twenty one districts in the state in

which chilling plants at Jalgaon, Kolhapur, Pune, Solapur, and Akluj were established. In 1987-92, 3rd phase were in action in which the programme were circulated all over the district of state. In all these three phases total investment in dairy sector of state is about 81 crore.

In the year 1991, the state government took the decision to merge all the government dairy schemes to co-operative dairy sector with a view to strengthening the co-operative dairy sector. The effect of this resolution is to merging the government dairy schemes at Baramati, Kolhapur, Sangamner, and Pandharpur to co-operative sector immediately. In the year 1992, central government took the milestone decision to open the dairy sector for the private sector with the view to move out from the dairy sector. This decision largely affects the co-operative dairy sectors in Maharashtra.

The merging of government dairy schemes to the co-operative sector leads to the excessive milk collection at co-operative dairy units. To overcome such problem the government permits the co-operative dairy unit in the state to sale their milk in Mumbai city. This decision probably decreases the importance of Aarey Milk Dairy in Mumbai. The collection and distribution of these dairy reduced in between ten years of decision.

Today, the milk collection and distribution of government dairy units is negligible. The co-operative and private sector leads the market. The private sector from the year 2000 goes far from co-operative sector. Nowadays the milk collection of

the government, co-operative and private sector is about 2.46, 48.76 and 64.67 lakh liter per day. The distribution of milk for government, co-operative and private sector is about 0.96, 51.45 and 35.72 lakh liter per day. The remaining milk in all sectors is used for processing the milk products. The dairy industry in the Maharashtra will be dominated by private dairy sector in near future.

1.6 Dairy development in Satara district

The Satara district has ranked 4th in the milk production in Maharashtra after the Ahmadnagar, Pune and Kolhapur districts. Satara contributes 0.69 million tons milk production in the year 2015-16 which is 10.15 per cent of the total milk production of Maharashtra state.

Satara district having two Government milk schemes, located at Satara and Mahabaleshwar. In the Satara district there are seven co-operative dairy units are in working, they are as follow,

- Khandala Co-operative Doodh Sangh, Kannavadi.
- Phaltan Co-operative Doodh Sangh, Phaltan.
- Satara Co-operative Doodh Sangh, Satara
- Jawali Co-operative Doodh Sangh, Jawali
- Koyna Co-operative Doodh Sangh, Karad
- Shiv-Shambhoo Co-operative Doodh Sangh, Patan.
- Patan Co-operative Doodh Sangh, Patan.

Beyond that district having 23 registered and 10 non-registered private dairy units which, collect milk throughout the district. There are 1346 registered milk producing societies

in the Satara among them only 412 milk producing societies are in function.

Private and co-operative dairy units from whole district procured milk about eight lakh liters per day. There are 33 private dairy units which are more in number with higher capacity of milk collection in the district because local political leaders open private unions and societies in each taluka, so that co-operative union requires making competition with private sectors.

1.7 Objectives

The present study was undertaken with the following specific objectives:

1. To evaluate the performance of co-operative, private and individual dairy units in Satara district of Maharashtra.
2. To estimate cost and returns of selected dairy units.
3. To study the problems of dairy industries and suggest measures to overcome.

1.8 Scope and utility of study

As the study is centered on the economic appraisal of dairy industry in Satara district of Maharashtra, the findings of study will be useful in understanding strengths and weaknesses of dairy industry in their right perspective. The study will help the dairy industry in determining ways and means for improving their efficiency in performing different activities so as to increase profitability of the business. The data will be useful in planning further efforts of dairy development in Satara district. Findings that would be

emerged out of this exercise will be useful to policy makers, executers, and the extension agents associated with development and growth of dairy industry, particularly for the betterment of all types of farmers which are mostly concerned with milch animals.

1.9 Limitation

As far as limitation of study is considered, the study is based on primary and secondary data. The secondary data is collected from published sources. There were certain difficulties in obtaining reliable secondary data on livestock from Census Report, 2012 and the private dairy units as well as individual dairy units for previous years from dairy business activities. The private dairy units have not provided sufficient data for analysis purpose as well as individual dairy units also not provided sufficient data. The difficulties were encountered in obtaining reliable data on the actual consumption of milk for previous years through different government reports. The study efforts was therefore, constrained to some extent. In spite of these limitations, the study has facilitated depth understanding of the progress of co-operative, private and individual dairy industry in Satara district.

2. REVIEW OF LITERATURE

In any systematic research, the review of literature on relevant aspect under study forms, an integral part of the research work. The exercise would help in highlighting the methodology and the result obtained by the different research worker in similar fields and would serve as a guideline for research to be carried out. Thus, it helps in proper understanding of concepts and the methodological and analytical issues related to the problems under study. Many times, it may be true that the previous research work might have been carried out under different set of conditions. Nevertheless, such knowledge is always useful for improving efficiency and effectiveness of all acts relating to the designing of research problem, adopting suitable methodology and interpreting result of research.

The major theme of project investigation was the “Economic appraisal of dairy industry in Satara district of Maharashtra.” This chapter reviews the literature on different methodological issues and empirical research results brought out by the various researchers from similar studies for shake of convenience, the collected reviews have been grouped under the following major sub-heading.

2.1 Economic performance of dairy unit

2.2 Costs and return structure of dairy unit

2.3 Problem faced by dairy unit

2.1 Economic performance of dairy units

Singh *et al.* (1989) studied the operational efficiency structure of 50 milk co-operative societies in Uttar Pradesh. Seven independent variables that affect the co-operative efficiency were (i) Composition and co-ordination of milk co-operatives, (ii) Input services, (iii) Communication and trade activities, (iv) Attitude of milk co-operatives, (v) Bye laws and role of officials, (vi) Training and proper planning (vii) Motivation. Correlation coefficient for all these seven variables indicated that this variable plays a greater role in bringing the efficiency of milk co-operative.

Jagtap (1992) in his investigation on an economical evolution of dairy co-operative societies from developed and underdeveloped regions in Satara district, he work out efficiencies in dairy societies by estimating the economic ratios *viz.,* (i) Income expenditure ration and (ii) Expenditure income ratio. The two ratios indicated that, the societies in the developed region were found to be less efficient than the societies in underdeveloped region. It was also seen that through the working societies was less, their total turnover seemed to be high because dairy societies did not made payment to milk producers from their own funds but payments were made when the same were received from the government milk schemes and till with limited capital their rate of turnover was very high.

Sanap (1996) studied the economics of Shrirampur milk products of Babhaleshwar Dudh Sangh. He reported that the quantity of milk lost during procurement, handling and transport was tune of 0.63, 0.90 and 1.18 lakh liters i.e. 0.16, 0.15 and 0.18 per cent during the years 1991 to 1993-94, respectively at Babhaleshwar plant of Ahmednagar district.

Singh (1998) conducted a study on marketing of milk and milk products through Dudh Utpadak Sahakari Sangh, Varanasi, Uttar Pradesh. He observed that, the union has large strength and covered a big area by collecting 30000 kg milk per day. It had 327 milk societies with the membership of 14091 in the year 1997-98. The total turnover, after standardization of union was found increased. The milk union had active role to procure milk from its members through a milk societies and make it available to the consumer through its commission agents at prescribed rate.

Yadav *et.al.* (1998) conducted a study on role of co-operative union in increasing rural income and employment in districts Kanpur, Delhi, Uttar Pradesh. They observed that, investment on milk producing resources was higher. On member households the net income, family labor income and farm business income per member household were ₹11809.97, ₹ 18769.77 and ₹ 19913.90, respectively. Whereas, on non-member households were ₹ 3693.53, ₹ 8993.56 and ₹ 9577.66, respectively. The cost of production of per liter and input output ratio on non-member household ₹ 7.34 and 1:1.17, respectively.

The days of employment were also higher per households and per adult worker on member household (348 and 249 days, respectively), whereas, on non-member household days of employment were 263 days and 155 days, respectively.

Bhattachatjee (2001) studied the progress of physical performance of Katraj Dairy. It was revealed that the membership was increased by 41.43 per cent while, the milk procurement declined by 29.60 per cent, i.e. from 1,28,527 thousand liters in 1990-91 to 1,90,481 thousand liters in 1999-2000. The total working capital was increased by 27.82 per cent, resulting in substantial increase in net profit (86.9 per cent). Although, the liabilities, and due to concerned effort of new management the performance of Katraj Dairy Unit in 1999-2000 showed good progress over previous year.

Gavali (2001) reported from his study on an economic analysis of dairy industry in Western Maharashtra that, the growth rate of total milk collected, milk processed, milk used for milk products manufacturing, milk distributed and daily milk collection were highly significant and estimated to the rate of 11.03, 11.08, 14.89, 10.81 and 11.03 per cent , respectively, at the overall level. The growth rate of above different indicators was increased with size of co-operative dairy unions over the time period.

Rao and Sharma (2003) studied the financial performance of dairy co-operative (URMUL) in Bikaner district of Rajasthan. The study revealed that, milk producers received ₹ 2.68 per kg of

milk in 1987-88, and it raise to ₹ 7.14 per kg in the year 1997-98 recording an annual growth rate of 11.22 per cent in milk prices. The total amount paid to producers per year increased from ₹ 8.40 crores to ₹ 34.39 crores over the period depicting a compound growth rate of 14.84 per cent per year. Gross profit of URMUL went up from ₹ 24.70 lakhs in 1989-90 to ₹ 495 lakhs in 1997-98, registering a significant annual growth rate of 69.33 per cent.

Shaikh (2003) studied operational excellence in manufacturing. He advocated the need for the dairy industry in India to achieve operational excellence in manufacturing in order to be global player. The application of six sigma method in Mother dairy was given an example. Attitude on the part of management was foremost requirement as far as excellence was concerned.

Kaware (2011) studied the total investment in the capital asset in co-operative dairy units increased from ₹ 1059.96 to ₹ 6010.97 lakhs during the year 1999 to 2008. It had increased by 467.09 per cent over the base year 1999. The capital investment in the business include the investment in the assets such as land and buildings, machinery and equipment's, vehicles, milk cans, crates and booths, furniture, dead stock and other assets etc. The investment in machinery, tools and equipment's had increased by 859.10 per cent followed by furniture, dead stock and library (164.38 per cent), land and buildings(121.96 per cent), cans/crates and booths together 44.93 per cent and

vehicles 37.26 per cent and water supply schemes (15.82 per cent) over the period of time. On an average, the proportionate share of investment in machinery and equipment's was nearly 48 per cent of the total investment over the entire period. The major items of the capital investment were land and buildings which shared 12 to 34 per cent, respectively.

The total investment in capital assets of private dairy units had increased from ₹ 162.78 to ₹ 181.87 lakhs during the year from 2006 to 2008, indicating an increase of 11.73 per cent. The investment in machinery, tools and equipment's was more than 74 per cent followed by land and building (10 to 11 per cent) and cans/crates, booths shared 8 to 10 per cent during the years from 2006 to 2008, respectively.

2.2 Cost and return structure of dairy units

Arora and Singh (1991) examined the price trends of milk and milk products in 5 major dairy markets in India and attempted to explain the extent of seasonal variation. The data on prices of milk and milk products, such as ghee and butter were analyzed for Bombay, Calcutta, Delhi, Kanpur and Madras markets for the year 1963-64. In general, the prices in Delhi and Kanpur market were found to be more variable than those in Calcutta and Bombay. Madras also demonstrated some variation, but of a smaller magnitude. The price projection was attempted on the basis of these findings.

Shah (1992) conducted study on dairy co-operation an instrument of social change. He studied the market cost, transport cost and commission cost for period of 1978-1986. He reported that, the marketing cost of dairy mainly constitute transport cost and commission of milk distribution agents. It was stated that, both these costs were beyond the control of dairy, because their stability depends upon the price of petrol as well as general price level he also observed that there was a very slow rise in unit cost till 1980. There was a sudden jump in per unit cost mainly because of steep rise in both transport cost as well as agent commission. Thereafter, the marketing cost never gone down beyond the 1981 level, but increase quite slowly.

Patil (1994) studied the economics of manufacturing and marketing of milk products by the government and co-operative milk processing units in Western Maharashtra and found that, the co-operative dairy has been observed to be relatively more efficient in performing all activities of the business as compare to the government dairy unit. The manufacturing and marketing of milk products has become an important aspect for increasing the efficiency of management system. At the same time efforts aiming at removal of existing drawback in the management of dairy unit would certainly enable them to additional profit in future.

Hange *et. al.* (1995) studied economics of procurement, processing, distribution of milk and manufacturing products of Shrirampur Dudh Utpadak Sangh, Babhaleshwar. They found

that variable cost accounted for nearly 92 per cent of total cost. The purchase price of raw milk had the lion's share (73 per cent) in the total cost. The average per liter total cost of milk worked out to ₹ 8.46. The major share i.e. 78 per cent in receipts was from sale of milk.

Dorge *et.al.* (1998) studied marketable surplus of milk in Konkan and Western Maharashtra. They reported that, the perform average marketable surplus of milk on sample farm in Western Maharashtra region was 31.85 liters per day, while Konkan region, it was 13.85 liters per day. The co-operative were the major buyer of milk in Western Maharashtra region. This was because of active participation of producers in co-operative movement having good network of milk co-operatives in entire region. They also observed that the cost of marketing of milk was ₹ 0.20 per liter in Konkan, while it was ₹ 0.11 per liter in Western Maharashtra region.

Agarwal (1998) conducted study on marketing cost, margins and price-spread for major agricultural commodities of Rajasthan. He observed that, the milk producer got about three-fourth of price paid by their consumer in different channel. However, the share got by the producer had been much higher in sale of milk through the milk collection centers established by the co-operatives in the villages. He also concluded that, dairy development programme has brought impact in terms of reduction in marketing cost and margin of middle man and providing a higher share to the producers in the price paid by the

ultimate consumers. He suggested that there is a need to extend the dairy development programme in other villages by establishing milk collection centers and making arrangement of transportation of milk from those villages which are situated in the remote areas from the roadside.

Yadav (2000) conducted and study on the relative efficiency in marketing of milk through private and co-operative agencies in Phaltan tehsil of Satara district. He worked out the procurement cost of milk to be ₹ 1.14 per liter and ₹ 0.89 liter in case of co-operative and private dairy units, respectively. The processing cost of ₹ 0.37 per liter and distribution cost was ₹ 0.42 per liter in case of private dairy unit, as the private unit performs all activities in milk processing. The management cost of milk was higher in case of co-operative dairy units (₹ 0.24 per liter) mainly due to salary and all allowances of excess number of workers.

Shelar (2000) studied management of Shrirampur Dudh Utpadak Sangh, Babhaleshwar in Ahmednagar district. He observed that, per liter procurement, processing and distribution cost were ₹ 0.80, ₹ 0.25 and ₹ 0.08, respectively and manufacturing and management cost of milk products was ₹ 100.96 lakhs, per liter marketing cost came to the ₹ 1.38. Total cost of sangh was ₹ 5482.81 lakhs in which fixed cost was ₹ 133.06 lakhs and variable cost was ₹ 5349.75 lakhs in the year 1998-99. Total income of sangh was ₹ 5210.46 lakhs in which

income from sale, was ₹ 4726.18 lakhs and from milk products was ₹ 139.93 lakhs in the year 1998-99.

Gavali (2001) indicated from his study on economic analysis of co-operative dairy industry in Western Maharashtra that, per unit price received by dairy union ranged from ₹ 4.08 to 9.87 for cow and buffalo milk. The annual gross returns amounted to ₹ 814 lakhs and ₹ 5697.21 lakhs during the years 1987 and 1997, respectively. The share of purchase of milk was nearly 90 to 98 per cent over the period of time. The profitability of business over variable cost worked out ₹ 26.63 and ₹ 266.74 lakhs during the year 1987 and 1997, respectively.

Dalton *et. al.* (2002) studied fluid milk processing cost: current and comparisons. The study reported the findings of an economic-engineering model used to determine theoretically the lowest achievable processing and distribution cost of white milk in the state of Maine. This model has indicated and important shift in processing cost. Labor cost exceeded the cost of packaging and plant supply. This was due to wide ranged inflation, plus dramatic increase in health care premiums paid by employers. Labor cost also has increase due to addition of highly educated plant employees with skills in computer driven plant automation and information technologies. Secondly, processing technology continued to evolve more sophisticated technology which was more expensive to implement. Equipment cost has been increased as percentage of total cost and may indicate a wider trend in industry practices to reduce human

handling and labor costs. Land and building cost were 12.2 per cent, labor cost 31.4 per cent, equipment cost 17.7 per cent, electricity cost 30.2 per cent, fuel oil 4.5 per cent, water and sewer 1.2 per cent, product loss 1.0 per cent and operating capital 0.6 per cent.

It appears from above review that the transportation cost was the major item of milk procurement and distribution cost it was followed by commission of agent and labor cost. The cost of milk collection decreased with increase in level of milk collection and vis-à-vis. The major component of milk processing cost was packaging material cost and administrative cost. Gross turnover of majority of dairy units was increased due to enhancement of sale price of milk over a time. Co-operative dairy units are more returns from sale of milk. Whereas, government dairy units were earned more returns from sale of milk products. The proportion of variable cost was relatively higher in the preparation cost of ghee and ice-cream milk products.

Pawar (2003) conducted a study on management of procurement, processing and distribution of milk and milk products of Mauli processing unit in Ahmednagar district. she reported that, the per liter cost of procurement and the processing cost of milk increased due to high commission from collecting agents and high cost of materials and supplies, respectively. Both costs ranged from ₹ 0.09 to ₹ 0.56. The distribution and management cost of milk and milk products showed 128.57 per cent and 100 per cent change respectively

over the period of time. The high distribution and management costs were mainly because of increase in outward transport charges, wages and salaries etc.

Mengade (2004) studied the management of procurement, processing and distribution of Parag milk and milk products, Manchar in Pune district. She observed that, overall work performance of selected dairy unit was economically viable in view of its net profit to the extent of ₹ 722.88 lakhs during the year 2002-03. The quantity of milk used for manufacturing of milk products was less than the quantity of milk used for liquid milk distribution. The loss of milk in the process of handling and transporting was to the extent of 1.22 lakh liters (0.3 per cent) during the year in study.

Patil (2005) studied the management of procurement, processing and distribution of Gokul Milk and Milk Products of Kolhapur Zilla Sahakari Dudh Utpadak Sangh Ltd., Kolhapur. She revealed that the quantity of milk used for manufacturing of milk and milk products was less than the quantity used for liquid milk distribution. The actual quantities of processed milk and milk products *viz.,* skimmed milk powder, ghee and butter were higher than the estimated break-even quantities. The study concluded that, the Dudh Sangh derived higher revenue from sell of milk than the sale of milk products.

Babu and Verma (2010) have compared the cost of production and manufacturing dairy products of co-operative and private dairy plant and indicated that the co-operative dairy

plant was more efficient in the manufacturing of toned milk, standardize milk, full cream milk and ghee, whereas the private plant has an edge over co-operative dairy plant in the manufacturing of the Butter and Milk powder. The distribution has been found lower for co-operative dairy plant for butter only, whereas for private dairy plants it was a lower for tonned milk, standardized milk, full cream milk, ghee and SMP.

Kaware (2011) studied the information of purchase, collection, processing, distribution and management cost of milk of selected co-operative and private dairy units in Western Maharashtra. For the co-operative dairy unit, the total cost of milk increased by 109.91 per cent, while per unit cost of milk increased by 42.53 per cent over the period of 10 years. The purchase cost of milk was ₹ 5618.14 lakhs in the year 1999, and its increased to ₹ 11888.64 lakhs in the year 2008 indicating 111.61 per cent rise during the study period. The per liter purchase price if milk for co-operative and private dairy units showed increasing trend mainly due to general rise in price level of commodities in economy. In addition, the economics of scale, butter management practices and supporting services for quality production, processing product manufacture as well as timely economic transport resulted in payment of higher milk prices. The total collection cost of milk was ₹ 455.18 lakhs in the year 1999 which increased by 100.44 per cent and its proportionate share was about 6 per cent, while its estimated per unit cost increased by 50 per cent over the time period. The per liter

collection cost of milk, was ranged in between ₹ 0.66 to ₹ 0.99. The cost was high due to the high cost of transports charges, commission given to the societies.

The total processing cost, distribution cost and management cost of milk increased by 129.95, 36.32, and 142.82 per cent over the period of time, respectively.

For private dairy the total cost of milk collection increased by 37.14 per cent. The total collection cost of milk was ₹ 95.65 lakhs in the year 2006, it increased by 16.96 per cent and its proportionate share was near about 5 per cent, while its estimated per unit cost increased by 1.54 per cent. The variable cost was important items and the commission paid to the collection agents and transports charges were the major items of variable cost. The total processing, distribution and management cost of milk increased by 17.24, 21.86 and 14.98 per cent during the years 2006, 2007 and 2008, respectively. The estimated per unit cost of processing and distribution increased by 1.79 and 5.88 per cent, respectively. The proportion of variable cost was higher and the materials and supplies, electricity charges, wages, salary formed the major items.

2.3 Problem faced by dairy units

Thombare and Pawar (1993) made efforts to study the profile of cross-bred cattle owners in Maharashtra. They identified the problems and made suggestion for cross-bred cattle owners. Non-functioning of milk producer's co-operative

societies (81.67 per cent) was the major problem followed by more expenditure on ration (68.33 per cent) a lack of green fodder (61.67 per cent).

Yadav *et al.* (1994) studied the constraints in dairy farming of sub-mountain zone of Maharashtra which is spread over five districts of Nashik, Pune, Satara, Sangali and Kolhapur covering 19 tehsils. It was revealed from the study that the farmers were not getting good animals locally (as per opinion of 56 per cent farmers). Because of poor financial status about 58 per cent farmers were not having adequate funds for purchase of animals also for purchase of feeds and fodder (33 per cent). About 85 per cent farmers have a express shortage of green fodder and concentrates, whereas 65 per cent farmers have express a shortage of dry fodder. It was also noticed that 85 per cent farmers could not provide proper housing to their animals. The need for availability of veterinary facilities in the village itself was expressed by 48 per cent of farmers.

Raskar (1996) reported in his study on economics of dairy farming in Karjat tehsil of Ahmednagar district that 91.52 per cent sample milk producer reported that there was high cost of animal feeds and fodder and 82.50 per cent sample milk producer reported low milk rate given by the dairy society. Few producers reported complaints of inadequate transports facilities, inadequate management, knowledge, inadequate artificial insemination facilities, irregular payment by society, etc.

Sathe (1996) stated that the constraints faced by farmers in milk production were less availability of grazing land, less availability of green fodder, less knowledge regarding production ration, high cost of concentrates and maintenance of less productive animals, occurrence of disease, inadequacy of veterinary aid and high temperature during summer and non-availability of hygienic drinking water.

Patil (1998) studied constraints in milk procurement at Shrirampur Dudh Utpadak Sangh, Babhleshwar. He reported that the low grade quality of milk, high procurement cost and cut throat competition by private sector were the major problems. He suggested the measures *viz.,* payment on quality basis, dairy extension activity, demonstration in procurement area etc.

Patil (1999) observed the major constraints of Tembhurni chilling centre. He stated that high procurement cost, collection of low grade milk, defective co-operative set-up, no correct testing of milk, no properly cleaned cans and no cooling facilities at milk collection centers (i.e. society) were the major constraints faced by Tembhurni chilling centre regarding milk collection. Further he studied, the problems of milk producers and reported that the low price of milk, high cost of cattle feeds, improper testing of milk by society, fluctuation in prices, lack of veterinary aids were faced by producers. He made suggestion on timely sanctions of loans, supply of quality feeds at reasonable rates, cattle insurance scheme and the payment of milk to be made in a time.

Shelar (2000) observed that the major constraints that high procurement cost, low grade quality of milk and the cut-throat competition by the private sector operating in the same area were the major problems of the dairy unit.

Kumar *et al.* (2000) conducted an economic analysis of production and disposal pattern of milk in Haryana and the study revealed that, the majority of milk producers faced the problems like lack of good quality feeds and their higher prices, lack of finance, lack of health and insemination facilities etc, while major problems encountered on disposal of milk were inadequate facilities of co-operative society, delayed payment, risk of payment and lower prices per unit of milk through milk vendors.

Gavali (2001) reported in his study of economic analysis of co-operative dairy industry in Western Maharashtra that the irregularity of electricity supply, high procurement cost, administrative cost and overhead charges, low commission, heavy competition in procurement of milk, collection of low quality milk, increased marketing cost due to distant market were the major problems of co-operative dairy unions, while the constrains of milk producers in milk production activity were inadequate money for purchase of animals, inadequate loan facilities, loan not easily available, shortages of manpower for animal management.

Mengade (2004) reported in his study the major problems *viz.,* adulteration in raw milk, high transportation and procurement cost, seasonal variation in milk production, lack of applied research and development in procurement activity, high losses of milk in the procurement activity of milk, high acidic milk, irregular supply of electricity, high price of materials and supply, increase in distribution cost due to distant market, fluctuation of demand of milk and milk products, lack of intelligent and efficient salesmen, commission agent, adulteration in milk products, which reduces the quality of milk and milk products.

Rao and Sharma (2003) studied the problems of dairy co-operatives in Bikaner district of Rajasthan state. They observed that the provision has been made for incentive for milk having more than 4.50 per cent fat and more than 8 per cent solid not fat. Whereas, such milk is not available in that area. The average fat and solid not fat available in milk is not more than 4.50 per cent and 8 per cent, respectively. As such the mass producers of the tract who supply large quantity of milk to URMUL are being deprived of a good incentive.

Rajput and Yadav (2004) observed that, the large number of cross-bred cow dairy entrepreneurs complained that the weak financial status, cost of fodder and management difficulties were the main constraints in not maintaining good quality of animals on the farms. The respondent farm families strongly expressed the desire need for finance for the purchase of animals and also

for feed, fodder and veterinary aid. A large number of commercial cross-bred cow dairy entrepreneurs reported insufficient storage facilities on their farms. Milk and milk products fall under highly perishable group of commodities and have to be stored under controlled condition of temperature and humidity in cold storage and deep freezers.

Rangasamy and Dhaka (2007) reported that the inadequate quantity of milk was very serious problem faced by co-operatives and private dairy plants. Underutilization of transports vehicles at milk transporters level, under capacity utilization of chilling centers and also under capacity utilization of plant at a 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 dairy plants. In order to minimize the identified constraints and developed the dairy industry in sustainable manner, co-operative and private dairy plants should devise strategy and also focus on consumer oriented market research and development.

Gauradha (2007) studied the economics of milk marketing in Chhattisgarh and observed that, the lack of veterinary facilities, lower prices of milk, high price of feed, lack of funds required to purchase feed and fodder for milch animals on the farms were the major constraints reported to be hindering the development of livestock enterprise in the rural areas while lack

of green fodder, lack of appropriate place for dairy herds, high price of feed, etc. were the major problems faced by farmers in urban areas.

Kaware (2011) studied the economic appraisal of dairy industry in Western Maharashtra and observed that, the economic efficiency of dairy unit is severely influenced by the variety of problems at three important value addition stages *viz.* milk collection, processing and distribution of milk and milk products. Collection of low quality of milk due to adulteration with water, starch and bicarbonate etc., losses in milk due to leakage of cans and crates, no cooling facilities are available at milk collection centers, lack of research and development facilities, irregularity of electricity supply causes spoilage of milk and milk products, high marketing cost lower the profit margins, high cost of packing material, etc. were the major problem faced by dairy unit.

3. METHODOLOGY

Every research project was planned and executed with appropriate methods and procedures to obtain the results of the study. The methodology adopted for the study was described under the sub-heads *viz,* requirement and sources of data, selection of time periods and area of the study, definitions of different variables, analytical techniques deployed in the analysis of data, etc. in order to fulfill the requirement of the objectives of the study.

3.1 Data requirement and sources of data

The requirement of data was varied in nature. Firstly, the data requirement of the study was for the broad indicators of dairy development activities of Satara district viz., livestock population, milch animal population, animal husbandry, veterinary facilities, breeding and health care programs. Secondly, the data on performance of co-operative, private, and individual dairy units dealing with procurement, processing and distribution of milk, manufacturing of milk products.

The data was comprised through the primary as well as secondary sources on different indicators of dairy development in the Satara district. The macro-level data was collected from the various Government reports of Department of Animal Husbandry, Department of Agriculture, Dairy Development Department, Co-operative and individual dairy units, etc. The pattern of costs and returns, collection, processing and distribution of milk was collected from the annual reports of

the respective selected co-operative and private dairy units and farm records given the data for individual dairy units.

3.2 Sampling design

The sampling design adopted for the study was two-stage stratified sampling with dairy unit as a primary unit of sampling and individual dairy unit as a secondary unit of sampling.

3.2.1 Selection of the district

Satara district was selected purposively, because Satara is the one of leading milk producing district in the Maharashtra state, securing 4th rank in the milk production.

3.2.2 Selection of dairy units

In Satara district, there were 33 private dairy units, 7 co-operative dairy units and 45 individual dairy units were there, from which 2 private, 2 co-operative and 2 individual dairy units have been selected on the basis of higher performance of as well as higher average daily milk collection per day.

a) Private Dairy Units

1) Govind Milk and Milk Products, Phaltan, Satara.
   (It is having the milk collection of about 6,00,000 liters/day)
2) Mamata Milk and Milk Products, Borgaon, Satara.
   (It is having the milk collection of about 35,000 liter/day)

b) Co-operative Dairy Units

1) Koyana Sahakari Dudh Utpadak Sangh, Karad, Satara.
(It is having the milk collection of about 75,000 liter/day)

2) Phaltan Taluka Dudh Utpadak Sangh, Phaltan, Satara
(It is having the milk collection of about 15,000 liter/day)

c) Selection of individual dairy units

The two large dairy units having more than 25 milch animals were selected randomly. The dairy units having one cow and one buffalo herd were selected purposively.

3.3 Collection of data

The annual reports of selected co-operative, private dairy units were collected from the office records. The information on the aspects like, capital investment, working cost on collection, processing and distribution of milk and milk products, cost on manufacturing of milk and milk products, returns from dairy units, development activities of dairy units for increase in milk production and problems of dairy units was collecting from the year 2012-13 for co-operative and private dairy units obtaining from the annual reports. The data for the individual dairy units was collected from the farm record of a particular dairy unit.

The data on total livestock population, milk production was collected from Animal Husbandry Department, Dairy Development Department, Co-operation and Agriculture Department, Livestock Census Reports of 1992, 1997, 2002, 2007 and 2012.

3.4 Analysis of data

The data pertaining to the year 2012-13 to 2015-16 were collected, compiled and analyzed by tabular method. The data obtained from the annual reports of selected dairy units were compiled and analyzed to obtain the magnitudes of different aspects on annual basis for the year 2012-13 to 2015-16 for co-operatives and private dairy units. The growth rates of milch animals, livestock population were computed for census years, 1992, 1997, 2003, 2007 and 2012. The analysis was carried out by simple tabular method according to individual sample categories viz; types of milch animals in different herd groups. The economics of milch animals was worked out.

3.4.1 Tabular Analysis

The required data was obtained from the various government reports such as Department of Animal Husbandry, Dairy Development and Agriculture was collected and analyzed to obtain the magnitudes of different aspects of dairy development activities. Simple statistical measures like per cent change and ratios were used to get the conclusions.

3.4.2 Compound growth rate (CGR)

$$\mathbf{Y = ab^t}$$

Where,

Y= Dependent variable,

a = Constant

b = Trend value,

t = Time (census / year).

Logarithmic transformation of above equation is.

Log Y = Log a + t Log b

Compound growth rate (r) was estimated by the identity equation,

r = (Antilog 'b'- 1) x 100

Where,

r = Per cent compound growth rate per year per census.

3.4.3 Classification of costs

The present set up of milk scheme comprises of the following major costs,

1. Milk procurement cost.
2. Milk processing cost
3. Distribution cost on processed milk
4. Administrative or overhead charges
5. Manufacturing/processing cost of milk products

3.4.4 Estimation and allocation of costs

The fixed and variable costs are calculated for the selected co-operative and private dairy units under the study.

3.4.4.1 Milk collection cost

Cost of milk collection includes costs on collection, transportation, chilling and delivery of cost at the reception dock.

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

Fixed assets for collection centers were valued in terms of equipment's supplied by the plants to the various co-operative societies, the milk can, furniture and fixtures, etc. Depreciation on value of fixed assets was taken from books and account section of the respective dairy units. 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 (Ethylene di-amine tetra acetic acid) 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 milko-tester service charges and rent paid for societies was also taken into account in the variable cost.

3.4.4.2 Processing cost

Processing cost of raw milk is the important activity in the dairy unit. Processing cost of milk is useful for

enhancing keeping quality of milk and converting milk into milk products. Processing cost comprises all the cost incurred on pasteurization of milk by the dairy unit during the study period.

3.4.4.3 Manufacturing Cost

The manufacturing cost comprises cost of raw material and total processing cost of dairy products. The total processing cost of dairy products comprises expenditures on electricity, water, refrigeration, maintenance and repairs, stationery and stores, labor, packing materials, detergents, besides quality control expenditure, salaries and administrative expenses, depression on buildings, equipment's and machinery, interest on investment in buildings, plant equipment's and machinery, losses in milk and milk solids and miscellaneous costs. The interest was calculated at the rate of 6.25 per cent per annum on the value of equipment's and machinery and electric installation in all the sections of dairy plant. The depreciation values of equipment's, machineries and all sections of dairy plant buildings were taken from the account books or account section of the respective dairy plants.

3.4.4.4 Distribution cost

Distribution cost included expenses on advertisement, sales promotion, rent of booths and parlors, salary of marketing and sale personnel, stationery, telephone, conveyance, sales commission to wholesalers, retailers and commission agents, transportation of milk and milk products

to booths, parlors and sales outlets, storage of milk and milk products under refrigerated condition, loading and unloading of milk and milk products in the dairy plant, sale tax and depreciation, interest and other miscellaneous costs. Depreciation on transport vehicles were taken from the books and accounts section of the respective dairy plants. The interest was calculated at the rate of 6.25 per cent per annum on the value of transport vehicles. Total distribution cost was apportioned to milk and milk products based on their total sales value.

3.4.4.5 Management cost

Management cost included all the costs of general administration, taxes, audit fees, postage, meeting and traveling allowances, salaries and benefits order to have meaningful comparison of the selected co-operative and private dairy units, the cost on account of procurement, processing, distribution, manufacturing, marketing and overhead charges have been estimated on per unit basis i.e. cost per litre of milk and cost per kg of milk products.

Land rent and interest on fixed capital have been calculated at the rate of 6.25 per cent per annum of the value of land and building and fixed capital assets rent, etc.

3.4.5 Estimation of Benefit-Cost Ratio

B:C ratio is the ratio of total returns received from milk processing to total cost required for milk processing. It was worked out by using the following formula,

$$\text{B:C ratio} = \frac{\text{Total Returns (₹)}}{\text{Total cost (₹)}}$$

3.4.6 Estimation of Break-even point of dairy units

The capacity of milk handling at which total revenue equates the total cost was taken as a break-even point. The break- even quantity of milk was to be estimated for dairy unit as,

$$Q = \frac{TFC}{(Ps - AVC)}$$

Where,

Q = Quantity of milk required for break-even (liters)

TFC = Total fixed cost (₹)

Ps = Price per liter of milk (₹)

AVC = Average variable cost per liter (₹)

3.4.7 SWOT analysis of dairy units

SWOT analysis was carried out for knowing strengths, weakness, opportunities and threats of particular dairy units. The purpose of SWOT analysis is to help policy makers and management body to take strategic decisions within given situation. SWOT analysis was to be worked out by making use of quantitative data on various indicators which were collected from the dairy units.

3.4.8 Estimation of cost and returns for individual dairy unit

The secondary (micro level) data were analyzed to find the unit milk production costs and returns of individual dairy unit.

The total cost of milk production was divided into two categories viz., working cost and fixed cost. The working cost includes feeding cost, human labor cost, veterinary charges and value of dairy accessories such as utensils, buckets and miscellaneous expenditure on milk production activity.

The fixed cost includes depreciation on the value of animal, depreciation on fixed investment and accessories and interest on fixed investment in animal and fixed assets. Output-input ratio was calculated as the ratio of gross income to the total production cost.

4. SOCIO-ECONOMIC FEATURES OF THE STUDY AREA

This chapter gives the detail information about the study area, which includes the location and geographical situation of area, demographic picture of selected district, topography and agro-climatic situations, rainfall, soil type, land use pattern and cropping pattern which ultimately affects the livestock population and milk production of the district.

4.1 Introduction

Satara district is located in the Western part of Maharashtra. It is bound by Pune district to the North, Solapur district to the East, Sangli district to the South and Ratnagiri district to the West. Raigad district lies to its North-West. The geographical area of Satara district is 10,480 Sq. Km. which is about 3.4 per cent of the state's total geographical area. Satara district is situated in the river basins of Bhima and Krishna. Panchgani, Mahabaleshwar, Karad, Wai, Koregaon and, Koyananagar are the chief towns of Satara district. Historically Satara was the capital of the Maratha kingdom, land of great warriors, saints and great personalities namely Rani Laxmibai, Krantisinha Nana Patil (Patri Sarkar), Savitribai Phule and Karmaveer Bhaurao Patil. This land has rich heritage. Mahabaleshwar, one of the most beautiful hill station of India, is located in this very district. The physical settings of Satara shows a contrast of immense dimensions and reveals a variety of landscapes influenced by relief, climate and vegetation.

4.2 District at a glance

4.2.1 Location and geographical units

Satara district lies between 17.5 to 18.11 degree North latitude and 73.33 to 74.54 degree Eastern longitude. The district comprises of 11 tehsils namely Satara, Koregaon, Khatav, Karad, Patan, Wai, Jaoli, Mahabaleshwar, Khandala, Phaltan and Man. Under the Satara Zilla Parishad jurisdiction, 1739 villages are covered through 11 panchayat Samities and 1509 Gram Panchayats. The variation in relief ranges from the pinnacles and high plateaus of main Sahyadrians range having height over 4500 feet above mean sea level to the subdued basin of the Nira river in Phaltan tehsil with the average height of about 1700 feet above mean sea level. The climate ranges from very heavy rainfall in Mahabaleshwar region, which has an average annual all of over 6000 mm to the driest in Man tehsil where the average annual rainfall is about 500 mm. The vegetation cover too varies from the typical monsoon forest in the western parts to scrub and poor grass in the eastern parts.

4.2.2 Demographic profile

As per the Census 2011, the total population of the Satara district was 30.04 lakh with a population density of 287 per square kilometer. Out of the total population, 24.34 lakh reside in rural areas while 5.70 lakh are in urban areas. This indicates that 81 per cent of Satara's population is living in rural area. The ratio of female population per thousand of

male was 986. The district has high literacy level of 92.09 per cent. (82.73 per cent in rural areas and 90.43 per cent in urban areas.)

The talukawise area, number of villages, gram panchayats and population of Satara district is presented in Table 4.1. It can be seen from the table that Satara district has 1716 villages and 1509 gram Panchayats. The population of the district is 30.04 lakhs with 19 and 16.71 per cent of the population in Karad and Satara taluka, which has 9.25 and 8.36 per cent of area of the district, respectively. The next two most populous talukas are Phaltan and Patan which accounts for 11.41 and 9.95 per cent of the population of the district respectively. Thus, 57.50 per cent of the district's population is located in Karad, Satara, Phaltan and Patan taluka. Other districts have 1 to 9 per cent of the total district population. The sex ratio of the population consists of 46.87 per cent male and 53.13 per cent female population. Satara district has no municipal corporation but 8 town councils.

It is important to understand the workforce engaged in agriculture in the state before analyzing the development of various aspects of agriculture. An analysis on the workforce would not only reveal the share of rural population relying on agriculture for livelihood but also help in framing a suitable agriculture policy for the district. The number of persons in the workforce in Satara district is 13.04 lakhs. This indicates that 46.41 per cent of the population is in the labor force. Out

of the total workforce, 70.06 per cent of the workers (main and marginal) are engaged in agriculture as cultivators and

Table 4.1 Taluka-wise area, number of villages, Gram Panchayats and Population of Satara district.

Sr. No.	Taluka	General				Population (2011) '000'		
		Area (sq.km)	% to total	No. of revenue villages	No. of G.P.	Male	Female	Total
1	Satara	906.53	8.39	208	202	253.62	248.05	501.67
2	Koregaon	943.27	8.73	139	142	129.14	128.19	257.33
3	Khatav	1384.43	12.81	136	133	136.91	138.20	275.11
4	Karad	1140.94	10.55	219	198	296.04	287.31	583.35
5	Patan	1433.70	13.26	336	241	145.09	154.54	299.63
6	Wai	624.85	5.78	119	99	100.23	100.52	200.75
7	Jaoli	583.36	5.40	155	126	52.79	55.10	107.89
8	M'Shwar	529.85	4.90	111	79	37.69	35.16	72.85
9	Khandala	532.06	4.92	66	65	70.60	66.86	137.46
10	Phaltan	1189.66	11.00	123	128	176.42	166.27	342.69
11	Man	1542.60	14.26	104	96	113.99	111.20	225.19
12	**Total**	**10811.25**	**100.0**	**1716**	**1509**	**1512.52**	**1491.40**	**3003.92**

Source: District Social and Economic Review- Satara District, 2015-16.

agricultural laborers. The agricultural laborers constitute 30.8 per cent of the workforce in agriculture while 69.2 per cent are cultivators. It can thus be observed that, agriculture is the dominant activity in Satara district. The share of workforce engaged in agriculture in Satara district is much higher than that for the state as a whole which is 55 per cent.

4.2.3 Topography and agro-climatic conditions

The Satara district contains two main systems of hills- the Sahyadri range in its offshoots, and the Mahadev range and its offshoots. The Sahyadri system includes the main

range of the Sahyadri's which, through its entire length of sixty miles from north to South forms the Western boundary of the district. Within Satara limits, the main range of the Sahyadri's, from about eight miles North of Pratapgad passes South-West for about twenty miles. The crest then turns up to the East of South and in an irregular line, continues South by East about forty miles, till it enters Kolhapur near Pritchard about fifteen miles South-West of Patan. In the sixty miles within Satara boundary, the crest of Sahyadri is guarded by five forts.

With diverse cropping pattern, the district can be segregated into three broad regions, viz., the Hilly tracts in the West comprising Mahabaleshwar, Jaoli, Patan and parts of Satara, Wai and Karad talukas; Irrigated areas of Wai, Satara,, Karad and part of Koregaon talukas in the central region and the drought-prone talukas of Khandala, Koregaon (East), Khatav and Man in the East. The climate of the district is characterized by dry atmosphere except during monsoon. The temperature varies from minimum 11.6 ^{0} c to 37.5^{0} c. The average annual rainfall is 1426 mm. The rainfall pattern varies between 5080 mm on the western hilly region to 457 mm in eastern plateau progressively declining eastwards. Satara district forms a part of the tropical monsoon land and therefore shows a significant seasonal variation in temperature as well as rainfall conditions.

4.2.3.1 Rainfall

The talukawise rainfall received in Satara district for the year 2016 showed in Table 4.2

The geographical situation of the Satara district is slightly connected with Sahyadri mountain ranges which clear that, the district havng the assured monsoon rainfall. The East part od Satara district having the higher rainfall and West portion of Satara district fall under drought prone area. Mahabaleshwar taluka (6520.10 mm) recorded highest rainfall followed by Patan, Jaoli and Satara taluka. Man taluka (637.3 mm) having the lowest rainfall followed with Khatav. Satara district receive rainfall during the month of June to November. Among this, the highest rainfall received in June month (5302.0 mm) followed by July (5120.8 mm), August (4291.5 mm), September (2126.0 mm). from the table 4.2 it is clear that, district having ample quantity of rainfall for production of green fodder which is available for more than six months which favors the milk production activity in the district.

4.2.3.2 Soil type

A variety of soils are found in Satara district ranging from deep black soils of plain and scarcity zone to shallow, red or reddish brown soils of sub mountain and Western ghat zone. Soils of Satara district are categorized in to 5 types' viz., Black (45 %), Red (5 %), Alluvial (8 %), Sandy (12 %) and Sandy loams (30 %).

Table 4.2 Talukawise monthly normal rainfall.

(mm)

Sr.No.	Taluka	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Satara	0.0	0.0	0.0	0.0	0.0	430.8	389.0	269.9	122.0	39.0	37.0	0.0
2	Koregaon	0.0	0.0	0.0	0.0	0.0	309.8	245.8	152.5	129.4	27.0	27.0.	0.0
3	Khatav	0.0	0.0	0.0	0.0	0.0	271.0	143.2	77.8	90.2	100.0	37.0	0.0
4	Karad	0.0	0.0	0.0	0.0	0.0	375.8	210.2	230.2	207.2	12.0	72.0	0.0
5	Patan	0.0	0.0	0.0	0.0	0.0	630.2	795.0	587.0	219.0	35.0	35.0	0.0
6	Wai	0.0	0.0	0.0	0.0	0.0	403.0	251.2	244.5	119.9	40.0	46.0	0.0
7	Jaoli	0.0	0.0	0.0	0.0	0.0	337.1	702.4	513.2	136.3	29.0	41.0	0.0
8	M.Shwar	0.0	0.0	0.0	0.0	0.0	1547.0	2119.5	1884.6	709.0	161.0	99.0	0.0
9	Khandala	0.0	0.0	0.0	0.0	0.0	281.5	126.2	113.0	163.8	37.0	0.0	0.0
10	Phaltan	0.0	0.0	0.0	0.0	0.0	417.0	55.0	126.0	127.0	41.0	37.0	0.0
11	Man	0.0	0.0	0.0	0.0	0.0	299.0	83.3	92.8	102.2	47.0	13.0	0.0
Total		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**5302.2**	**5120.8**	**4291.5**	**2126.0**	**568.0**	**444.0**	**0.0**

4.2.4 Land use pattern of Satara district

Land use pattern explains how effectively land resources are utilized for different purposes in a state. Development in irrigation and growth in population are the two important factors, which mostly decide the land use pattern of any state. Table 4.4 presents the detailed land use pattern of the Satara district. It can be seen from the Table that out of geographical area, about 36 per cent of land is under non-agricultural usage i.e. forest, land under non-agricultural use, cultivable waste, permanent pasture and miscellaneous trees and groves. About 12 per cent land is as current and other fallow and about 55 per cent of land is sown. Thus, altogether about 23.4 per cent of land is available in the form of cultivable waste, permanent pastures, land under tree crops and grooves, current as well as other follows, which can be brought under productive use with a proper wasteland development programme. The cropping intensity of the district is 124 per cent, which is marginally higher than the state average (117 %).

4.2.5 Cropping pattern

The maximum area of Satara district is categorized as scarcity zone and agriculture is dependent mainly on monsoons. Hence, kharif crops dominate the cropping pattern.

The cropping pattern of Satara district is shown in Table 4.4.

Table 4.3 Land use pattern of Satara and Maharashtra for year 2015-16.

('00' ha.)

Sr. No.	Taluka	Geographical area	Forest Area	Barren and Uncultivable area	Land under Non-agri. Use	Cultivable Waste	Permanent Pasture	Misc. Trees and Groves	Current Fallows	Other Fallow	Net Sown Area	Gross Cropped Area	Cropping Intensity (%%)
1	Satara	8.65	9.7	8.4	6.2	2.5	9.1	0.0	3.7	3.7	60.7	88.7	146.2
2	Koregaon	9.00	11.1	3.9	5.4	5.4	0.0	0.0	10.5	13.6	54.9	70.3	128.1
3	Khatav	13.20	3.0	7.4	0.9	0.2	4.1	1.5	11.5	11.9	80.5	100.6	125.0
4	Karad	10.88	10.2	1.9	3.8	0.2	1.4	0.0	1.5	0.6	76.6	85.5	111.5
5	Patan	13.68	19.7	8.7	2.6	6.5	9.6	3.1	2.1	4.1	42.6	52.1	122.3
6	Wai	5.96	20.6	3.2	1.6	0.0	8.5	0.0	4.6	4.2	56.5	79.1	140.0
7	Jaoli	5.56	22.8	10.5	2.5	5.6	2.2	0.0	3.0	4.9	50.5	65.4	129.7
8	M.Shwar	5.05	59.7	2.5	1.2	3.2	6.8	0.5	14.5	4.9	12.6	24.4	193.6
9	Khandala	5.07	12.1	17.0	0.4	0.9	9.6	0.1	7.1	14.9	55.7	99.4	178.5
10	Phaltan	11.35	9.2	11.5	2.6	6.5	6.3	0.0	3.9	7.9	60.1	76.9	128.0
11	Man	14.71	8.6	15.4	1.3	7.6	16.1	0.0	2.2	4.3	28.2	30.0	106.6
	Total	103.11	186.70	90.4	28.5	38.6	73.70	5.20	64.6	75.00	578.9	772.40	128.4

Source: www. Agri. mah. nic. in

The area under kharif crops is about 60 per cent, while that under rabi crops is 35 per cent. The area under summer crops is negligible. The cropping pattern of Satara district is mainly dominated by cereal crops which includes Rice, Wheat, Jowar, Bajara and other cereal crops among that Jowar contributes maximum area (176200 ha) with higher per cent of gross cropped area (30.07 %). The total area under cereal crops is about 316900 ha in overall district. Maharashtra state showed similar picture with highest area under cereal crops and also it dominates with Jowar crop.

After the cereal crops in cropping pattern other food grain crops are pulses which covers area about 76900 ha in the Satara district. The major crops in the pulses are Gram, Red gram, etc. the total area under the food grain crop was about 393800 ha in the Satara district which was the highest share in the cropping pattern of the district. Similar picture in case of Maharashtra state also, which has the highest area under the food grain crops.

Satara district having the major producer of oilseed crops which includes, Groundnut, Soybean, Safflower, Sunflower, etc. Soybean is the major growing oilseed crop in the district which contributes about 46100 ha area and having 7.87 per cent share of gross cropped area. Similar picture shown in Maharashtra stare.

Sugarcane is the major cash crop growing in mainly Satara, Karad, Jaoli, Koregaon, Wai taluka and some part of other taluka. Satara district having sugar recovery of about 12.76 per cent which is second highest after Kolhapur district.

Satara is higher contributor of fruit crops and vegetables and having area under these crops was about 26100 ha. which provide export quality produce for marketing in foreign country markets.

Table 4.4 Cropping pattern in Satara and Maharashtra (2015-16).

Sr. No.	Crops	Satara		Maharashtra	
		Area '00' ha.	% to GCA	Area '00' ha.	% to GCA
1	Rice	505	8.62	15164	7.82
2	Wheat	366	6.24	8781	4.53
3	Jowar	1762	**30.07**	32290	16.66
4	Bajara	257	4.38	8382	4.33
5	Other Cereals	279	4.76	6605	3.41
	Total Cereals	**3169**	**54.10**	**71222**	**36.75**
1	Gram	273	4.66	10751	5.55
2	Tur	23	0.39	12331	6.36
3	Other Pulses	473	8.07	14815	7.64
	Total Pulses	**769**	**13.13**	**37897**	**19.55**
	Total Food grains	**3938**	**67.22**	**109119**	**56.30**
1	Groundnut	423	7.22	2377	1.23
2	Safflower	21	0.36	2519	1.30
3	Soybean	461	7.87	30103	15.53
4	Sunflower	42	0.72	3207	1.65
	Total Oilseed	**947**	**16.16**	**38206**	**19.71**
1	Cotton	6	0.10	28395	14.65
2	Sugarcane	706	12.05	10220	5.27
3	Fruits	78	1.33	4692	2.42
4	Vegetables	183	3.12	3170	1.64
	GCA	**5858**	**100**	**193802**	100

Source: Agricultural Statistical Information of Maharashtra State 2015 and Season and Crop Report 2015-16

4.2.6 Animal husbandry

Animal husbandry is closely interwoven with agriculture and obviously plays an important role in the national/state economy and also in the socio-economic development of rural households. This is the sector where the poor contribute to growth directly instead of getting benefit from growth generated elsewhere. The livestock sector is one of the important allied activities of agriculture. By providing substantial income to rural households especially in the areas where agricultural growth is poor, it helps to reduce the rural poverty. Satara district is very rich in case of animal population. The district has near about 6,65,000 bovines and 5,73,000 sheep and goats.

Table 4.5 Livestock population of Satara and Maharashtra, (2012).

Particulars	Livestock Population ('000)		% share of Satara
	Satara	Maharashtra	
Cattle	571	19135	2.98
Buffalo	353	5594	6.31
Total Bovine	665	24729	2.69
Sheep and Goat	573	11015	5.20
Other	0	0	0
Total Livestock	1759	38316	4.59

Source: Livestock census report, 2012

Allied activities in the form of animal husbandry and dairy development play a very important role for rural households. Besides providing additional employment, these sectors also supplement income and enhance nutritional

security. It is well known that dietary patterns are gradually shifting towards livestock and dairy products with increase in income levels. Hence, Animal Husbandry and Dairy development can play a major role as activities allied to agriculture.

The total number of veterinary institutes in the Satara district is about 192, total district veterinary polyclinic is one, the total taluka mini veterinary polyclinics are five in numbers, total state grade 'A' institutes are four in number, grade 'B' institutes are 12, total ZP grade 'I' institutes are 55, grade 'II' are 113, total ZP mobile veterinary clinics are two in numbers. All these veterinarian institute helps in development of disease free and healthy livestock development in the Satara district.

5. ECONOMIC ANALYSIS OF DAIRY INDUSTRY IN SATARA DISTRICT

The present chapter deals with the growth and development of dairy industry, milk processing industries, economics of manufacturing and marketing of milk products and management of private as well as co-operative dairy units in the Satara district. This has been attempted through costs and returns analysis of the business activities of the processing units on the basis of data obtained from them for the financial years 2012-13 to 2015-16.

5.1 Growth of livestock population

The trend of change in the population of livestock during different census period from 1992 to 2012 is given in Table 5.1

Table 5.1 clearly indicates that, in case of cattle, the total population of the adult male is decreased by 20.79 per cent and 31.61 per cent in Maharashtra and Satara district respectively. The population of Adult female is divided in Indigenous and cross-bred. Indigenous adult female showed reduction in number from 693.5 lakhs to 418.3 lakh (39.68 %) and 10.4 lakh to 8.2 lakh (21.15 %) in Maharashtra and Satara district respectively. The adult females from cross-bred showed opposite picture and tremendous increase in number from 91.0 lakhs to 320.7 lakhs and 11.1 lakhs to 18.6 lakhs in Maharashtra and Satara district. The young stock from cattle also showed similar trend of decrease in indigenous population by 22.45 per cent and increase in cross-bred population by 57.04 per cent in Maharashtra. The overall

review of cattle population revealed that, the indigenous cattle were replaced by cross-bred cattle for increasing the overall milk production of the State and Satara district also. In the case of buffalo, there was increase in the total population by 2.70 per cent and 6.65 per cent in Maharashtra and Satara respectively. The population of sheep and goat decreased from 1301.5 lakhs to 1101.5 lakhs and 71.3 lakhs to 57.3 lakhs during the period from 1992 to 2012 in Maharashtra and Satara, respectively. Relatively higher growth rates were observed in cross-bred cattle than indigenous cattle in Satara and Maharashtra as a whole and which has confirmed that cross-bred cows are preferred over indigenous cows for milk production in the State. This is because of agro-climatic conditions are favorable for rearing the cross-bred cows.

5.2 Growth of milk production

The growth of milk production in Satara, Maharashtra and India during last one decade is shown in Table 5.2

India having the first rank in milk production, in which the buffalos contributed about, 54 per cent while, cows contribution was about 38 per cent of total milk production in the year 2015-16. Similar trends were revealed by Gavali (2001) and Kaware (2011).

The milk production of India has grown from 102.6 million tons in the year 2006-07 to 155.5 million tons in the year 2015-16, similarly the milk production of the Maharashtra and Satara district got increased from 6.98 million tons to 10.15 million tons and 0.41 million tons to

Table 5.1 Growth of livestock population in Satara district and Maharashtra.

Sr. no.	Particulars	Census										Per cent change in 2012 over base year 1992	
		1992		1997		2002		2007		2012			
		Satara	MH	Satara	MH	Satara	MH	Satara	MH	Satara	MH	Satara	MH
A	**Cattle**												
	a) Adult male												
	1) Indigenous	148	8736	131	8783	124	7784	114	7630	97	6780	-34.46	-22.39
	2)Cross-bred	7	384	9	578	11	543	10	2580	9	444	28.57	15.63
	Total adult male	155	9120	140	9361	135	8327	263	10210	106	7224	-31.61	-20.79
	b) Adult female												
	1) Indigenous												
	i) In milk	53	2547	54	2914	33	2832	35	1959	33	1712	-37.74	-32.78
	ii) Dry	40	2443	34	2038	23	1667	21	1324	21	1340	-47.50	-45.15
	Total indigenous Female	104	6935	98	6832	85	5784	87	5430	82	4183	-21.15	-39.68
	2) Cross-bred												
	i) In milk	48	548	52	733	66	937	70	1138	89	1445	85.42	163.7
	ii) Dry	20	278	25	399	26	459	27	484	31	593	55	113.3
	Total cross-bred Female	111	910	83	1132	132	2299	149	2580	186	3207	67.57	252.4
	c) Young stock												
	1) Indigenous	11	3857	83	4209	98	3986	95	3220	28	2991	154.55	-22.45
	2) Cross-bred	43	703	61	987	78	905	89	1153	110	1104	155.81	57.04
	Total adult female	215	7854	181	7964	217	8320	359	16183	368	15040	71.16	91.49
	Total cattle (I)	370	17441	303	18072	528	16738	464	16259	571	19135	54.32	9.71
	1) Indigenous	252	15672	229	15615	307	13568	305	13121	377	15484	49.60	-1.20
	2) Cross-bred	118	1769	74	2455	153	2898	159	3122	195	3651	65.25	106.4
B	**Buffaloes**												
	a) Adult male	25	1002	39	1065	26	892	27	871	22	597	-12	-40.4
	b) Adult female												
	i) In milk	120	1799	146	2151	151	2252	139	2351	142	2162	18.33	20.18
	ii) Dry	77	1141	65	1433	70	1090	69	1018	67	1010	-12.99	-11.48
	Total female	218	4445	322	3584	330	3342	320	3369	331	4998	51.83	12.42
	c) Young stock	103	1887	39	2149		2220		2320	100	1229	-2.91	-34.8
	Total Buffaloes (II)	331	5447	361	6073	359	6084	347	6308	353	5594	6.65	2.70
	Total Bovine	788	22888	826	24144	712	22377	706	22568	665	24729	-15.61	8.04
C	**Total Sheep**	363	3074	367	3368	327	3175	312	2909	264	2580	-27.27	-161
D	**Total Goat**	350	9941	433	11434	385	10449	321	10391	309	8435	-11.71	-15.2
E	**Total Livestock**	1517	36393	1642	39630	1652	37058	1703	37228	1759	38316	15.95	5.28

Source: Livestock Census Reports of Maharashtra, 1992 to 2012 (MH= Maharashtra)

to 0.69 million tons during the year 2006-07 to 2015-16.

The per cent share of Satara district to Maharashtra state in total milk production were ranges from 5.87 per cent to 6.80 per cent, while in comparison with India it was ranges from 0.40 per cent to 0.44 per cent. The rate of growth of annual milk production is 5.07 per cent, 4.18 per cent and 4.54 per cent for Satara, Maharashtra and India respectively.

Dairying in Maharashtra is well established due to assured market, reasonably good prices for milk and easy access to health services.

5.3 Performance of co-operative and private dairy units.

The private and co-operative dairy units in the Satara district are carrying out dairy business in competition with each other. The activity of milk production has been taken up

Table 5.2 Growth of milk production in Satara district, Maharashtra and India.

(Million Tons)

Sr. No.	Years	Milk production			Per cent share of Satara to	
		Satara	Maharashtra	India	Maharashtra	India
1	2006-07	0.41	6.98	102.6	5.87	0.40
2	2007-08	0.44	7.21	107.9	6.10	0.41
3	2008-09	0.47	7.45	112.2	6.31	0.42
4	2009-10	0.48	7.68	116.4	6.25	0.41
5	2010-11	0.46	8.04	121.8	5.72	0.38
6	2011-12	0.49	8.47	127.9	5.79	0.38
7	2012-13	0.51	8.73	132.4	5.84	0.39
8	2013-14	0.56	9.09	137.7	6.16	0.41
9	2014-15	0.61	9.54	146.3	6.39	0.42
10	2015-16	0.69	10.15	155.5	6.80	0.44
CGR		**5.069*** **	**4.18*** **	**4.54*** **		

Source: Various reports of Dept. of Animal Husbandry.

on commercial lines by a majority of cultivators in the area and the supply of milk from the milk producers. The outcome

of business depends on efficient management, minimizing losses during collection, processing and distribution as well as performing all the functions at minimum costs in order to optimize returns of the ultimate milk producer. Therefore, the detail economic analysis of the dairy business for co-operative and private dairy units has been done.

This topic deals with the economic analysis of co-operative and private dairy units in respect of milk collection, processing, distribution of milk, manufacturing and marketing of milk products under different management systems. This has been attempted through costs and returns analysis of the business activities of the processing units on the basis of the data obtained for the financial years from 2012-13 to 2015-16 for co-operative dairy units and private dairy units.

5.3.1 Capital investment in the dairy business.

For operating the dairy business more efficiently, the business activity requires sufficient investment in different capital asset such as land, buildings, shed, godawns, machinery, tools, equipment's, electric structures, water supply system, vehicles, milk cans, crates and booths. The co-operative and private dairy units in Satara district have been well equipped with the adequate technology embodied in the plant and machineries owned by them is most advanced one. Obviously, these dairy units required huge amount of investment in different capital assets. The details of the investment in different capital assets of co-operative and private dairy units are presented in Table 5.3.

Table 5.3 Capital investment in fixed asset of co-operative and private dairy units during the period of 2012-13 to 2015-16.

(₹ Lakh/unit)

Sr. No	Particulars	Co-operative		Private		Per cent change over base year 2012-13	
		2012-13	2015-16	2012-13	2015-16	Co-operative	Private
1	Land and buildings	439.50 (53.43)	525.73 (44.08)	988.52 (45.65)	1120.16 (47.42)	19.62	13.32
2	Furniture and dead stock	7.70 (0.94)	7.85 (0.66)	17.99 (0.83)	20.13 (0.85)	1.95	11.90
3	Machinery, tools and equipment's	309.66 (37.65)	534.53 (44.82)	900.36 (41.58)	939.13 (39.76)	72.62	4.31
4	Vehicle	37.63 (4.58)	48.01 (4.03)	103.89 (4.80)	115.23 (4.88)	27.58	10.92
5	Cans, crates	22.49 (2.73)	65.38 (5.48)	96.14 (4.44)	105.36 (4.46)	190.71	9.59
6	Others	5.59 (0.67)	11.23 (0.93)	58.53 (2.70)	62.14 (2.63)	100.89	6.17
	Total cost	**822.57 (100)**	**1192.73 (100)**	**2165.43 (100)**	**2362.15 (100)**	45.00	9.09

(Figures in parentheses are the per centages to the total cost.)

Source: Annual dairy report of co-operative and private dairy units, 2012-13 to 2015-16.

The total investment in capital assets of co-operative and private dairy unit has been increased from ₹ 822.57 lakhs to ₹ 1192.73 lakhs in co-operative and ₹ 2165.43 lakhs to ₹ 2362.15 lakhs during the period of 2012-13 to 2015-16. The investment in land and building was the major portion of the investment which lies in a range of 53.43 per cent to 44.08 per cent and 45.65 per cent to 47.72 per cent in co-operative and private dairy unit respectively which showed decrease of 9.35 per cent in case of co-operative dairy unit while increase of 1.77 per cent in case of private dairy unit.

The second major and most important part of investment is in the machinery, tools and equipment's which

contributes about 41 per cent of co-operative and 40 per cent of private dairy units. The investment in the machinery, tools and equipment's showed an increase of 72.62 per cent and 4.31 per cent in co-operative and private dairy unit during the period of 2012-13 to 2015-16.

The remaining 11 per cent investment for co-operative and 14 per cent investment for private dairy unit were divided into vehicles, cans and crates, furniture and dead stock, library and other necessary things require for operating dairy unit.

The growth rate of machinery, tools and equipment's was the highest in co-operative dairy units because of the replacement of old machinery or expansion of dairy units those were made during the period under study. Similar results were reported by Shelar (2000), Gavali (2001), and Kaware (2011)

5.3.2 Financial strength of dairy units

There are many elements which are essential for successful running of the co-operative and private dairy units. These are mainly share capital funds, working capital, assets and liabilities of the dairy unit.

This analysis of the co-operative and private dairy units for the period of 2012-13 to 2015-16 were made to know the composition of variable items of the assets, liabilities and analysis of sources, utilization of funds by the different co-operative and private dairy units. The information on financial

strength of co-operative and private dairy units is presented in Table 5.4

Table 5.4 Financial strength of co-operative and private dairy units during year the 2012-13 to 2015-16.

A) Assets

(₹ Lakh/unit)

Sr. No	Particulars	Co-operative		Private		Per cent Change over base year 2012-13	
		2012-13	2015-16	2012-13	2015-16	Co-operative	Private
1	Cash in hand	9.63 (0.74)	5.48 (0.34)	7.99 (0.26)	9.65 (0.28)	-43.09	20.78
2	Bank balance	21.17 (1.62)	16.88 (1.05)	53.26 (1.74)	55.76 (1.63)	-20.26	4.69
3	Investment	173.82 (13.27)	206.63 (12.83)	164.26 (5.35)	177.35 (5.19)	18.88	7.97
4	Stored product	53.48 (4.08)	33.40 (2.07)	32.23 (1.05)	99.36 (2.91)	-37.55	208.28
5	Credit	225.31 (17.21)	151.04 (9.38)	369.45 (12.04)	389.32 (11.41)	-32.96	5.38
6	Profit	3.55 (0.27)	4.22 (0.26)	276.14 (9.00)	321.26 (9.41)	18.87	16.34
7	Fixed asset	822.57 (62.81)	1192.73 (74.07)	2165.43 (70.56)	2362.15 (69.17)	45.00	9.09
	Total cost	**1309.53 (100)**	**1610.38 (100)**	**3068.74 (100)**	**3414.85 (100)**	22.97	11.28

(Figures in parentheses are the per centages to the total cost)

Source: Annual dairy report of co-operative and private dairy units, 2012-13 to 2015-16.

The total turnover of the co-operative and private dairy unit has been increased from ₹ 1309.53 lakhs to ₹1610.38 lakhs (22.12 %) and ₹ 3068.74 lakhs to ₹ 3414.85 lakhs (11.28 %) over the period of time respectively. In case of co-operative dairy unit, the cash and bank balance is decreased by 43.09 per cent and 20.26 per cent, while in private dairy unit it was increased by 20.78 per cent and 4.69 per cent during the study period. Investment during the corresponding

period was increased by 18.88 per cent and 7.97 per cent in the co-operative and private dairy units.

The stored product and credit showed reduction in case of co-operative dairy unit (37.55 % and 32.96 %), while it was increased in case of private dairy unit. (208.28 % and 5.38 %) The rate of increase in the profit of firm is much more in case of private dairy unit (₹ 321.26 lakhs) than co-operative dairy unit. (₹ 4.22 lakhs)

From the above data, it is clearly revealed that private sector was much more dominant sector over the co-operative sector on the basis of monitory returns.

The total liabilities of co-operative and private dairy units were increased from ₹ 1466.84 lakhs to ₹ 1963.17 lakhs (20.20 %) and ₹ 2877.24 lakhs to ₹ 2984.55 lakhs (3.73 %) respectively during the period of 2012-13 to 2015-16.

The items included in liabilities viz., paid up share capital, deposits, current liabilities and provisions, other funds shows common trend of increase in the value, only loans showed a decrease by 28.75 per cent and 11.49 per cent in co-operative and private dairy unit respectively during the study period.

Authorized capital for both the dairy unit and share suspense for co-operative dairy unit showed no any change during study period.

The overall result from above study concluded that the financial strength of the co-operative dairy unit having poor performance as compare to private dairy unit which indicating the good financial strength.

B) Liabilities

(₹ Lakh/unit)

Sr. No.	Particulars	Co-operative		Private		Per cent Change over base year 2012-13	
		2012-13	2015-16	2012-13	2015-16	Co-operative	Private
1	Authorized capital share	110.00 (7.50)	110.00 (6.24)	175.00 (6.08)	175.00 (5.86)	0.00	0.00
2	Paid up share capital	43.73 (2.98)	48.81 (2.77)	105.19 (3.66)	121.65 (4.08)	11.62	15.65
3	Share suspense	0.28 (0.02)	0.28 (0.02)	-	-	0.00	-
4	Reserved funds	88.55 (6.04)	93.21 (5.29)	209.23 (7.27)	196.28 (6.58)	5.26	-6.19
5	Deposits	20.28 (1.38)	21.13 (1.20)	65.46 (2.28)	75.36 (2.53)	4.19	15.12
6	Loans	560.03 (38.18)	398.99 (22.63)	1287.22 (44.74)	1139.33 (38.17)	-28.76	-11.49
7	Current liabilities and provision	327.66 (22.34)	428.45 (24.30)	811.88 (28.22)	989.57 (33.15)	30.76	21.89
8	Loss	0.26 (0.02)	-	-	-	-	-
9	Grants	20.84 (1.42)	20.84 (1.18)	-	-	0.00	-
10	Other funds	295.21 (20.12)	641.46 (36.37)	223.26 (7.75)	287.36 (9.63)	117.29	28.71
	Total cost	**1466.84 (100)**	**1763.17 (100)**	**2877.24 (100)**	**2984.55 (100)**	20.20	3.73

(Figures in parentheses are the per centages to the total cost)

Source: Annual dairy report of co-operative and private dairy units, 2012-13 to 2015-16.

The growth of indicators increased with size of the dairy unit over the period indicating the good financial strength of the unit. Similar results were found by Gavali (2001), Pawar (2003) and Kaware (2011)

5.3.2.1 Growth rates in financial indicators of co-operative dairy unit

Annual compound growth rates of assets and liabilities i.e. financial indicators of dairy business have been

worked out for co-operative dairy unit for the year 2006-07 to 2015-16 and are presented in Table 5.5

It is observed from the Table that, annual compound growth rate of profit was the highest (50.72 %) followed by investment (22.91 %), cash in hand (16.26 %), credit (11.65 %), fixed assets (10.19 %) stored product (10.11 %), and bank balance (8.90 per cent).

Table 5.5 Growth rates of financial indicators of co-operative dairy unit.

Sr. No.	Particulars	CGR
A) Assets		
1	Cash in hand	16.26*
2	Bank balance	8.90**
3	Investment	22.91***
4	Stored product	10.11**
5	Credit	11.65*
6	Profit	50.72**
7	Fixed asset	10.19***
B) Liabilities		
1	Authorized share capital	0
2	Paid up share capital	14.46NS
3	Share suspense (Share anamat)	13.46***
4	Reserve funds	14.28**
5	Loans	25.10***
6	Deposits	7.37***
7	Grants and subsidies	0
8	Current liabilities and provisions	10.51***
9	Loss	-75.96**

'***','**' and '*'= significant at 1, 5, and 10 per cent level, respectively.

NS= Non significant

In the case of liabilities, loans were the highest (25.10 %) share, followed by reserve fund (14.28 %), share suspense (13.46 %), current liabilities and provisions (10.51 %). The losses showed reduction by 75.96 per cent.

The growth rates of assets were found positive and highly significant. The annual growth rates of liabilities were positive and highly significant except paid up share.

5.3.3 Size of business of dairy units

The co-operative and private dairy units have been involved in the activity of collection, processing and distribution of milk as well as manufacturing and marketing of milk products. The size of the business activity could therefore, be measured in terms of volume of milk and milk products handled/processed by them per unit of time i.e. year. Table 5.6 indicates the average collection and disposal of milk of selected co-operative and the private dairy unit over the period of time i. e. 2012-13 to 2015-16.

Total milk collection by the co-operative and private dairy unit was 158.40 lakh liters and 632.13 lakh liters respectively, in the year 2012-13, which was increased to 167.95 lakh liters and 1158.88 lakh liters in the year 2015-16 i.e. 6.03 per cent and 83.32 per cent increase was noticed in co-operative and private dairy unit respectively. The absolute quantities of milk losses due to handling, processing and transportation was reduced from 0.47 per cent to 0.40 per cent in case of co-operative dairy unit and 0.02 per cent to 0.01 per cent in case of private dairy unit. Though the overall

Table 5.6 Collection and disposal of milk of co-operative and private dairy units during the year 2012-13 to 2015-16.

(Lakh liters)

Sr. No.	Particulars	Co-operative		Private		Per cent Change over base year 2012-13	
		2012-13	2015-16	2012-13	2015-16	Co-operative	Private
1	Cow	78.82 (49.76)	92.82 (55.27)	297.01 (46.99)	660.56 (57.00)	17.76	122.40
	Buffalo	79.58 (50.24)	75.13 (44.73)	335.12 (53.01)	498.32 (43.00)	-5.59	48.70
	Total	158.40 (100)	167.95 (100)	632.13 (100)	1158.88 (100)	6.03	83.32
2	Milk loss in handling	0.74 (0.47)	0.67 (0.40)	0.14 (0.02)	0.09 (0.01)	-9.46	-35.71
3	Milk processed	157.66 (99.53)	167.28 (99.60)	631.99 (99.98)	1158.79 (99.99)	6.10	83.35
4	Milk used for products	7.33 (4.63)	8.46 (5.04)	195.92 (30.99)	405.58 (35.00)	15.42	107.01
5	Milk sell	150.33 (94.91)	158.82 (94.57)	436.07 (69.01)	753.21 (64.99)	5.65	72.72
6	Daily milk collection	0.43	0.46	1.73	3.17	6.98	83.24

(Figures in parentheses are the per cent to the total milk collection.)
Source: Annual dairy report of co-operative and private dairy units, 2012-13 to 2015-16.

turnover of dairy increased over the period, losses did not increase in that proportion. It was mainly because of efficient handling.

The percentage of milk collection and milk processed were nearly same, while the milk used for preparation of different milk products has been increased by 15.42 per cent and 107.01 per cent, in co-operative and private dairy unit respectively over the period under study. It is observed that about 99 per cent of the total milk collected was processed.

The per cent share of fluid milk sale is higher (94 %) in case of co-operative dairy unit as compare to private dairy unit (65 to 69 %). The remaining milk was used for preparation of different milk products by both the dairy units. The private

dairy unit used 30.99 per cent to 35 per cent of processed milk for preparation of milk products, which is much higher than co-operative dairy unit (5 %). The average daily milk collection was increased from 0.43 lakh liter to 0.46 lakh liter in case of co-operative dairy unit, while in case of private dairy unit it was increased from 1.73 lakh liters to 3.17 lakh liter. Similar results were reported by Gavali (2001), Mengade (2004) and Kaware (2011)

The share of cows and buffalos milk in the total milk collection was showed an increasing trend of cow milk over the buffalo milk during corresponding years of study. It can be said that the average daily milk collection and total milk collection for the year on an average, increased substantially over the period of time.

From the above discussion it is clear that, private dairy unit grows much higher rates as compare to co-operative dairy as indicated by meager progress in daily and total milk collection because it having the higher rate of purchase of milk, better transportation facilities and higher milk handling capacity than co-operative dairy unit.

5.3.3.1 Growth rates of milk collected, processed, distributed and loss of milk in handling and milk used for milk products by co-operative dairy unit.

The annual compound growth rates with regard to milk collected, processed, distributed, loss and milk used for milk products in co-operative dairy unit were estimated and are given in Table 5.7.

Table 5.7 Growth rates of collection and disposal of milk of co-operative dairy unit.

Sr. No.	Particulars	CGR
1	Total milk collection	-21.23**
	a) Cow	-24.6***
	b) Buffalos	-4.84***
2	Milk loss in handling	-1.75***
3	Milk Processed	-21.26**
4	Milk used for milk products	38.62***
5	Milk sell	-21.81**
6	Daily milk collection	-21.23**

'***', '**' and '*'= significant at 1, 5, and 10 per cent level, respectively.

NS= Non significant

To have clear picture in the trend of total milk collected, processing and transportation, milk processed, milk used for milk products and daily milk collection, compound growth rates were worked out. All the indicators were found negatively significant during the period from 2006-07 to 2015-16. The growth rates of milk used for products were only significant, and milk loss in handling showed a negatively significant which indicates the increase in the efficiency of dairy business. Thus, it is quite clear that the performance of co-operative dairy unit was not satisfactory.

5.3.4 Different milk products and the quantity of milk used.

The process of manufacturing of milk products is more complex because of high level interdependence of individual

milk products on each other. There are certain milk products which could be considered as final products as well as intermediate products serving as raw material input in manufacturing of some other final product.

Appendix-I and II presents the break-up of the total quantity of milk used for preparation of different milk products for co-operative and private dairy units.

For co-operative and private dairy unit the total quantity of buffalo and cow milk used for manufacturing milk products was 7.33 lakh liters and 195.92 lakh liters respectively in the year 2012-13 and it was increased to 8.46 lakh liters and 405.58 lakh liters in the year 2015-16, respectively. No specific trend was observed for quantity of milk used in preparation of milk products.

The proportionate share of milk used for separation of cream ranged between 30 per cent to 35 per cent for co-operative dairy and 12 to 15 per cent for private dairy unit over the period of time. Out of the total milk used for preparation of different milk products, the proportion of Curd was 30 to 32 per cent and 35 to 45 per cent for co-operative and private dairy unit respectively, over the study period. The remaining quantity of milk was used for preparation of other milk products.

It is observed from Appendix-III that, the co-operative and private dairy units, having the total production of Cream was 27.94 tons and 303.84 tons in the year 2012-13 which were increased to 30.58 tons and 493.48 tons in the year

2015-16. Out of total production of cream, the maximum portion of cream utilized for preparation of Butter, Ghee and Ice-cream.

In the case of co-operative and private dairy units, the total production of Butter was 13.51 tons and 81.65 tons in the year 2012-13, respectively, which was increased to 14.82 tons and 158.33 tons in the year 2015-16, as showed in Appendix-IV. The Butter was used for preparation of Ghee and direct selling.

Ghee was prepared from Butter and Cream. From the Appendix-V it can be observed that the total production of Ghee for private dairy unit was increased by 148.64 per cent over the period of time.

It can be observed from Appendix-VI, that the total production of Curd by co-operative and private dairy units was 222.65 tons and 9325.00 tons in the year 2012-13, which was increased to 236.73 tons and 13840.01 tons in the year 2015-16. Curd was utilized for the direct selling and also for preparation of products like Shrikhand and Aamrakhand. The total production of Shrikhand in the co-operative and private dairy units was increased from 104.47 tons and 2891.39 tons to 107.80 tons and 3936.25 tons, respectively over the period of time. Aamrakhand also showed an increase in production from 48.35 tons and 2227.34 tons to 68.19 tons and 3825.04 tons, for co-operative and private dairy units respectively.

It can be observed from Appendix-IX, that the total production of Basundi for co-operative and private dairy units was 27.33 tons and 162.67 tons, respectively in the year

2012-13 and which was increased to 72.67 tons and 276.67 tons in the year 2015-16.

It can be revealed from Appendix-X, that the total production of Flavored milk for co-operative and private dairy units was 50.05 thousand liters and 113.75 thousand liters, respectively in year 2012-13 and which was increased to 55.51 thousand liters and 332.15 thousand liters in the year 2015-16.

In the case of private dairy unit, the total production of Paneer was 44.44 tons in the year 2012-13, which was increased to 138.16 tons in the year 2015-16. The co-operative dairy unit first time started their production of Paneer in the year 2015-16 and the total production for that year was 4.40 tons.

Only the co-operative dairy unit was manufacturing Pedha for direct selling. The total production of Pedha was also increased from 46.60 tons to 49.00 tons during study period, showed great demand sweet milk Pedha in the local and domestic market.

From the Appendix-XIII and XIV, it is cleared that, the Khoa and Ice-ream were the products only manufactured by private dairy unit. The total production of Khoa and Ice- cream was also increased from 80.84 tons and 70.34 thousand liters in the year 2012-13 to 133.45 tons and 228.54 thousand liters in the year 2015-16.

5.3.5 Cost structure of dairy business

The cost structure of the business includes following major activities.

1. Purchase cost of milk
2. Collection cost of milk
3. Processing cost of milk
4. Distribution cost of milk
5. Management cost of milk
6. Processing cost of milk products
7. Manufacturing cost of milk products
8. Marketing cost of milk products
9. Marketing management cost of milk products

The different items of cost of all the above activities are included under the fixed and variable cost categories.

5.3.5.1 Purchase, collection, processing, distribution and management costs of milk.

The information of purchase, collection, processing, distribution and management cost of milk of selected co-operative and private dairy units in Satara district is presented in Table 5.8

The total cost including purchase, collection, processing, distribution of milk in co-operative dairy unit were increased from ₹ 4446.32 lakhs to ₹ 5132.49 lakhs by 15.43 per cent, while in private dairy unit it was increased from ₹ 18691.07 to ₹ 36780.88 lakhs by 93.42 per cent during the period of 2012-13 to 2015-16. It clearly indicates that there were high efforts Taken by the private dairy units for the collection and

processing of milk and milk products and also the highest use of available resources.

Table 5.8 Purchase, collection, processing, distribution, and management costs of co-operative and private dairy units during year 2012-13 to 2015-16

(₹ Lakh/unit)

Sr. No.	Particulars	Co-operative		Private		Per cent change over base year 2012-13	
		2012-13	2015-16	2012-13	2015-16	Co-operative	Private
1	Total purchase cost	3920.43 (88.17)	4542.99 (88.52)	17225.69 (92.16)	33317.66 (90.58)	15.88	93.42
	Unit cost (₹/liter)	24.75	27.05	27.25	28.75	9.29	5.50
2	Collection cost	172.66 (3.88)	198.18 (3.86)	512.03 (2.74)	1216.82 (3.31)	14.78	137.65
	Unit cost (₹/liter)	1.09	1.18	0.81	1.05	8.26	29.63
3	Processing cost	117.22 (2.64)	129.32 (2.52)	284.11 (1.52)	752.66 (2.05)	10.32	164.92
	Unit cost (₹/liter)	0.74	0.77	0.45	0.65	4.05	44.44
4	Distribution cost	96.62 (2.17)	112.53 (2.19)	284.11 (1.52)	625.29 (1.70)	16.47	120.09
	Unit cost (₹/liter)	0.61	0.67	0.45	0.54	9.84	20.00
5	Management cost	139.39 (3.14)	149.47 (2.91)	385.13 (2.06)	868.45 (2.36)	7.23	125.50
	Unit cost (₹/liter)	0.88	0.89	0.61	0.75	1.14	22.95
	Total cost including purchase price	**4446.32 (100)**	**5132.49 (100)**	**18691.07 (100)**	**36780.88 (100)**	15.43	96.78
	Unit cost (₹/liter)	28.07	30.56	29.57	31.74	8.87	7.34

(Figures in parentheses are the per centages to the total)

Source: Annual dairy report of co-operative and private dairy units, 2012-13 to 2015-16.

The per liter purchase price of private dairy unit was quite higher than co-operative dairy unit, which attract the milk producer for getting higher benefit from their produce.

The per liter purchase price of co-operative dairy unit was increased from ₹ 24.75 to ₹ 27.05, while in case of private dairy unit it was increased from ₹ 27.25 to ₹ 28.75 during same period of time. Total purchase cost contributes to about 88 per cent in the total cost in co-operative sector as compare to 90 to 92 per cent in private sector.

After the purchase of milk, it was collected and transported to the processing unit; the total collection cost was increased by 14.78 per cent and 137.65 per cent of co-operative and private dairy unit respectively. The higher the milk collection increases the cost of collection. Per unit collection charges for private dairy unit is slightly lower than the co-operative dairy unit because of the better linkage of milk collection centers and having their own vehicles.

Whenever milk reached to dairy unit, it gets processed through procedures *viz.,* pasteurization, homo-genization, etc. Per unit cost required for the processing depends on the modern machineries available to the dairy units. It is observed that, the co-operative dairy unit having the higher per unit cost (₹ 0.74 to ₹ 0.77) than the private dairy unit (₹ 0.45 to ₹ 0.65) during study period. It clearly warns the co-operative dairy unit for adoption of modern technologies and machineries on for processing of milk.

After the processing of milk it gets packed and distributed to the consumer for further selling. The distribution cost includes transportation, publicity, etc. costs. The distribution cost at co-operative dairy unit increased from

₹ 96.62 lakhs to ₹ 112.53 lakhs by 16.47 per cent, while in case of private dairy unit it gets increased from ₹ 284.11 lakhs to ₹ 625.29 lakhs by 120 per cent during the year 2012-13 to 2015-16.

In the whole process of purchase to distribution, labor force require for the management of all these activities. The co-operative unit having higher per unit management cost (₹ 0.88 to ₹ 0.89) as the lower quantity of milk processed as compared to private dairy unit (₹ 0.61 to ₹ 0.75) having higher milk collection.

As far as average per unit cost of milk is concerned, it has steadily increased over the year for all the major items and that too for all the various items costs due to increase in the salary and allowances to staff and overhead charges and also increase in the prices of all items.

On an average, price paid to producers by the private dairy unit was comparatively higher than the co-operative dairy unit in corresponding years. This was possible mainly due to efficient management by the private dairy unit which has been reflected in the average per liter cost of collection, processing, distribution and management of private dairy unit. Similar results were obtained by Shelar (2000), Yadav (2000), Gavali (2001), Pawar (2003), Mengade (2004) Babu and Verma (2010), and Kaware (2011).

5.3.5.1.1 Growth rates of purchase, collection, distribution and management costs of milk by co-operative dairy unit

The annual compound growth rates of purchase, collection, distribution and management costs of milk in co-operative dairy unit are given in Table 5.9

To have clear picture in the trend of purchase, collection, distribution and management costs of milk, compound growth rates were worked out. All the indicators except purchase cost were found non-significant. It clearly shows from the study during the period from 2006-07 to

Table 5.9 Purchase, procurement, processing, distribution and management cost of milk of co-operative dairy unit.

Sr. No.	Particulars	CGR
1	Purchase cost	6.41***
2	Collection cost	1.31 NS
3	Processing cost	0.57 NS
4	Distribution cost	1.79 NS
5	Management cost	1.06 NS
	Total	5.70***

('***','**' and '*'= significant at 1, 5, and 10 per cent level, respectively.)

NS= Non significant

2015-16, the performance of co-operative dairy unit was poor and alarming that much more efforts should be require for efficient and better working of dairy unit in future.

5.3.5.2 Cost of processing of milk products

Cost of conversion of milk into various milk products is an important activity in the manufacturing of milk products by dairy industry. It provides scope for utilization of increasing milk production.

In the present study, it is observed that, the production of different milk products was carried out by co-operative and private dairy units. The cost of processing of milk products included all the cost incurred for conversion of milk into various milk products like electricity, water supply expenditure, material supplies, salaries and general administration.

The product wise cost of production of milk products is shown in Table 5.10

The production of different milk products by co-operative dairy unit are Shrikhand, Aamrakhand, Basundi, Pedha, Butter, Flavored milk, Lassi, Curd, Paneer, and Tak. In addition to that, private dairy unit is more efficient in manufacturing of milk products like, Milk powder, Ghee, Khoa, Shrikhand, Aamrakhand, Basundi, Butter, Flavored milk, Lassi, Curd, Paneer, and Ice-cream.

For the co-operative dairy unit, the total cost of processing of milk products were increased from ₹ 6.52 lakhs to ₹ 14.47 lakhs resulted in 121.59 per cent change over base year 2012-13, but as compared with private dairy unit the total cost increased from ₹ 1575.21 lakhs to ₹ 2101.98 lakhs

Table 5.10 Costs of processing of milk products by co-operative and private dairy units during the period of 2012-13 to 2015-16

(₹ Lakh/unit)

Sr. No.	Milk Products	Particulars	Co-operative		Private		Per cent change over base year 2012-13	
			2012-13	2015-16	2012-13	2015-16	Co-operative	Private
1	Milk Powder	Total cost	-	-	1223.83 (77.69)	1513.32 (71.99)	-	23.65
		Unit cost (₹/Kg)	-	-	33.85	35.38		
2	Ghee	Total cost	-	-	6.48 (0.41)	16.93 (0.81)	-	161.27
		Unit cost (₹/Kg)	-	-	15.48	16.25	-	
3	Khoa	Total cost	-	-	7.16 (0.45)	12.61 (0.60)	-	76.12
		Unit cost (₹/Kg)	-	-	9.9	10.35		
4	Shrikhand	Total cost	2.07 (31.70)	3.10 (21.42)	118.85 (7.55)	175.89 (8.37)	49.76	47.99
		Unit cost (₹/Kg)	7.94	8.55	7.75	8.11		
5	Aamrkhand	Total cost	0.46 (7.04)	0.81 (5.60)	96.20 (6.11)	160.40 (7.63)	76.09	66.74
		Unit cost (₹/Kg)	8.05	8.65	7.75	8.11		
6	Basundi	Total cost	0.79 (12.10)	1.32 (9.12)	7.38 (0.47)	13.48 (0.64)	67.09	82.66
		Unit cost (₹/Kg)	5.15	5.51	4.81	5.11		
7	Pedha	Total cost	1.26 (19.30)	1.63 (11.26)	-	-	29.37	-
		Unit cost (₹/Kg)	6.80	7.48	-	-		
8	Butter	Total cost	0.69 (10.57)	1.13 (7.81)	2.64 (0.17)	4.88 (0.23)	63.77	84.85
		Unit cost (₹/Kg)	6.20	6.94	6.10	6.65		
9	Flavored milk	Total cost	0.57 (8.73)	0.80 (5.53)	3.73 (0.24)	11.77 (0.56)	40.35	215.55
		Unit cost (₹/liter)	2.75	3.15	3.35	3.68		

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10	Lassi	Total cost	0.27 (4.13)	0.50 (3.46)	4.33 (0.27)	12.50 (0.59)	85.19	188.68
		Unit cost (₹/liter)	2.20	2.35	2.36	2.50		
11	Curd	Total cost	0.41 (6.28)	5.02 (34.69)	99.16 (6.30)	161.04 (7.66)	1124.39	62.40
		Unit cost (₹/liter)	6.3	6.85	5.40	6.45		
12	Paneer	Total cost	-	0.09 (0.62)	1.28 (0.08)	4.46 (0.21)	-	248.44
		Unit cost (₹/Kg)	-	3.25	3.10	3.35		
13	Tak	Total cost	-	0.07 (0.49)	-	-	-	-
		Unit cost (₹/liter)	-	2.1	-	-		
14	Ice-cream	Total cost	-	-	4.17 (0.27)	14.70 (0.70)	-	252.52
		Unit cost (₹/liter)	-	-	7.12	7.72		
	Total Cost		**6.52 (100)**	**14.47 (100)**	**1575.21 (100)**	**2101.98 (100)**	121.59	33.44

Source: Annual dairy report of co-operative and private dairy units, 2012-13-2015-16.

which showed an increase by 33.44 per cent during the period of study.

The Milk powder, Khoa, Ghee are the products which are made only by the private dairy units and not by the co-operative dairy unit. Whereas the Pedha and Tak are the milk products only made by the co-operative dairy unit and not by private dairy unit.

In case of co-operative dairy unit, Shrikhand share the highest portion of total cost (31.70 %) in the year 2012-13 which was replaced by the curd in the year 2015-16 (34.69 %), While in case of private dairy unit out of the two sample dairy units only one dairy unit was favored with preparation of Milk powder. The per cent share of Milk powder is the highest in case of private dairy unit, which was 77.69 per cent and 71.99 per cent during period of 2012-13 to 2015-16.

In case of co-operative dairy unit, after the highest share of Shrikhand, Pedha, Basundi, Butter and Flavored milk having share of 19.30 per cent, 12.10 per cent, 10.57 per cent, 8.73 per cent in the total cost of processing in the year 2012-13 and changes in 2015-16 by first position occurred by Curd. In case of private dairy unit after the highest share of Milk powder followed by Shrikhand, Aamrakhand and Curd having share of 7.5 per cent to 8 per cent, 6.11 per cent to 7.63 per cent and 6.30 per cent to 7.66 per cent during the year 2012-13 to 2015-16 respectively.

The net per cent change estimated in the co-operative dairy unit was highest for Curd (1124.39 per cent) while in case of private dairy unit, Ice-cream (252.52 per cent) showed

the highest per cent change over period of 2012-13 to 2015-16.

As far as average per unit cost of conversion (processing/ making) is concerned, it has steadily increased over the years for all the milk products. It is a good indication of efficient management of co-operative dairy unit.

There has been substantial increase in the gross value of all these milk products together from the year 2012-13 to 2015-16. Similar results were obtained by Shelar (2000), Gavali (2001), Pawar (2003), Mengade (2004) and Kaware (2011).

5.3.5.2.1 Growth rates of cost of processing of milk products

The annual compound growth rates of processing of different milk products have been worked out for the co-operative dairy unit for the years from 2006-07 to 2015-16 and are given in Table 5.11

Annual compound growth rates of Shrikhand was the highest (35.35 per cent) followed by Aamrakhand (13.82 per cent), Lassi (10.34 per cent), Basundi (9.98 per cent), and Pedha (9.47 per cent) respectively, only the Butter showed an decreasing rate of growth during the period of 2006-07 to 2015-16.

Table 5.11 Growth rates of cost of processing of milk products by co-operative dairy unit.

Sr. No.	Particulars	CGR
1	Shrikhand	35.35**
2	Aamrakhand	13.82***
3	Basundi	9.98***
4	Pedha	9.47***
5	Butter	-3.75NS
6	Flavored milk	4.40*
7	Lassi	10.34***

'***', '**' and '*'= significant at 1, 5, and 10 per cent level, respectively.

NS= Non significant

5.3.5.3 Manufacturing cost of milk products

The important thing in the process of manufacturing of various qualitatively good milk products is of using a required quantity of raw milk and milk products by adding required quantities of ingredients, whenever necessary. While working out the estimates of manufacturing cost of any milk product, the use of raw materials is an important aspect of the cost structure. In effect, along with the collection and processing cost of milk, the conversion cost of milk products is also the part and parcel of the items of manufacturing cost of milk products.

The break-up of the manufacturing cost of Cream for co-operative and private dairy units are given in Appendix-III. It can be observed that the share of raw material used (Cow and buffalo milk) in the total cost was above 90 per cent, the

collection cost was nearly 2 to 4 per cent and that of processing cost was about 2 to 3 per cent during the period from 2012-13 to 2015-16. The total manufacturing cost of cream increased significantly by 19.42 per cent and 73.43 per cent for co-operative dairy unit over the period of time, respectively.

The production of Cream manufacturing process in co-operative and private dairy unit indicating output of 27.94 tons and 303.84 tons of main product (Cream) and 2.63 lakh liters and 31.68 lakh liters, of skim milk as a by-product in the year 2012-13. The production of Cream was increased by 9.45 per cent and 62.39 per cent. Whereas the by product, Skim milk showed an increase of 9.51 per cent and 62.37 per cent, in the co-operative and private dairy units respectively in the year 2015-16. Both cream and skim milk showed no definite trend during the year under study. The total value of milk products together was ₹ 102.07 lakhs and ₹ 1200.74 lakhs in the year 2012-13 and it was increased to ₹117.23 lakhs to ₹ 2017.80 lakhs in the year 2015-16. The apportioned cost of manufacturing of Cream and Skim milk was estimated at ₹ 86.74 lakhs and ₹ 1018.38 lakhs during 2012-13, while it was ₹ 101.10 lakhs and ₹ 1781.57 lakhs in the year 2015-16.

The per unit cost of manufacturing for the Cream was ₹ 193.75 per kg and ₹ 197.33 per kg, for co-operative and private dairy units, respectively in the year 2012-13, while the same was ₹ 195.45 per kg and ₹ 201.25 per kg in the year 2015-16. The per unit cost of manufacturing of Skim milk was

₹ 12.40 per liter and ₹ 13.22 per liter, for co-operative and private dairy unit respectively in the year 2012-13, while the same was ₹ 14.35 per liter and ₹ 15.33 per liter in the year 2015-16. The apportioned cost of Cream, Skim milk and per unit value of Cream, Skim milk increased over the period of time. The per unit value added by them were maximum in the year 2012-13 than in the year 2015-16.

The data presented in Appendix-IV, indicate the details of the manufacturing cost of Butter. The total manufacturing cost of Butter was maximum (₹ 52.02 lakhs and ₹ 553.25 lakhs) in the year 2015-16. The raw material used for manufacturing of Butter i.e. Cream, which shared about 96 per cent of the total cost and the conversion cost shared about 3 to 4 per cent of the manufacturing cost in co-operative and private dairy units.

The Appendix-IV also indicates the apportioned cost of manufacturing of the Butter which worked out ₹ 41.41 lakhs and ₹ 254.14 lakhs in the year 2012-13, which were increased to ₹ 45.80 lakhs and ₹ 497.60 lakhs in the year 2015-16 for co-operative and private dairy unit respectively. Same case were observed in Butter milk also, the value was increased from ₹ 0.59 lakhs and ₹ 3.87 lakhs to ₹ 0.79 lakhs and ₹ 8.07 lakhs in the year 2015-16 for co-operative and private dairy units respectively, with value added by Butter was ₹ 5.30 and ₹ 4.70 per kg and Butter milk by ₹ 3.90 and ₹ 4.13 per liter, respectively in the year 2012-13 and 2015-16.

Appendix-V showed the manufacturing cost of Ghee of the selected private dairy unit, it was observed that the share

of raw material used to the total cost was about 95 per cent and production cost formed nearly 5 per cent during the year 2012-13 to 2015-16. The total cost of production of Ghee was ₹ 165.54 lakhs in the base year which increased to ₹ 389.05 lakhs in the year 2015.16. The apportioned cost of manufacturing of Ghee ranged from ₹ 341.75 per kg to ₹ 351.28 per kg. The value added by Ghee was maximum (158.72 per kg) in the year 2015-16.

The break-up of the cost of manufacturing of Curd is shown in Appendix-VI, for co-operative and private dairy units. It is observed that the share of raw material used in the total cost was about 75 to 80 per cent for co-operative and 92 to 95 per cent for private dairy unit. The collection cost was nearly 2 to 3 per cent for both the dairy units. The processing cost for co-operative dairy unit was 18 to 20 per cent while in case of private dairy unit it was nearly 2 to 3 per cent. The total quantity of Curd manufactured was 222.65 thousand liters and 9325.00 thousand liters in the year 2012-13 and 236.73 thousand liters and 13840.01 thousand liters in the year 2015-16 for co-operative and private dairy units, respectively. The apportioned cost of manufacturing of Curd has been estimated at ₹ 77.59 lakhs and ₹ 3030.63 lakhs with the per unit cost of ₹ 33.85 per liter and ₹ 32.50 per liter for the year 2012-13 as compared with 2015-16 which having the apportioned cost of manufacturing was ₹ 90.62 lakhs and ₹ 4740.20 lakhs with the per unit cost of ₹ 38.28 per liter and ₹ 34.25 per liter. The value added by the same was ₹ 14.40 per liter and ₹ 30.00 per liter in the year 2012-13. It was

increased to ₹ 19.72 per liter and ₹ 32.25 per liter in the year 2015-16.

Appendix-VII indicates the details of manufacturing cost of Shrikhand for co-operative and private dairy units. The share of raw material *viz.,* Curd and other ingredients in total cost was about 85 to 90 per cent and that of production cost was about 10 to 15 per cent. The total production was 104.47 tons and 2891.39 tons in the year 2012-13, which increased significantly up to 107.80 tons and 3936.25 tons in the year 2015-16 for co-operative and private dairy units, respectively. The apportioned cost of manufacturing of Shrikhand has been increased during the year 2012-13 to 2015-16.

Appendix-VIII indicates the details of manufacturing cost of Aamrakhand for co-operative and private dairy units. The share of raw material *viz.,* Curd and other ingredients in total cost was about 85 to 90 per cent and that of production cost was about 10 to 15 per cent. The total production was 48.35 tons and 2227.34 tons in the year 2012-13, which was increased significantly up to 68.19 tons and 3825.04 tons in the year 2015-16 for both the dairy units respectively. The apportioned cost of manufacturing of Aamrakhand was estimated at ₹ 43.68 lakhs and ₹ 2334.48 lakhs in the year 2012-13, while it was increased to ₹ 70.37 lakhs and ₹ 4302.02 lakhs during 2015-16 for both the dairy units.

The break-up of the cost of manufacturing of Basundi is shown in Appendix-IX, for co-operative and private dairy units. It is observed that the share of raw material and other ingredients used in the total cost was about 75 to 85 per cent

for co-operative and private dairy unit. The collection cost was nearly about 2 to 3 per cent for both the dairy units. The processing cost for Basundi was 10 to 20 per cent in case of co-operative and private dairy units. The total quantity of Basundi produced were 27.33 tons and 162.67 tons in the year 2012-13 and which was pushed up to 72.67 tons and 276.67 tons in the year 2015-16 for co-operative and private dairy unit respectively. The apportioned cost of manufacturing of Basundi has been estimated at ₹13.96 lakhs and ₹ 83.86 lakhs with the per unit cost of ₹ 51.12 per kg and ₹ 51.55 per kg for the year 2012-13 as compared with 2015-16 which having the apportioned cost of manufacturing was ₹ 38.56 lakhs and ₹ 151.89 lakhs with the per unit cost of ₹ 53.06 per kg and ₹ 54.90 per kg for both the dairy units. The value added by the same was ₹ 96.38 per kg and ₹ 99.95 per kg in the year 2012-13. It was increased to ₹ 106.94 per kg and ₹ 105.10 per kg in the year 2015-16 for co-operative and private dairy unit, respectively.

Appendix- X indicates the details of manufacturing cost of Flavored milk for co-operative and private dairy units. The share of raw material *viz.,* Skim milk and other ingredients in total cost was about 86 to 87 per cent and that of production cost was about 13 to 14 per cent for both the dairy units. The total production was about 50.05 tons and 113.75 tons in the year 2012-13, which increased significantly up to 55.51 tons and 332.15 tons in the year 2015-16 for co-operative and private dairy unit respectively. The apportioned cost of manufacturing of Flavored milk was estimated at ₹ 11.88

lakhs and ₹ 29.02 lakhs in the year 2012-13, while it was ₹ 15.25 and ₹ 90.64 lakhs during the year 2015-16. The per unit manufacturing cost for Flavored milk was estimated to ₹ 23.71 per liter and ₹ 25.71 per liter in the year 2012-13 and it was increased to ₹ 27.48 per liter and ₹ 27.29 per liter for the year 2015-16.

Appendix-XI clearly indicates that, both the co-operative and private dairy units were manufacturing Paneer, but the co-operative dairy unit was started their production from 2015-16 onward, so we can compare their performance for the year 2015-16 only.

As the Table shows, the manufacturing cost of Paneer for the selected co-operative private dairy units for the year 2015-16. It was observed that the share of raw material used to the total cost was about 87 to 88 per cent. The collection cost was determined to about 2 to 3 per cent and production cost formed nearly 8 to 9 per cent for both the dairy units. The total cost of production of Paneer was ₹ 3.61 lakhs and ₹ 118.23 lakh in the year 2015-16. The per unit apportioned cost of manufacturing of Paneer was ₹ 72.27per kg and ₹ 75.10 per kg for co-operative and private dairy units. The value added by Paneer was maximum (190.90 per kg) in private dairy unit during the year 2015-16.

Appendix-XII indicates the manufacturing cost of milk Pedha by the co-operative dairy unit. It can be observed that the share of raw material and ingredient in the total cost of milk Pedha was about 76 per cent during the study period. The conversion cost formed nearly 24 per cent of the total cost

for corresponding years. The production of milk Pedha was the highest i.e. 49.00 tons in the year 2015-16. The apportioned cost of manufacturing of milk Pedha showed an increasing trend from ₹ 141.46 per kg to ₹ 152.49 per kg throughout the period. The value added by milk Pedha was maximum (181.54 per kg) in the year 2012-13.

Appendix-XIII shows that the total manufacturing cost of Khoa for the private dairy unit. It was ranged from ₹ 182.59 lakhs to ₹ 318.80 lakhs in the year 2015-16. The share of raw material used such as cow and buffalo milk was 71 to 72 per cent, while the collection and production cost were about 28 to 29 per cent. Per kg apportioned cost of Khoa was increased from ₹ 140.87 lakhs to ₹ 245.52 lakhs during the study period. The total production of Khoa was 80.84 tons in the year 2012-13 and it was increased to 133.45 tons in 2015-16.

The data in Appendix XIV depicts the break-up of the cost of manufacturing of Ice-cream by the private dairy unit. It can be observed that the share of raw material used milk and cream, ingredients (sugar and other essential ingredients) ranged between about 92.27 per cent, 0.35 per cent, respectively. The production cost for the Ice cream was 7.38 per cent. The total quantity of production of Ice-cream was 70.34 thousand liters in the base year which was increased to 228.54 thousand liters in the year 2015-16. The apportioned cost of Ice-cream ranged from ₹ 76.60 lakhs to ₹ 259.67 lakhs during the study period, while its value added by the same was maximum (₹ 36.38 per liter) in the year 2015-16.

5.3.5.4 Marketing cost of milk products

The co-operative and private dairy units have made adequate arrangement for efficient marketing of their milk products to consumers. Some dairy units have their own vehicles and some dairy units do not have their own vehicles. In that case, they hire vehicles for distribution of milk and milk products in various cities. The milk products were transported to Mumbai and Pune cities, while some other milk products were sold to marketing agents spread over different places throughout the state and country. Co-operative and private dairy unit had appointed the dealers; area wise, for marketing of their products. There is a great demand for the Milk powder manufactured by Govind milk and milk products, throughout the country.

A magnitude of parameters like marketing cost, marketing margin, marketing efficiency, etc. depend on the structure of milk and milk products marketed. Marketing costs and margins of a particular commodity reflect the efficiency of a system to a great extent. The analysis of marketing costs of dairy plants would help in reducing the unwarranted costs in marketing of dairy products.

The cost of marketing of milk products includes all the costs of marketing, transportation charges incurred to send milk products to consuming places and other distribution centers, octrai, sale tax on the milk products, advertisement expenses, etc. The product wise marketing cost of milk products for co-operative and private dairy units are given in Table5.12

Table 5.12 Marketing cost of milk products of co-operative and private dairy units during the period of 2012-13 to 2015-16.

(₹ Lakh/unit)

Sr. No.	Milk Products	Particulars	Co-operative		Private		Per cent change over base year 2012-13	
			2012-13	2015-16	2012-13	2015-16	co-operative	Private
1	Milk Powder	Quantity (tons)	-	-	3615.44	4277.34		
		Unit cost (₹/Kg)	-	-	7.41	7.81		
		Total cost	-	-	267.90 (40.88)	334.06 (33.92)	-	24.70
2	Ghee	Quantity (tons)	-	-	41.85	104.16		
		Unit cost (₹/Kg)	-	-	6.75	7.31		
		Total cost	-	-	2.83 (0.43)	7.61 (0.77)	-	168.91
3	Khoa	Quantity (tons)	-	-	72.35	121.85		
		Unit cost (₹/Kg)	-	-	3.03	3.37		
		Total cost	-	-	2.19 (0.33)	4.11 (0.42)	-	87.67
4	Shrikhand	Quantity (tons)	26.09	36.29	1533.61	2168.83		
		Unit cost (₹/Kg)	8.50	9.15	8.10	8.63		
		Total cost	2.22 (34.26)	3.32 (22.87)	124.22 (18.96)	187.17 (19.00)	49.55	50.68
5	Aamrkhand	Quantity (tons)	5.66	9.35	1241.23	1977.84		
		Unit cost (₹/Kg)	8.5	9.15	8.10	8.63		
		Total cost	0.48 (7.41)	0.86 (5.92)	100.54 (15.34)	170.69 (17.33)	79.17	69.77
6	Basundi	Quantity (tons)	15.38	24.01	153.35	263.69		
		Unit cost (₹/Kg)	7.00	7.20	6.21	6.70		
		Total cost	1.08 (16.67)	1.73 (11.92)	9.52 (1.45)	17.67 (1.79)	60.19	85.61
7	Pedha	Quantity (tons)	18.59	21.73	-	-		
		Unit cost (₹/Kg)	4.05	4.15	-	-		
		Total cost	0.75 (11.57)	0.90 (6.20)	-	-	20	-

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8	Butter	Quantity (tons)	11.15	16.26	43.29	73.33		
		Unit cost (₹/Kg)	4.15	4.21	6.45	6.81		
		Total cost	0.46 (7.10)	0.68 (4.68)	2.79 (0.43)	4.99 (0.51)	47.83	78.85
9	Flavored milk	Quantity ('000' lit.)	20.91	25.50	111.48	319.85		
		(tons)	22.16	27.03	118.16	339.04		
		Unit cost (₹/liter)	3.65	3.90	4.97	5.27		
		Total cost	0.76 (11.73)	0.99 (6.82)	5.54 (0.85)	16.86 (1.71)	30.26	204.33
10	Lassi	Quantity ('000' lit.)	12.05	21.41	183.33	500.06		
		(tons)	11.69	20.77	177.83	485.06		
		Unit cost (₹/liter)	2.46	2.59	5.08	5.42		
		Total cost	0.30 (4.63)	0.55 (3.79)	9.31 (1.42)	27.10 (2.75)	83.33	191.09
11	Curd	Quantity ('000' lit.)	6.55	73.32	1836.22	1496.72		
		(tons)	6.7	75.52	1891.31	2571.62		
		Unit cost (₹/liter)	6.6	7.2	6.55	7.13		
		Total cost	0.43 (6.64)	5.28 (36.36)	120.27 (18.35)	178.02 (18.08)	1127.91	48.02
12	Paneer	Quantity (tons)	-	2.64	41.29	133.22		
		Unit cost (₹/Kg)	-	4.5	6.80	7.12		
		Total cost	-	0.11 (0.75)	2.81 (0.46)	9.49 (1.04)	-	237.72
13	Tak	Quantity ('000' lit.)	-	3.35	-	-		
		(tons)	-	3.02				
		Unit cost (₹/liter)	-	2.5	-	-		
		Total cost	-	0.08 (0.58)	-	-	-	-
14	Ice- cream	Quantity ('000' lit.)	-	-	58.61	190.45		
		(tons)	-	-	56.85	184.74		
		Unit cost (₹/liter)	-	-	12.56	14.25		
		Total cost	-	-	7.36 (1.12)	27.14 (2.76)	-	268.75
	Total Cost		**6.48 (100)**	**14.52 (100)**	**655.29 (100)**	**984.90 (100)**	124.07	50.30

Source: Annual dairy report of co-operative and private dairy units, 2012-13-2015-16.

The cost of marketing of different milk products varied greatly according to the mode of transport and marketing system adopted by the individual dairy unit. The total marketing cost of different milk products of co-operative and private dairy unit ranged from ₹ 6.48 lakhs to ₹ 14.52 lakhs and ₹ 655.29 lakhs to ₹ 984.90 lakhs respectively, during the year 2012-13 to 2015-16.

The per cent share of the Shrikhand (34.26 per cent to 22.87 per cent) is the highest in total marketing cost in case of co-operative dairy unit, followed by Basundi (16.67 per cent to 11.92 per cent) and Pedha (11.57 per cent to 6.57 per cent), while in case of private dairy unit the per cent share in the total marketing cost was dominated by Milk powder (40.88 per cent to 33.92 per cent), Shrikhand (18.96 per cent to 19 per cent) and Aamrakhand (15.34 per cent to 17.33 per cent) during the study period.

The per unit marketing cost of Shrikhand and Aamrakhand was highest (₹ 8.50 to ₹ 9.15), followed by Basundi (₹ 7 to ₹ 7.20) and Curd (₹ 6.6 to ₹ 7.20) in case of co-operative dairy unit, while in private dairy unit the highest per unit marketing cost showed by Ice-cream (₹ 12.56 to ₹ 14.25) followed by Shrikhand and Aamrakhand (₹ 8.10 to ₹ 8.63) during the period of 2012-13 to 2015-16.

The per kg cost of marketing of all milk products showed increasing trends over the period of time due to increase in transport cost, salary, repairs and maintenance of vehicles.

The total marketing cost for sell of different milk products was more in private dairy unit mainly because their spread of operation was not restricted to the particular pocket or district or state but it was even in many states and other countries also, whereas co-operative dairy has limited area of operation.

5.3.5.5 Quantity sold and marketing management cost of milk products

Marketing management of milk product is another important activity in the business. This activity is useful for the dairy unit for efficient management of marketing of milk products. The activity of marketing of milk products was managed by the separate unit. The dairy unit had to incur costs on account of the items such as general administration, taxes, audit fees, postage, meeting and traveling allowances, salaries and benefits, rent etc. The break-up of quantity sold and marketing management cost of milk products in co-operative and private dairy units are given in Table 5.13.

For success of any business activity efficient management is required. The management of dairy unit has to incur costs on account of several items. This cost included all the costs of director's honorarium, office expenses, salary and wages, electricity, postage, printing, stationery, labor welfare etc. The per unit cost of marketing management of co-operative and private dairy unit was increased from ₹ 2.22 per kg to ₹ 2.48 per Kg and ₹ 1.41 per kg to ₹ 1.51 per kg respectively. The total cost of management was increased from ₹ 2.61 lakhs to ₹ 5.87 lakhs indicating 124.90 per cent

Table 5.13 Quantity marketed and marketing management cost of milk products of co-operative and private dairy units during year 2012-13 to 2015-16.

(tons)

Sr. No.	Milk Products	Co-operative		Private		Per cent change over base year 2012-13	
		2012-13	2015-16	2012-13	2015-16	Co-operative	Private
1	Milk powder	-	-	3615.43	4277.34	0.00	18.31
2	Ghee	-	-	41.85	104.16	0.00	148.89
3	Khoa	-	-	72.35	121.85	0.00	68.42
4	Shrikhand	26.09	36.29	1533.61	2168.83	39.10	41.42
5	Aamrakhand	5.66	9.35	1241.23	1977.84	65.19	59.35
6	Basundi	15.38	24.01	153.35	263.69	56.11	71.95
7	Pedha	18.59	21.73	-	-	16.89	-
8	Butter	11.15	16.26	43.29	73.33	45.83	69.39
9	Flavored milk ('000' lit.)	20.91	25.50	111.48	319.85	21.95	186.91
	(tons)	22.16	27.03	118.16	339.04	-	-
10	Lassi ('000' lit.)	12.05	21.41	183.33	500.06	77.68	172.76
	(tons)	11.69	20.77	177.83	485.06	-	-
11	Curd ('000' lit.)	6.55	73.32	1836.22	2496.72	1019.39	35.97
	(tons)	6.74	75.52	1891.31	2571.62	-	-
12	Paneer	-	2.64	41.29	133.22	-	222.64
13	Tak ('000' lit.)	-	3.35	-	-	-	-
	(tons)	-	3.02	-	-		-
14	Ice-cream ('000' lit.)	-	-	58.61	190.45	-	224.94
	(tons)	-	-	56.85	184.74	-	-
	Total milk products	117.46	236.62	8986.55	12700.72	101.45	41.33
	Total management cost (₹ lakh)	**2.61**	**5.87**	**111.43**	**191.78**	124.90	72.11
	Management cost (₹/Kg)	2.22	2.48	1.41	1.51	11.71	7.09

Source: Annual dairy report of co-operative and private dairy units, 2012-13 to 2015-16.

absolute increase in case of co-operative dairy unit, while in

case of private dairy unit it was increased from ₹ 111.43 lakhs to ₹ 191.78 lakhs indicating 72.11 per cent absolute increase during the corresponding years. The total quantity of milk products processed by the co-operative dairy unit was 117.46 tons in the base year and it was increased up to 236.61 by 101.45 per cent over the period of time. In case of private dairy unit quantity of milk product was increased from 8986.55 tons to 12700.72 tons by 72.11 per cent during the study period, due to increased demand for milk products, as well as the expansion of the business. The quantity of different milk products sold in the market showed great variation during the study period.

The proportion of variable cost was higher in the total marketing cost and it was due to high transport charges for transporting milk and milk products to the distant cities. The marketing management cost of milk products varied according to the system of marketing management adopted by the co-operative and private dairy units.

5.3.6 Returns from milk and milk products

The dairy units were actively engaged in the activities of collection, processing, distribution of milk and manufacturing and marketing of milk products. Therefore, efforts have been made to work out estimates of annual total costs, gross returns and net returns of the entire business handled by the dairy unit. The details of gross returns, total costs and net returns of the business handled by co-operative and private dairy units are presented in Table 5.14.

Table 5.14 Returns from milk and milk products for a co-operative and private dairy units during year 2012-13 to 2015-16.

(₹ Lakh/unit)

Sr. No.	Particulars	Co-operative		Private		Per cent change over base year 2012-13	
		2012-13	2015-16	2012-13	2015-16	Co-operative	Private
1)	**Gross Returns**						
A	**From milk sold**						
	Quantity of milk sold ('000' liters)	15038.06	15882.72	43564.15	753210.30		
	Unit price (₹/liter)	31.25	33.5	32.75	35		
	Total value	4699.40	5320.70	14267.26	26362.36	13.22	84.78
B	**From sell of milk products**						
	i) Milk Powder (tons)	-	-	3135.44	4277.34		
	Unit price (₹/Kg)	-	-	285	315		
	Total value	-	-	8936.01	13473.63	-	50.78
	ii) Ghee (tons)	-	-	41.85	104.16		
	Unit price (₹/Kg)	-	-	462	510		
	Total value	-	-	193.36	531.21	-	174.73
	iii) Khoa (tons)	-	-	72.35	121.85		
	Unit price (₹/Kg)	-	-	222.5	230		
	Total value	-	-	160.97	280.24	-	74.10
	iv) Shrikhand (tons)	26.09	36.29	1533.61	2168.83		
	Unit price (₹/liter)	135	140	131.25	140		
	Total value	35.23	50.81	2012.87	3036.36	44.22	50.85
	v) Aamrkhand (tons)	5.66	9.35	1241.23	1977.84		
	Unit price (₹/liter)	136.5	145	142	150		
	Total value	7.72	13.56	1762.55	2966.76	75.65	68.32
	vi) Basundi (tons)	15.38	24.01	153.35	263.69		
	Unit price (₹/liter)	147.5	160	151.5	160		
	Total value	22.68	38.42	232.32	421.90	69.40	81.60
	vii) Pedha (tons)	18.59	21.73	-	-		
	Unit price (₹/liter)	323	330	-	-		
	Total value	60.03	71.69	-	-	19.42	-
	viii) Butter (tons)	11.15	16.26	43.29	73.33		

Contd....

	Unit price (₹/liter)	342.5	350	345.33	355.50		
	Total Value	38.20	56.89	149.49	260.69	48.93	76.22
	ix) Flavored milk ('000' liters)	20.91	25.50	111.48	319.85		
	Unit price (₹/liter)	33.5	40	35.50	42.25		
	Total value	7.00	10.20	39.58	135.14	45.71	220.78
	x) Lassi ('000' liters)	12.05	21.41	183.33	500.06		
	Unit price(₹/Liter)	44.25	50	53	58		
	Total value	5.33	10.70	97.16	290.04	100.75	198.52
	xi) Curd ('000' liters)	6.55	73.32	1836.22	2496.72		
	Unit price(₹/liter)	50.25	58	62.5	66.5		
	Total value	3.29	42.53	1147.64	1660.32	1192.71	44.67
	xii) Paneer (tons)	-	2.64	41.29	133.22		
	Unit price (₹/liter)	-	260	255.5	266		
	Total value	-	6.86	105.49	354.37	-	235.93
	xiii) Tak ('000' liters)	-	3.35	-	-		
	Unit price (₹/liter)	-	25	-	-		
	Total value	-	0.84	-	-	-	-
	xiv) Ice- cream	-	-	58.61	190.45		
	Unit price (₹/liter)	-	-	125.00	150.00		
	Total value	-	-	73.27	285.68	-	289.90
	Total value (B)	**179.48**	**302.50**	**14910.71**	**23696.34**	68.54	58.92
C	Difference between closing and opening stock of milk and milk product	32.57	33.96	1394.36	2780.22	4.27	143.77
D	Other receipts	87.55	210.05	1065.43	3424.39	32.36	296.50
	Total returns (A+B+C+D)	4998.99	5867.22	31667.41	56263.31	17.29	71.87
	Total cost of milk purchase	4446.32	5132.49	18691.07	36780.88	15.43	96.78
	Milk Products						
	1) Cost of processing	6.52	14.47	1575.21	2101.98	121.59	33.44
	2) Marketing cost	6.48	14.52	655.29	984.90	124.07	50.30
	3) Management cost	2.61	5.87	111.43	191.78	124.90	72.11
	Total cost (1+2+3)	15.62	34.86	2341.93	3278.66	123.18	40.00
	Total cost of milk and milk products	4461.94	5167.35	21033.00	40059.54	12.40	90.45
	Total returns	4998.99	5867.22	31637.76	56382.68	17.37	78.21
3)	**Benefit: Cost ratio**	**1.12**	**1.14**	**1.50**	**1.41**		

From the study of co-operative and private dairy unit it is observed that, the income from the selling of packed milk by co-operative dairy unit was increased from ₹ 4699.40 lakhs to ₹ 5320.70 lakhs by 13.22 per cent, while income of private dairy unit increased from selling of packed milk was ₹ 14267.26 lakhs to ₹ 26362.36 lakhs by 84.78 per cent during the study period.

The income from the selling of milk product was increased by 68.54 per cent (₹ 179.48 lakh to ₹ 302.50 lakh) and 46.03 per cent (₹ 16308.36 lakhs to ₹ 23815.70 lakhs) in case of co-operative and private dairy unit respectively.

The total purchase cost for milk, in case of co-operative dairy unit was increased from ₹ 4446.32 lakhs to ₹ 5132.49 lakhs (15.43 per cent), while in case of private dairy unit it was increased from ₹ 18691.07 lakhs to ₹ 36780.88 lakhs (96.78 per cent) during the period of 2012-13 to 2015-16.

The total returns from all the activities in the co-operative and private dairy was increased from ₹ 4998.99 lakhs to ₹ 5867.22 lakhs (17.37 per cent) and ₹ 31637.76 lakhs to ₹ 56382.68 lakhs (78.21 per cent) during the period of study.

The business was in profit as indicated by the benefit cost ratio. Similar results were found by Shelar (2000), Gavali (2001), Pawar (2003), Mengade (2004) and Kaware (2011)

Table 5.15 Overall review of co-operative and private dairy units.

(Per cent)

Sr. No.	Particulars	Co-operative				Private			
		2012-13	Returns	2015-16	Returns	2012-13	Returns	2015-16	Returns
1	Milk Collected	100	100	100	100	100	100	100	100
2	Fluid milk sell	94.91	94.01	94.57	90.69	69.01	45.10	64.99	46.76
3	Milk used for Products	4.63	5.99	5.04	9.31	30.99	54.90	35.01	53.24

From the Table 5.15 it is clear that the maximum share of returns in case of private dairy unit was came from selling of milk products (54.90 % and 53.24 %) as compared to co-operative dairy unit (5.99 % and 9.31 %) during the period of 2012-13 to 2015-16. Co-operative dairy unit has maximum share in selling of processed milk (94.91 % and 94.57 %) which not returns well as returns obtained from milk products. Co-operative dairy unit needs to increase the production of milk products to increase outcome.

5.3.7 Break-even analysis of dairy units.

The break-even analysis was done in order to estimate the minimum annual quantities of processed milk, which the dairy unit must handle to cover the total cost. The break-even output is that quantity where total revenue equals the total cost. Accordingly, at these minimum quantities of processed milk, the individual dairy unit will not incur any loss and at the same time earn no profits from the business.

Table 5.16 Break even analysis of co-operative and private dairy units during the period of 2012-13 to 2015-16.

Sr. No.	Particulars	Co-operative		Private		Per cent change over base year 2012-13	
		2012-13	2015-16	2012-13	2015-16	Co-operative	Private
1	Annual output (actual quantities of processed milk) **(Lakh liters)**	157.71	167.28	631.36	1157.94	6.07	83.40
2	Annual fixed cost of milk processing unit **(₹ Lakh)**	383.07	667.00	1176.91	1241.99	74.12	5.53
3	Annual total variable cost of milk processing unit **(₹ Lakh)**	4121.59	5317.23	18058.95	36780.87	29.01	103.67
4	Annual gross return from milk processing unit **(₹ Lakh)**	5147.86	6567.20	30156.26	52708.33	27.57	74.78
5	Estimated break- even quantities of processed milk **(Lakh Liters)**	**70.73**	**90.89**	**150.99**	**355.01**	**28.50**	**135.12**
6	Break-even quantities as the per centage of actual quantities of processed milk **(%)**	**44.85**	**54.33**	**23.92**	**30.66**		

The estimated break-even quantities of processed milk of co-operative and private dairy units are depicted in Table 5.16 along with actual quantities of processed milk handled by the respective cooperative and private dairy units. The results also indicates the annual fixed cost, total variable cost and gross returns of co-operative and private dairy units.

For a co-operative and private dairy unit, the quantity of processed milk increased by 6.07 per cent and 83.40 per cent

during the year 2012-13 to 2015-16. The annual fixed cost and variable cost of processed milk were ₹ 383.07 lakhs and ₹ 4121.59 lakhs during the year 2012-13, which reached to ₹ 667.00 lakhs and ₹ 5317.23 lakhs, respectively in the year 2015-16, while in case of private dairy unit, the annual fixed cost and variable cost of processed milk were ₹ 1176.91 lakhs and ₹ 18058.95 lakhs during the year 2012-13, which reached to ₹ 1241.99 lakhs and ₹ 36780.87 lakhs, respectively in the year 2015-16. While annual gross returns of processed milk of co-operative dairy unit was increased by 27.57 per cent and 74.78 per cent of private dairy unit over the period of time. The estimated quantities of processed milk required to be handled by co-operative dairy unit for break-even worked out to be 70.73 lakh liters to 90.89 lakh liters during the year 2012-13 to 2015-16 respectively. Whereas, in case of private dairy unit it gets increased from 150.99 lakh liters to 355.01 lakh liters during the period of 2012-13 to 2015-16. The break-even quantities of processed milk formed 44.85 per cent and 54.33 per cent of actual quantities of milk processed in the year 2012-13 to 2015-16 for the co-operative dairy units, while in case of private dairy unit the quantities of processed milk was 23.92 per cent and 30.66 per cent for the year 2012-13 and 2015-16 respectively. Similar results were found by Singh *et al* (1999), Yadav (2000), Gavali (2001), Pawar (2003), Mengade (2004), and Kaware (2011).

5.3.8 Economics evaluation of individual dairy unit.

The study of costs and returns of individual dairy unit groups form an important base in determining their profitability. Also, the study of costs and returns is an important economic criterion for reorganizing the business. For this purpose, total costs and returns were analyzed on per commercial cow herd and buffalo herd. The two large dairy farms having more than 25 milch animals were selected purposively from Satara district. One cow and one buffalo dairy farm were selected purposively for studying the economics of dairy farm activity.

5.3.9 Individual cow and buffalo dairy herd

The profitability of individual dairy unit is dependent on the efficient use of the available resources. The sample commercial dairy herds were selected purposively from the study area. The dairy herds having cross-bred cows and improved buffalos for milk production. Hence, the two large commercial dairy herds having more than 25 milch animals (cows and buffalos) were selected purposively for studying the economic evaluation of commercial large dairy herds.

5.3.10 Livestock pattern of individual dairy unit

The average number of animals maintained by the commercial dairy herd samples is given in Table 5.17.

Table 5.17 Composition of livestock of individual dairy unit

(No's)

Sr. No.	Particulars	Cow herd	Buffalo herd
1	In- milk animal	296	80
2	Dry animal	168	45
3	Calves	265	36
4	Breeding bull	0	5
	Total livestock	**729**	**166**

Source: Farm record of a cow and buffalo dairy units.

From the above Table, it can be seen that total number of livestock was 729 and 166 for cow herd and buffalo herd respectively. Out of total livestock, in-milk cows and buffalos contributed major in numbers i.e. 296 and 80, followed by calves in case of cow and dry animals in case of buffalo.

5.3.11 Capital assets of the individual dairy unit

Land, labor and capital are the most important factors of milk production activity. Out of these, capital determines the production capacity of the dairy herds. At the same time, its composition influences the enterprise mix and scale of production under the given conditions. The assets such as land, farm buildings, byre, irrigation structure, machinery and tools and dairy equipment's, well etc. need to be viewed accordingly.

The information on per dairy herd value of the capital assets of the sample dairy herds is presented in Table 5.18.

Table 5.18 Capital assets of commercial dairy herd

(₹ Lakh)

Sr. No.	Particulars	Cow herd	Buffalo herd
1	Land	300.00	160.00
2	Farm buildings	51.50	0.65
3	Byre	25.50	1.76
4	Irrigation structure	1.26	0.30
5	Livestock	212.10	91.65
6	Machinery and tools	6.26	2.41
7	Dairy equipment's	0.19	0.08
	Total assets	**596.81**	**256.84**
	Value of capital asset excluding land	**296.81**	**96.84**

Source: Farm record of a cow and buffalo dairy units.

It can be observed from the Table, that the total value of the assets inclusive of land was around ₹ 596.81 lakhs, and ₹ 256.84 lakhs for cow and buffalo dairy sample herd, respectively. The value of the total assets was the highest in the case of cow herd and lowest in buffalo herd, because of number of animal maintained by each firm. It can be also revealed that, the share of land in the total value of capital assets was around 50.27 per cent and 62.30 per cent in cow and buffalo herd, respectively. Thereby, indicating that land as the major item of farm assets.

Besides land, the other items of investment of capital assets were farm machinery, livestock, irrigation structure, farm buildings and dairy equipment's. The share of the livestock in the total value of the capital assets was found second highest i.e. 35.54 per cent in cow herd and 35.68 per cent in buffalo herd. The value of farm buildings and byre was 12.90 per cent and 0.94 per cent in case of cow and buffalo

herd respectively. The irrigation structure contributes 0.21 per cent and 0.11 per cent in cow and buffalo dairy herd respectively. The dairy equipment's had least share as compared to other items.

5.3.12 Cow and buffalo milk production of individual dairy unit

From the Table 5.19 it can be observed that, the per herd feeding cost shared 69.13 and 45.62 per cent of the total

Table 5.19 Cost of milk production of commercial dairy herd.

(₹ Lakh)

Sr. No.	Particulars	Cow herd	Buffalo herd
1	No. of milch animals	464	125
2	Feeding cost	342.23	53.21
3	Labor cost	33.00	9.60
4	Veterinary and Misc. charges	4.03	1.70
5	Working of accessories and vehicles	37.43	12.46
	Working cost (2+5)	416.69	76.97
6	Herd replacement cost	8.00	10.50
7	Interest on value of animals and fixed assets	59.68	25.68
8	Depreciation on fixed investment and accessories	10.69	3.49
	Fixed cost (6+8)	78.37	39.67
	Total cost (Working + fixed cost)	**495.06**	**116.64**
	Per animal cost (₹)	67909.47	70265.06
	Per liter cost (₹)	18.27	26.63

Source: Farm record of a cow and buffalo dairy units.

cost for cow and buffalo herd, respectively. Labor is an important input in dairy business and it has bearing on income and employment generation. In the order of

importance, the labor cost came next to feeding cost. The total labor cost per lactation was estimated ₹ 33.00 lakhs and ₹ 9.60 lakhs for cow herd and buffalo herd, respectively having a share of 7.33 per cent and 8.23 per cent in the total cost. Veterinary cost was calculated by Taking into account the actual cost incurred by the producers. Doctor's fee and medicines constitutes the major components of the total veterinary cost. The veterinary cost comprised a negligible amount in total cost and its shared only 0.90 per cent and 0.15 per cent for cow and buffalo herd respectively. The value of accessories required for management of herd have minimum in the total cost.

The herd replacement cost was estimated ₹ 8.00 lakhs and ₹ 10.50 lakhs for cow herd and buffalo herd, respectively. Interest on value of animals and fixed asset were measured by as the interest on the average value of dairy animal. The rate of interest was found to be 10 per cent per annum. The interest on value of animal and fixed assets was estimated ₹ 59.68 lakhs and ₹ 25.68 lakhs for cow and buffalo herd, respectively at the overall level. Depreciation of fixed investment and accessories was another cost in raising dairy animals. The depreciation was calculated by Taking into account the depreciation cost, repairing cost and interest on the average value of housing shed.

Per unit annual cost of milk production was the highest for buffalo herd (₹ 26.63) followed by cow herd (₹ 18.27). The structural composition of total cost of milk production

revealed that the feed shared maximum expenditure for cows and buffalos dairy herds. Similar results were found by Raskar (1996), Gavali (2001) and Kaware (2011).

The net per liter production cost of milk production was worked out to ₹ 18.27 for cow which was lower than buffalo herd i.e. ₹ 26.63.

5.3.13 Relative profitability of cow and buffalo milk production of individual dairy unit.

Relative profitability of cow and buffalo milk production has been studied separate on per animal basis for in-house cow and buffalo herd. The results relative to per cow and per buffalo cost of milk production, quantity of milk produced, gross returns from milch animals and net returns are presented in Table 5.20.

Among the different herds, the proportionate shares of working cost and fixed cost to the total cost of milk production of cow and buffalo having difference in the case of cow and buffalo herd. The total cost of milk production activity was ₹ 61735 for cow and ₹ 70265.06 for buffalo different, respectively. The per liter cost of milk production was ₹ 18.27 for cow and ₹ 26.63 for buffalos, respectively. Per liter price received for cow milk was ₹ 25.50 and ₹ 37.50 for buffalo milk.

The production activity yielded the net returns of ₹ 97010.53 and ₹ 115984.94 for cow and buffalo herd respectively. The net returns over working cost were maximum in case of buffalo herd than cow herd. The input-output ratio

was the highest (2.65) in buffalo herd followed by cow herd (2.43).

Table 5.20 Annual cost and returns from milk production of commercial dairy herd.

(₹ /milch animals)

Sr. No.	Particulars	Cow herd	Buffalo herd
1	No. of milch animals	464	125
2	Working cost	57159.13	46366.86
3	Fixed cost	10750.34	23898.06
	Total cost (Working + Fixed cost)	67909.47	70265.06
4	Milk production (liter)	5840	4380
5	Per liter price realized	25.50	37.50
6	Per liter cost	16.61	26.63
7	a) Milk value b) Value of calves c) Value of dung Total returns	148920 7000 9000 164920	164250 11500 10500 186250
8	Net returns over working cost	107760.87	139883.14
9	Net return over total cost	97010.53	115984.94
10	**B:C ratio**	**2.43**	**2.65**

From the above discussion it can be concluded that, the cow herd was relatively more efficient in management as compared to the buffalo herd but the returns from buffalo herd was higher than the cow herd.

5.3.15 Annual income of individual dairy unit.

Table 5.21 represents the information on per herd source wise annual income.

It is evident from the Table that, the annual gross income from milk production, from cow herd was the highest ₹ 708.17 lakhs followed by buffalo herd ₹ 191.80 lakhs. The gross returns from milk production activity-shared 91.24 and

91.55 per cent in the total income for cow and buffalo herd respectively.

Table 5.21 Annual income of commercial dairy herd

(₹ Lakh)

Sr. No.	Particulars	Cow herd	Buffalo herd
1	Milk selling activity	690.99	188.89
2	Dairy tourism	0.75	0
3	Other sources	65.61	17.43
	Total income	**757.35**	**206.32**

In case of cow herd, it having the additional income of ₹ 0.75 lakhs incurred from dairy tourism activity. Dairy tourism is the new emerging field where, the new entrepreneur who wants to start the dairy unit is visits the dairy plant and get all the knowledge of dairy activity. It could be concluded that the total income was positively related with the herd size. The major source of income for the selected commercial large dairy herds was from the milk production activity.

5.4 SWOT analysis

- Strengths
  - Satara ranks 4th in milk production in Maharashtra state with total milk production of 0.69 million tons in the year 2015-16.
  - Satara district was blessed with variety of climate suitable for different animal breed, which encourage to do livestock business profitably.

- Mumbai and Pune are the bigger markets available and connected with the National Highway no. 47.
- One Government Veterinarian College and one government Agriculture College established in Satara district.
- Availability of raw materials for the dairy farming in bulk quantity.
- Traditional emphasis on consumption of the people is the best policy to increase the demand of milk products.

➢ Weaknesses

- Traditional method of animal rearing decreases the efficiency of available resources for milk production.
- Lack of mechanization.
- Dairy is considered as the subsidiary business but not prime business in the Satara district.
- Poor quality of milk production decreases the demand for milk.
- Poor management and feeding practices increases the cost of production of dairy farm.

➢ Opportunities

- Satara is developing district having great scope for urbanization which ultimately increases the demand for better nutritious products like, milk and milk products.
- Elasticity in demand i.e. as the population increases the demand for commodity is also increases.

- Increased investment in milk industry through private sectors.
- Few companies emerging as popular brand in milk sector in Satara district.

➢ Threats

- Fluctuation in prices of milk and milk products discourage the producer to invest more in the firm.
- Maximum dairy units from Satara are having the unorganized sector.
- Reduction in the quality of milk production.
- Higher cost of milk production due to not efficient and proper utilization of available resources.

5.5 Problems faced by dairy units.

- **Problems faced by co-operative and private dairy units**

a) Collection of milk

-The major problem during the collection of milk was loss of milk during handling. (0.47 to 0.40 % in case of co-operative and 0.02 to 0.01 % private dairy unit.)

-Heavy competition to co-operative dairy from private dairy unit in collection and also distribution of milk and milk products.

-Low quality milk should be collected on the collection center without following the standards for milk quality.

-Low milk collection ultimately increases cost of production through transport cost, management cost, etc.

b) Processing of milk

- Irregularity in electricity supply increases the cost of production by additional expenditure for other sources of electricity.
- Increase in the price of raw materials and chemicals requires for milk and milk product processing should definitely increases cost of production.
- Use of older machinery leads to increase in repairing and maintenance cost of machinery which reflects in increased cost of production.
- Lack of research and development facilities stops the development of modern technology on the firm.
- Lack of skilled labor is the major problem for processing of milk products.

c) Marketing of milk and milk products

- Highly competitive market condition leads to development of monarchy condition in the milk market.
- High cost of packing material ultimately increases the cost of milk product production.
- Higher commission to commission agent, increases the marketing margin which leads to increase in selling price of milk and milk products.
- Spoilage of milk and milk product due to poor keeping quality is the major problem in co-operative dairy unit than in private dairy unit.

d) Manufacturing of milk products

- Quality of milk products produced in co-operative dairy units is not of required standard, which reduces the

demand of milk products.

e) Financial and administrative constraints

- High production cost for co-operative dairy unit than private dairy units.
- Political interference in co-operative dairy units.
- Curtailed in Government grants.

- **Problems faced by individual dairy unit**

a) Purchase on milch animals

- Difficulty in getting loans for the purchasing of milch animal.
- Non availability of pure breed in local market which reduces the efficiency of the animal and leads to low milk production.

b) Sell of milch animal

- Malpractices followed by agent in local market leads to reduction in price of milch animal.
- Distantly situated regulated market favors the selling of animal in local markets which leads minimum returns for farmers.

c) Maintenance of milch animals

- Shortage of man power increases excess load on available labors.
- Higher wage rates for labor ultimately increases the cost of milk production.
- High cost of fodder and concentrates increases the

feeding cost of dairy firm.

- Lack of knowledge about scientific feeding approach leads to excess or insufficient feeding to the milch animal which results in either increased cost of milk production or damage the health of animal.

d) Marketing of milk

- Fluctuation in the price of milk is the major problem of dairy firm.
- Lack of knowledge about making of value added product which gives better returns.

6. SUMMARY AND CONCLUSIONS

The development of dairy industry in India has been acknowledged the world over as one of the most successful development programme. Demand for milk and milk products in India is increasing because of increasing urbanization, income levels, awareness about nutritive value of milk, changes in preferences and consumer behavior etc. Dairying provides sustenance and opportunities for supplementary employment and additional income to a vast majority of small, medium and large herd size farm households in India.

The present investigation was based on both macro and micro level data. At the macro level, at attempt has been made to estimate growth rates of different indicators of dairy development in Satara district and Maharashtra. The time series data obtained from various published sources were also used for the purpose. The micro level investigation was related to milk production activity on the basis of cross-sectional data at the farm level collected from farm records.

Selection of the sample was based on higher performance of co-operative, private and individual dairy unit. At first, the co-operative and private dairy units were selected purposively. After that, individual dairy unit was selected on the basis of performance.

The data were analyzed to obtain estimates of different variants relating to dairy development activity and selected co-operative, private and individual dairy units in the Satara district during different years. The analytical framework

includes estimation of growth rates of different dairy development indicators and financial strengths of co-operative and private dairy units which were estimated by estimation of costs and returns, break-even analysis of co-operative and private dairy units and output of milk production, economics of cow milk production and buffalo milk production.

The use of major inputs and level of output produced from milk production have been worked out on per animal basis for each herd. The problems faced by dairy units and milk producers were examined in the present investigation. The specific objectives of the study are,

1. To evaluate the performance of selected co-operative and private dairy units in Satara district.
2. To estimate the costs and returns from selected dairy units at in Satara district.
3. To study the problems of dairy units and milk producers and suggest the measures thereon.

6.1 Summary of findings

1. The geographical area of Satara district is 10,480 Sq. Km. which is about 3.4 per cent of the state's total geographical area. As per the Census 2011, the total population of the Satara district was 30.04 lakh with a population density of 287 per square kilometer. Out of the total population, 24.34 lakh people reside in rural areas while 5.70 lakh people are in urban areas. This indicates that 81 per cent of Satara's population is rural.

2. There are 46.41 per cent of the population is in the labor force. Out of the total workforce, 70.06 per cent of the workers (main and marginal) are engaged in agriculture as cultivators (69.2 %) and agricultural laborers (30.8 %), which is more than state's share i.e. 55 per cent. It can thus be observed that agriculture is the dominant activity in Satara district.

3. Out of total geographical area, about 36 per cent of land is under non-agricultural usage i.e. forest, land under non-agricultural use, cultivable waste, permanent pasture and miscellaneous trees and groves. About 12 per cent land is as current and other fallow and about 52 per cent of land is sown. The cropping intensity of the district is 124 per cent, which is marginally higher than the state's average i.e. 117 per cent.

4. The maximum area of Satara district is categorized as scarcity zone and agriculture is dependent mainly on monsoons. Hence kharif crops dominate the cropping pattern. The area under kharif crops is about 60 per cent, while that under rabi crops is 35 per cent.

5. The total livestock of Maharashtra was 383.16 lakhs in the year 2012. Whereas, in Satara it was 17.59 lakhs (4.59 %). The cattle constituted nearly 4.17 to 4.59 per cent of the total livestock of the state during different time periods. Sheep and goat together shared 5.48 to 5.20 per cent of the total population in the state. The

total buffalos accounted for 6.08 to 6.31 per cent of the total livestock in state. The population of sheep and goat decreased substantially during the period.

6. In Maharashtra, the total livestock increased significantly by 5.28 per cent over the period from 1992 to 2012. The growth rates of cross-bred cow in-milk and buffalo in-milk were highly significant, but the population of indigenous cow, sheep and goats were decreased.

7. The total milk production in the State had increased from 6.98 million tons in 2006-07 to 10.15 million tons in the year 2015-16. The total milk production showed an increasing trend in Satara district and the State as a whole, over the period of time.

8. The proportionate share of milk production of Satara district to the state ranged between 5.87 to 6.80 per cent, while the share of Satara district to India ranged from 0.40 to 0.44 per cent and this was due to conversion of large number of indigenous milch cattle into high yielding breeds (cross-bred) and increased productivity.

9. The milk collected by various agencies was maximum by private sector followed by co-operative and government sector.

10. The total investment in capital assets of co-operative dairy units was increased from ₹ 346.50 lakhs to ₹ 525.73 lakhs (44.70 %) during the year 2012-13 to 2015-16. The investment in machinery, tools and equipment's was reported to increase in share from 37.65 per cent to 44.82 per cent of the total investment. The land and buildings showed decreasing share 52.43 per cent to 44.08 per cent in the total capital investment.

11. The total investment in capital assets of private dairy units increased from ₹ 2165.43 lakhs to ₹ 2362.15 lakhs during the year 2012-13 to 2015-16. The investment in machinery, tools and equipment's was near about 41.58 per cent to 39.76 per cent succeeded by land and buildings (45.65 % to 47.42 %). The can and creates shared nearly 4.5 per cent during year 2012-13 to 2015-16, respectively.

12. The total assets of co-operative dairy unit increased from ₹ 1309.53 lakhs to ₹ 1599.16 (22.12 %) during the period from 2012-13 to 2015-16. The cash in hand, bank balance, stored products and credit showed decreasing trend while investment and profit resulted positive increasing trends in the total assets. In the case of private dairy sector, the picture is directly opposite to co-operative sector, all the elements of the total assets showed increasing trends.

13. In the case of liabilities, the total liabilities of the co-operative dairy units are increased from ₹ 1466.84 lakhs to ₹ 1763.17 lakhs. All the elements from the total liabilities showed increasing trends except paid up share capital, loans, losses and grants. The paid up share capital and grants were constant while loans and losses showed a decreasing trends during the study period. The liabilities of co-operative dairy unit are more than assets which showed poor financial strength of co-operative dairy unit, while private dairy sector showed better performance.

14. The total turnover of private dairy unit has increased by 3.73 per cent. The profit of private dairy unit increased from ₹ 276.14 lakhs to ₹ 321.26 lakhs by 16.34 per cent over the period of time. The share of profit to the total turnover ranged from 9.0 per cent to 9.41 per cent during the period of 2012-13 to 2015-16. The liabilities of private dairy unit increased over the period of time except reserved funds and loans which decreased by 6.19 per cent and 11.49 per cent, respectively.

15. The annual compound growth rate of co-operative dairy unit for profit was the highest (50.72 %) followed by loans (25.10 %), investment (22.91 %). The growth rates of grants and subsidy authorized share capital were zero, which indicates government's intension towards the co-operative dairy business.

16. The total milk collection of co-operative dairy unit was 158.40 lakh liters and it increased to 167.95 lakhs liters by 6.03 per cent from the year 2012-13 to 2015-16. The absolute quantities of milk losses due to handling, processing and transportation was slightly decreased from 0.74 lakh liters to 0.67 lakh liters during the study period and the share has also declined. The per cent of milk collection and milk processed were nearly same, while the milk sell and milk used for preparation of different milk products increased by 5.56 per cent to 15.42 per cent, respectively over the period under study.

17. The proportion of cows and buffalos milk to the total milk collection was 49.76 per cent and 50.24 per cent, respectively in the year 2012-13 which was changed to 55.27 to 44.73 per cent in the year 2015-16,showed an overpassing of cow milk collection over buffalo milk. The collected milk used for processing was about 99 per cent and nearly 94 to 95 per cent processed milk was sold as fluid milk and remaining milk was used for preparation of different milk products.

18. For private dairy unit, the total milk collection increased tremendously by 83.32 per cent. The total milk collection, milk processed, milk distributed, average daily milk collection had increased from the year 2012-13 to 2015-16. This was mainly due to the fact that quantity of milk procured or handled by dairy units increased over period of time. The per cent of total milk collection and milk

processed were nearly the same, while the milk distributed increased by 72.72 per cent and milk used for preparation of different milk products was ranges between 30 to 35 per cent.

19. The share of cows and buffalos milk in the total milk collection was nearly 46.99 per cent and 53.01 per cent, during the year 2012-13 which changed by 57.06 per cent and 42.96 per cent respectively. From the processed milk 65 to 70 per cent milk was sold as fluid milk in markets and remaining used for preparation of different milk products by private dairy unit. The average daily milk collection was increased from 1.73 lakh liters in the year 2012-13 to 3.12 lakh liters by 83.24 per cent in the year 2015-16.

20. The total quantity of milk used for preparation of different milk products in the co-operative dairy unit was 7.33 lakh liters in the year 2012-13 and it was increased to 8.46 lakh liters by 15.42 per cent in the year 2015-16, due to steady increased demand for milk products. The proportionate share of milk used for separation of cream ranged between 30 to 32 per cent over the period of time. Out of the total milk used for preparation of different milk products, the proportion of Dahi ranged from 28 per cent to 31 per cent and remaining milk was used for other different milk products.

21. For private dairy units, the total quantity of milk used for preparation of different milk products was 195.92 lakh liters in the year 2012-13 and it was increased to 405.58 lakh liters by 107.01 per cent in the year 2015-16. The proportionate share of milk used for separation of Cream showed reducing share from nearly 12 per cent to 10 per cent over the period of time. The proportion of milk used for of Dahi reduces from 47 per cent to 34 per cent but increases in quantity of milk used because increased milk collection. The collection of milk increased by 83.32 per cent during the period of 2012-13 to 2015-16.

22. The per unit purchase price of milk in private dairy unit was ₹ 27.25 in the year 2012-13, which was increased up to ₹ 28.75 in the year 2015-16. The estimated per unit cost of collection was the higher after purchase cost followed by processing, distribution and management cost of milk over the period of time, during the period under study.

23. In the private dairy unit, the total cost of milk had increased by 96.78 per cent during the period from 2012-13 to 2015-16. The estimated per unit purchase cost of milk was lower in the case of co-operative dairy unit as compared with private dairy unit during 2012-13 to 2015-16. The total collection cost of milk was ₹ 512.03 lakhs in the year 2012-13, which was increased by 137.65 per cent and its proportionate share was near about 3 per cent. The total processing cost, distribution

cost and management cost of milk increased by 164.92, 120.09 and 125.50 per cent during the year from 2012-13 to 2015-16.

24. For co-operative dairy unit, the total cost of production of milk products was ₹ 6.53 lakhs in the year 2012-13 and it was increased up to ₹ 14.47 lakhs in the year 2015-16, which indicated increase of 121.59 per cent. The proportionate share of Shrikhand in the year 2012-13 is observed to be highest but in 2015-16 the share of Dahi was maximum.

25. For the private dairy unit, the total cost production of milk products worked out to ₹ 1575.21 lakhs, in the year 2012-13 and it was ₹ 2106.44 lakhs in the year 2015-16, indicating increase by 33.44 per cent. The share of processing cost of Milk powder in the total cost of production was observed to be the highest for all the years of study.

26. For the co-operative dairy unit, the total manufacturing cost for cream increased by 19.43 per cent over the period of time. The per kg apportioned cost of cream was ₹ 193.75 in the year 2012-13 and it rose to ₹ 195.45 by 0.8 per cent in the year 2015-16, while value added by Cream was ₹ 16.25 and ₹ 19.80 for the year 2012-13 and 2015-16.

27. For private dairy unit, the total manufacturing cost for cream increased significantly by 73.44 per cent, over the

period of 2012-13 to 2015-16. The per kg apportioned cost of cream was ₹ 197.33 in the year 2012-13 and it rose to ₹ 201.25 by 1.99 per cent in the year 2015-16, while value added by cream was ₹ 18 and ₹ 19 for the year 2012-13 and 2015-16, respectively.

28. The total cost of manufacturing of Butter was ₹46.16 lakhs in the year 2012-13 and it was increased to ₹ 52.02 lakhs in the year 2015-16. The value added by Butter significantly increased over the period of time for co-operative dairy unit. While the total cost of manufacturing of Butter was ₹ 278.43 lakhs in the year 2012-13 and it increased to ₹ 553.25 lakhs in the year 2015-16.

29. For private dairy unit the total cost of production of Ghee was ₹ 165.54 lakhs in the base year which increased to ₹ 389.05 lakhs in the year 2015-16. The per unit apportioned cost of manufacturing of Ghee ranged from ₹ 341.75 per kg to ₹ 351.28 per kg during the study period, while the value added by Ghee was to the tune of ₹ 120.25 per kg and it increased to ₹ 158.72 per kg in the year 2015-16.

30. For co-operative dairy unit, the cost of production of Dahi was ₹ 72.63 lakh in the year 2012-13; it was increased to ₹ 83.14 lakhs in the year 2015-16, The per kg apportioned cost of Dahi was ₹ 34.85 in the year 2012-13; it was increased to ₹ 38.28 in the year 2015-16.

31. For private dairy unit, the cost of production of Dahi was ₹ 2658.55 lakhs in the year 2012-13; it was increased to ₹ 4214.28 in the year 2015-16, The per kg apportioned cost of Dahi was ₹ 32.50 in the year 2012-13 and it was increased to ₹ 34.25 in the year 2015-16.

32. The marketing cost of milk products in co-operative dairy unit was ranged from ₹ 6.48 lakhs to ₹ 14.52 lakhs during the year 2012-13 to 2015-16. The per kg cost of marketing was high (₹ 8.50 and ₹ 9.15) in the case Shrikhand and Aamrakhand followed by Basundi and Dahi, it was the least for Lassi and Tak (₹ 2.59 and ₹ 2.50). The total cost of marketing of Dahi was increased substantially during the year 2012-13 to 2015-16 indicating 1127.91 per cent tremendous change.

33. For private dairy unit, the marketing cost of milk products ranged from ₹ 655.29 lakhs to ₹ 984.90 lakhs during the year 2012-13 to 2015-16. The per kg cost of marketing was high (₹ 12.56 and ₹ 14.25) in the case of Ice-cream followed by Shrikhand and Aamrakhand (₹ 8.10 and ₹ 8.63) and it was the least for Khoa (₹ 3.03 to ₹ 3.37). The total cost of marketing of Ice cream increased during the year 2012-13 to 2015-16 indicating 268.75 per cent change.

34. The different milk products were sold by dairy co-operative in the different markets at different places. The quantity of Dahi, Shrikhand, Aamrakhand, Flavored

milk, Pedha was sold in the market increased significantly over the period of time from 2012-13 to 2015-16. The per unit cost of marketing management was ₹ 2.22 in the year 2012-13 and it was increased to ₹ 2.48 in the year 2015-16 indicating 11.71 per cent increase during the study period, whereas the total quantity of milk products was 117.46 tons in the base year and it increased up to 236.61 tons by 101.44 per cent over the period of time.

35. The milk products were sold by private dairy unit in the different markets at different places. The quantity of Milk powder, Ghee, Khoa, Shrikhand, Aamrakhand, and Dahi was sold in the market have increased significantly over the period under study. The per unit cost of marketing management was ₹ 1.41 in the year 2012-13 and it increased to ₹ 1.51 in the year 2015-16 indicating 7.09 per cent change during the study period, whereas the total quantity of milk products sold was, 8986.56 tons in the base year and it increased up to 12700.72 tons by 41.33 per cent over the period of time.

36. The receipts generated from the sell of fluid milk or milk products have been increased. The result have indicated that there were more profits in sell of these milk products rather than selling fluid milk used in those preparation over the period from 2012-13 to 2015-16 for co- operative and private dairy units.

37. Per unit price has received by co- operative dairy unit ranged from ₹ 31.25 to ₹ 33.50 for cow and buffalo milk. The annual gross returns amounted to ₹ 4699.40 lakhs to ₹ 5320.70 lakhs during the year 2012-13 and 2015-16, respectively. The total cost increased from ₹ 4461.94 lakhs to ₹ 5167.35 lakhs during the period under study. The share of purchase cost of milk was nearly 99.64 per cent over the period of time. The benefit-cost ratio ranged from 1.12 to 1.14 during the corresponding year.

38. For private dairy unit, per unit price received ranged between ₹ 32.75 per liter to ₹ 35.00 per liter for cow and buffalo milk. The annual gross returns amounted to ₹ 31637 lakhs and ₹ 56382.68 lakhs during the year 2012-13 to 2015-16, respectively. The total cost increased from ₹ 21049.56 lakhs to ₹ 40064.01 lakhs during the period under study. The share of purchase cost of milk was nearly 88 to 90 per cent over the period of time. The benefit-cost ratio ranged between ₹ 1.50 and ₹ 1.41 for the year 2012-13 and 2015-16 respectively.

39. The estimated quantities of processed milk required to be handled by co-operative dairy unit for break-even point worked out to 70.73 lakh liters in the year 2012-13 and 90.89 lakh liters in the year 2015-16.

40. For private dairy, the estimated quantities of processed milk required to be handled for break-even worked out to

150.99 lakh liters in the year 2012-13 and 355.01 lakh liters in the year 2015-16.

41. In the commercial dairy herds, the total number of livestock was 729 and 166 for cow herd and buffalo herd, respectively. Out of total livestock, in-milk cows and buffalos contributed major share i.e. 296 and 80 in numbers, followed by calves in case of cows and dry milk animal in case of buffalo, in cow and buffalo herd, respectively.

42. The total cost of milk production composed of working cost and fixed cost which shared about 46.75 per cent and 53.25 per cent of the total cost, in case of cows it contributes about 65.99 per cent and 34.01 per cent in case of buffalos at the overall level.

43. In the structural composition of total cost of milk production the feed shared 33.94 per cent and 45.62 per cent expenditure for cow and buffalo dairy herds, respectively. The net per liter production cost was worked out to be ₹ 26.63 which was the highest in buffalo herds, followed by cow herds which was ₹ 18.27. Per liter price received for cow milk was ₹ 25.50 and for buffalo it was ₹ 37.50. The gross returns obtained from milk production activity were shared about 91.24 per cent in case of cow herd and 91.55 per cent in case of buffalo herd in the total income.

44. The dairy units faced several problems in their business activity viz., irregularity of electricity supply, reception of low quality of milk due to adulteration, high collection and administrative cost and overhead charges, heavy competition in collection of milk, marketing cost increased due to distant markets places and high cost of packaging material were the major problems of dairy units but the most emphasized problem was that the private and co-operatives dairy units have to face a cut- throat competition for milk collection.

45. The problems faced by milk producers viz., non availability of pure breed in local market, difficulties in obtaining loans, inadequate money for purchase of milch animals, malpractice followed by agents in market, in distantly situated regulated market, price for cross-bred animals received was not satisfactory. Shortage of man power for animal management, high wage rate of labor, high cost of feed and fodder, non-availability of good quality feed and fodder, lack of knowledge about scientific feeding and management and lack of knowledge health care of animals. Rate of milk is not proper, improper measuring and testing of milk by dairy society/ milk collection centers etc. were the problems faced by the milk producers.

6.2 Conclusions

1. The population of less productive bovine (indigenous cattle and male cattle) has declined whereas that of

productive animals like crossbred cows has been increased. The population of ovines (sheep and goat) has decreased as compared to bovines. Between two species, sheep population has decreased faster rate than goat population indicating the importance of goat for meat production.

2. The total milk production showed an increasing trend in Satara district and the state as a whole, over the period of time. The proportionate share of milk production of Satara district to the state ranged in 5.87 per cent to 6.80 per cent, while the share of Satara district to India ranged between 0.40 per cent to 0.44 per cent and this was due to conversion of large number of indigenous milch cattle into high yielding breeds (cross-bred) which have high productivity potential.

3. The different indicators of livestock development programme such as artificial insemination, cases treated, vaccinations, number of veterinary aid centers and development of infrastructure such as hospitals, polyclinics and mobile vans, etc. has progressed over the period of time.

4. The milk collected by various agencies was maximum by private sector, while it was minimum in co-operative sector in Satara district.

5. The co-operative and private dairy units in Satara district have made progress in capital investment, financial

strength of assets and liabilities over the period of time. The growth rates of the above different indicators have increased during the study period. The proportion of cow milk and buffalo milk collection was 55.27 per cent and 44.73 per cent in co-operative dairy unit and 57.06 per cent and 42.96 per cent in private dairy unit, respectively.

6. The collected milk used for processing was about 99 per cent and nearly 94 to 96 per cent processed milk was sold as fluid milk in case of co-operative dairy unit, while in case of private dairy unit it was about 65 to 70 per cent and remaining used for preparation of different milk products indicating that the private dairy unit use more milk for production of milk products than co-operative dairy unit which ultimately reflects in the maximum returns from their investment.

7. The total quantity of milk used for preparation of different milk products in co-operative and private dairy unit, was increased over the period of time but the total quantity of milk product prepared was comparatively higher in case of private dairy unit than co-operative dairy unit.

8. The private dairy unit paid relatively higher price to the milk producers than co-operative dairy unit.

9. Per liter cost of collection, processing, distribution, marketing management cost, manufacturing of milk products; marketing of milk products was relatively

higher in co-operative dairy unit than private dairy unit. This was possible mainly due to efficient management by private dairy unit.

10. The total quantity of milk product prepared by the private dairy unit was comparatively higher than co-operative dairy unit. The value added by the different milk product varied greatly from product to product among the co-operative and private dairy units.

11. The cost of marketing of different milk products varied greatly according to the mode of transport and marketing system adopted by the particular dairy unit. Per kg cost of marketing in co-operative dairy unit was high in case of Shrikhand and Aamrakhand (₹ 8.50 and ₹ 9.15) followed by Basundi (₹ 7.00 to ₹ 7.20), while it was least for the Lassi and Tak during the study period. In private dairy unit, the per kg cost of marketing of all milk products had showed increasing trends over the period of time. The per kg cost of marketing was high (₹12.56 and ₹14.25) in the case of Ice-cream followed by Shrikhand and Aamrakhand (₹ 8.10 and ₹ 8.63), while it was the least for Khoa (₹ 3.03 to ₹ 3.37) during the period.

12. The per unit cost of marketing management of co-operative dairy unit was ₹ 2.22 per kg in the year 2012-13, which increased to ₹ 2.48 per kg in the year 2015-16, indicating 11.71 per cent absolute increase during the period, while the per unit cost of marketing management

of private dairy unit its was ₹ 1.41 per kg in the year 2012-13, which was increased to ₹ 1.51 per kg in the year 2015-16 indicating 7.09 per cent increase. The total quantity of milk products was 117.46 tons and 8986.56 tons in the base year and it was increased to 236.61 tons and 12700.72 tons over the period of time.

13. Per liter price of milk procured by private dairy unit was relatively higher than co-operative dairy unit.

14. The total income of co-operative and private dairy units from sell of milk and milk products and other receipts showed an increasing trend with increase in business.

15. The milk production and gross returns showed positive relationship with the number of milch animals. Amongst the various items of total cost of milk production, feed and labor were the major items which together shared 39.62 per cent in case of cow herd and 53.85 per cent for buffalo herd, respectively. The gross returns from milk production activity ranged between 97 to 98 per cent. The gross returns increased with the herd size. The activity of maintaining cross-bred cows of milk production was profitable than that of maintaining buffalos.

16. Feeding of green fodder and concentrates to cows and buffalos contributed significantly indicating that the milk productivity could be increased through feeding of green fodder and concentrates.

17. The average productivity of cross-bred cow and buffalo could be increased well above the present level by way of feeding the animal with higher quantities of green fodder, dry fodder and concentrates and by decreasing use levels of human labor and miscellaneous expenditure.

18. The dairy units faced several problems in their business activity viz., irregularity of electricity supply, the milk so collected is of low grade due to adulteration, high collection cost, administrative cost and overhead charges, heavy competition in collection of milk, marketing cost increased due to distant markets places and high cost of packaging material were the major problems of dairy units but the most emphasized problem was that the private and co-operatives dairy units have to face a cut-throat competition for milk collection.

19. For the co-operative and private dairy units, management have still a scope to increase the economic stability through collection of milk from its operational area to minimize collection cost, minimize losses in handling and transport, minimize distribution costs of milk products, besides either increasing the output of Ghee, Butter, Ice-cream, Shrikhand, Milk powder and Milk Pedha on large scale to reap the advantages of expanding market for milk products in accordance with changing pattern of consumers preference, taste and affordability. This will help to reduce cost of milk products as well as to enable

the units to supply milk and milk products in the market at comparative rates.

18. The problems faced by milk producers viz., non-availability of pure breed in local market, difficulties in obtaining loans, more transport cost, malpractice followed by agents in the market, low price for crossed animals, shortage of man power for animal management, high wage rate of labor, high cost of feed and fodder, non-availability of good quality feed and fodder, lack of knowledge about scientific feeding and management and lack of health care knowledge of animals.

19. Low milk rate, improper measuring and testing of milk by dairy society/ milk collection centers etc. are the problems faced by the milk producers. It is suggested that there is a need to reduce the milk production cost of milch animals, to improve the productivities of milch animals and strengthen the marketing infrastructure. This can be done by introducing high yielding varieties of grasses, legumes and fodder crops in farmers' fields, replacing the local milch animals with improved breeds at faster rate.

6.3 Policy implications

1. The programme of crossbreeding has not been uniformly effective across different categories of farms. Hence, there is a need to have long-term appropriate breeding policy including timely delivery of livestock services.

2. The milk production has increased over a period of time with fluctuations yearly. There is a need to establish more number of the milk processing units on private and co-operative basis so as to reap the renenumerative market prices for the milk and milk products and intern, the consumers will be benefited through quality milk at reasonable prices.

3. The co-operative and private dairy units, managements have still a scope to increase the economic stability through collection of milk from its operational area to minimize procurement cost, losses in handling and transport, distribution costs of milk products. In view, the dairy units should try to improve the manufacturing of milk products to catch the increased demand.

4. The expenditure on feed, fodder and concentrates could be reduced by adopting high yielding varieties of grasses, legumes and fodder crops on farmers' fields, replacing the local milch animals with improved breeds at faster rate. The Government should provide the necessary input supplies at subsidized rates to the dairy farmers so that these breeds can be reared cheaply and commercially.

5. There is scope to improve the milk production of crossbred cows, indigenous cows and buffaloes across dairy farm using the existing resources. The milk producers should be trained for dairy management

practices viz; feeding practices, maintaining optimal herd size, balanced feeding, artificial insemination and new technologies in dairying in order to achieve the maximum milk production thereby realizing more profit and would generate employment and income.

6. Dairy enterprise absorbs the major portion of the available labor force particularly the women. Therefore, the training programmes on dairy management for women be arranged.

7. The milk producers, co-operatives societies and milk collection centers can handle the problems in milk production. However, for making the producers fully aware of the management practices of milch animals, the Department of Animal Husbandry, the Agricultural Universities and Veterinary University should make joint efforts so that dairy enterprise can be taken by large number of farmers where it has not taken up on a large scale.

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8. APPENDIX

Appendix No. I- Milk used for different milk products in co-operative dairy units.

Sr. No.	Milk Products	Quantity of milk used in the year	
		2012-13	2015-16
1	Cream	2.33	2.55
2	Dahi	2.26	2.37
3	Basundi	0.41	1.09
4	Paneer	-	0.10
5	Pedha	2.33	2.35
	Total	7.33	8.46

Appendix No. II- Milk used for different milk products in private dairy units.

Sr. No.	Milk Products	Quantity of milk used in the year	
		2012-13	2015-16
1	Cream	25.34	41.15
2	Dahi	93.25	138.40
3	Basundi	2.44	4.15
4	Paneer	1.01	3.14
5	Khoa	4.81	7.94
6	Ice-cream	26.40	85.79
	Total	153.25*	280.57*

*Note: The total quantity of milk taken in the average of two sample dairy units and the milk powder cannot take in average, so The remaining quantity of milk used for preparation of milk powder because there is only one dairy unit produce milk powder.

Appendix No. III-Manufacturing cost of Cream, by co-operative and private dairy units during the year 2012-13 to 2015-16.

Sr. No	Particulars	Co-operative		Private	
		2012-13	2015-16	2012-13	2015-16
1	Raw material used (Milk)	2.33	2.55	25.34	41.15
	Quantity (Lakh liters)	24.75	27.05	27.25	28.75
	Unit Price (₹/Kg)	57.66	68.98	690.52	1183.06
	Total cost (₹ Lakh)				
2	Collection cost (₹ /liter)	1.09	1.18	0.81	1.05
	Total procurement cost (₹ Lakh)	2.54	3.01	20.53	43.20
3	Processing cost (₹ /liter)	0.74	0.77	0.45	0.65
	Total processing cost (₹ Lakh)	1.72	1.96	11.40	26.75
	Total cost (₹ Lakh)	61.92	73.95	722.45	1253.01
1	Main product				
	Quantity (tons)	27.94	30.58	303.84	493.41
	Unit price (₹/Kg)	210	215.25	215.33	220.25
	Total value (₹ Lakh)	58.67	65.82	654.26	1086.74
2	By product- Skim milk				
	Quantity (Lakh liters)	2.63	2.88	31.68	51.44
	Unit price (₹/Kg)	16.50	17.85	17.25	18.10
	Total value (₹ Lakh)	43.40	51.41	546.48	931.06
	Total value (₹ Lakh)	102.07	117.23	1200.74	2017.80
	Apportioned cost of manufacturing of,				
	a) Cream- Unit cost (₹/Kg)	193.75	195.45	197.33	201.25
	Total cost (₹ Lakh)	54.13	59.77	599.57	992.99
	b) Skim milk- Unit cost	12.40	14.35	13.22	15.33
	(₹/lit.)	32.61	41.33	418.81	788.58
	Total cost (₹ Lakh)				
	Value Added				
	a) Cream- Unit cost (₹/Kg)	16.25	19.8	18	19
	Total value (₹ Lakh)	4.54	6.05	54.69	93.75
	b) Skimmed milk- Unit cost (₹/kg)	4.1	3.5	4.03	2.77
	Total value (₹ Lakh)	10.78	10.08	127.67	142.49

Appendix No. IV-Manufacturing cost of Butter, by co-operative and private dairy units during the period of 2012-13 to 2015-16.

Sr. No.	Particulars	Co-operative		Private	
		2012-13	2015-16	2012-13	2015-16
1	Raw material used (Cream) Quantity (tons) Unit Price (₹/Kg) Total cost (₹ Lakh)	 21.35 210 44.84	 23.41 215.25 50.39	 125.74 215.33 270.76	 243.83 220.25 537.04
2	Processing cost (₹ /kg.) Total processing cost (₹ Lakh)	6.20 1.32	6.94 1.63	6.10 7.67	6.65 16.21
	Total cost (₹ Lakh)	46.16	52.02	278.43	553.25
1	Main product- Butter Quantity (tons) Unit price (₹/Kg) Total value (₹ Lakh)	 13.51 342.50 46.27	 14.82 350 51.87	 81.65 345.33 281.96	 158.33 355.50 562.86
2	By product- Butter milk Quantity (Lakh liters) Unit price (₹/lit.) Total value (₹ Lakh)	 0.03 24.80 0.74	 0.035 26.35 0.92	 0.19 25.05 4.76	 0.36 26.55 9.56
	Total value (₹ Lakh)	47.01	52.79	286.72	572.42
	Apportioned cost of manufacturing of, a) Butter - Unit cost (₹/Kg) Total cost (₹ Lakh)	 306.49 41.41	 309.04 45.80	 311.25 254.14	 314.28 497.60
	b) Butter milk- Unit cost (₹/lit.) Total cost (₹ Lakh)	19.50 0.59	22.45 0.79	20.35 3.87	22.42 8.07
	Value Added a) Butter - Unit cost (₹/Kg) Total value (₹ Lakh)	 36.01 4.87	 40.96 6.07	 34.08 27.83	 41.22 65.26
	b) Butter milk- Unit cost (₹/liter) Total value (₹ Lakh)	5.3 0.16	3.9 0.14	4.70 0.89	4.13 1.49

Appendix No. V- Manufacturing cost of Ghee by private dairy unit during the period of 2012-13 to 2015-16.

Sr. No.	Particulars	Private	
		2012-13	2015-16
1	Raw material used (Butter + Cream) Quantity (tons) Unit Price (₹/Kg) Total cost (₹ Lakh)	 52.07 302.43 157.48	 118.93 310.87 369.72
2	Processing cost (₹/kg.) Total processing cost (₹ Lakh)	15.48 8.06	16.25 19.33
	Total cost (₹ Lakh)	165.54	389.05
	Main product Quantity (tons) Unit price (₹/Kg) Total value (₹ Lakh)	 42.33 462 195.56	 105.25 510 536.78
	Total value (₹ Lakh)	195.56	536.78
	Apportioned cost of manufacturing of, a) Ghee - Unit cost (₹/Kg) Total cost (₹ Lakh)	 341.75 144.66	 351.28 369.72
	Value Added a) Ghee - Unit cost (₹/Kg) Total value (₹ Lakh)	 120.25 50.90	 158.72 167.05

Appendix No. VI- Manufacturing cost of Dahi, by co-operative and private dairy units during the period of 2012-13 to 2015-16.

Sr. No.	Particulars	Co-operative		Private	
		2012-13	2015-16	2012-13	2015-16
1	Raw material used (Milk) Quantity (Lakh liters) Unit Price (₹/Kg) Total cost (₹ Lakh)	 2.26 24.75 55.93	 2.37 27.05 64.11	 93.25 27.25 2541.06	 138.40 28.75 3979.00
2	Collection cost (₹ /liter) Total procurement cost (₹ Lakh)	1.09 2.46	1.18 2.80	0.81 75.53	1.05 145.32
3	Processing cost (₹/liter) Total processing cost (₹ Lakh)	6.30 14.24	6.85 16.23	0.45 41.96	0.65 89.96
	Total cost (₹ Lakh)	72.63	83.14	2658.55	4214.28
	Main product- Dahi Quantity ('000' liters) Unit price (₹/Kg) Total value (₹ Lakh)	 222.65 50.25 111.88	 236.73 58 137.30	 9325.00 62.50 5828.13	 13840.01 66.50 9203.61
	Total value (₹ Lakh)	111.88	111.88	5828.13	9203.61
	Apportioned cost of manufacturing of, Dahi- Unit cost (₹ /Kg) Total cost (₹ Lakh)	 34.85 77.59	 38.28 90.62	 32.50 3030.63	 34.25 4740.20
	Value Added Dahi- Unit cost (₹ /Kg) Total value (₹ Lakh)	 15.4 34.29	 19.72 46.68	 30 2797.50	 32.25 4463.40

Appendix No. VII-Manufacturing cost of Shrikhand by co-operative and private dairy units during the period of 2012-13 to 2015-16.

Sr. No.	Particulars	Co-operative		Private	
		2012-13	2015-16	2012-13	2015-16
1	Raw material used (Dahi)				
	Quantity ('000' Liters)	148.35	153.08	4105.78	5589.48
	Unit Price (₹/Kg)	50.25	58	62.50	66.50
	Total cost (₹ Lakh)	74.55	88.79	2566.11	3717.00
2	Processing cost (₹/liter)	7.94	8.55	7.75	8.11
	Total processing cost (₹ Lakh)	11.78	13.09	318.20	453.31
3	Ingredients (Sugar and other ingredients)				
	Quantity (tons)	4.18	4.31	115.66	166.81
	Unit Price (₹/Kg)	35	40	35	40
	Total cost (₹Lakh)	1.46	1.72	40.48	66.72
	Total cost (₹ Lakh)	87.79	99.06	2924.79	4237.03
	Main product-Shrikhand				
	Quantity (tons)	104.47	107.80	2891.39	3936.25
	Unit price (₹/Kg)	135	140	131.25	140
	Total value (₹ Lakh)	141.03	150.92	3794.95	5510.75
	Total value (₹ Lakh)	141.03	150.92	3794.95	5510.75
	Apportioned cost of manufacturing of, Shrikhand- Unit cost (₹/Kg)	96.25	110.01	113.50	121.54
	Total cost (₹ Lakh)	100.55	118.59	3281.73	4784.12
	Value Added Shrikhand- Unit cost (₹/Kg)	38.75	29.99	17.75	18.46
	Total value (₹ Lakh)	40.48	32.33	513.22	726.63

Appendix No. VIII- Manufacturing cost of Aamrakhand, by co-operative and private dairy units during the period of 2012-13 to 2015-16.

Sr. No.	Particulars	Co-operative		Private	
		2012-13	2015-16	2012-13	2015-16
1	Raw material used (Dahi)				
	Quantity ('000' liters)	62.85	88.65	2895.54	4972.55
	Unit Price (₹/liter)	50.25	58	62.50	66.50
	Total cost (₹ Lakh)	31.58	51.42	1809.71	3306.75
2	Processing cost (₹/liter)	8.05	8.65	7.75	8.11
	Total processing cost (₹ Lakh)	5.06	7.67	224.40	403.27
3	Ingredients (Sugar and other ingredients)				
	Quantity (tons)	2.20	3.07	100.23	172.13
	Unit Price (₹/Kg)	36	41	36	41
	Total cost (₹ Lakh)	0.79	1.26	36.08	70.57
	Total cost (₹ Lakhs)	37.43	60.35	2070.19	3780.59
	Main product- Aamrakhand				
	Quantity (tons)	48.35	68.19	2227.34	3825.04
	Unit price (₹/Kg)	136.5	145	142	150
	Total value (₹ Lakh)	66.01	98.88	3162.82	5737.56
	Total value (₹ Lakh)	66.01	98.88	3162.82	5737.56
	Apportioned cost of manufacturing of, Aamrakhand - Unit cost (₹/Kg)	90.33	103.20	104.81	112.47
	Total cost (₹Lakh)	43.68	70.37	2334.48	4302.02
	Value Added Aamrakhand- Unit cost (₹/Kg)	46.17	41.80	37.19	37.53
	Total value (₹ Lakh)	22.32	28.50	828.35	1435.54

Appendix No. IX- Manufacturing cost of Basundi, by co-operative and private dairy units during period of 2012-13 to 2015-16.

Sr. No.	Particulars	Co-operative		Private	
		2012-13	2015-16	2012-13	2015-16
1	Raw material used (Milk)				
	Quantity (liters)	0.41	1.09	2.44	4.15
	Unit Price (₹/liter)	24.75	27.05	27.25	28.75
	Total cost (₹Lakh)	10.15	29.48	66.49	119.31
2.	Collection cost (₹ /liter)	1.09	1.18	0.81	1.05
	Total procurement cost (₹ Lakh)	0.45	1.29	1.98	4.36
3	Processing cost (₹/liter)	7.00	7.20	4.81	5.11
	Total processing cost (₹ Lakh)	2.87	7.85	11.74	21.21
4	Ingredients (Sugar and other ingredients)				
	Quantity (tons)	4.1	10.90	24.40	41.50
	Unit Price (₹/Kg)	36.50	41	36.50	41
	Total cost (₹ Lakh)	1.50	4.47	8.91	17.02
	Total cost (₹ Lakh)	14.97	43.09	89.12	161.90
	Main product- Basundi				
	Quantity (tons)	27.33	72.67	162.67	276.67
	Unit price (₹/Kg)	147.50	160	151.50	160
	Total value (₹ Lakh)	40.27	116.27	246.45	442.67
	Total value (₹ Lakh)	40.27	116.27	246.45	442.67
	Apportioned cost of manufacturing of, Basundi- Unit cost (₹/Kg)	51.12	53.06	51.55	54.90
	Total cost (₹ Lakh)	13.96	38.56	83.86	151.89
	Value Added Basundi- Unit cost (₹/Kg)	96.38	106.94	99.95	105.10
	Total value (₹ Lakh)	26.31	77.71	162.59	290.78

Appendix No. X- Manufacturing cost of Flavored Milk, by co-operative and private dairy units during the period of 2012-13 to 2015-16.

Sr. No.	Particulars	Co-operative		Private	
		2012-13	2015-16	2012-13	2015-16
1	Raw material used (Skim milk)				
	Quantity (liters)	0.55	0.61	1.25	3.65
	Unit Price (₹/liters)	16.50	17.85	17.25	18.10
	Total cost (₹Lakh)	9.08	10.89	21.56	66.07
2	Processing cost (₹/liter)	2.75	3.15	3.35	3.68
	Total processing cost (₹ Lakh)	1.51	1.92	4.19	13.43
3	Ingredients (Flavour)				
	Quantity (tons)	5.50	6.10	12.51	36.55
	Unit Price (₹/Kg)	35	40	35	40
	Total cost (₹ Lakh)	1.93	2.44	4.38	14.62
	Total cost (₹ Lakh)	12.52	15.25	30.13	94.12
	Main product- Flavored milk				
	Quantity ('000' lit.)	50.05	55.51	113.75	332.15
	Unit price (₹/Kg)	33.5	40	35.50	42.25
	Total value (₹ Lakh)	16.77	22.20	40.38	140.33
	Total value (₹ Lakh)	16.77	15.97	40.38	94.12
	Apportioned cost of manufacturing of, Flavored milk- Unit cost (₹/Kg)	23.73	27.48	25.51	27.29
	Total cost (₹ Lakh)	11.88	15.25	29.02	90.64
	Value Added Flavored milk - Unit cost (₹/Kg)	9.77	12.52	9.99	14.96
	Total value (₹ Lakh)	4.89	6.95	11.36	49.69

Appendix No. XI- Manufacturing cost of Paneer, by co-operative and private dairy units during the period of 2012-13 to 2015-16.

Sr. No.	Particulars	Co-operative		Private	
		2012-13	2015-16	2012-13	2015-16
1	Raw material used (Milk) Quantity (liters) Unit Price (₹/liter) Total cost (₹ Lakh)	-	 0.10 27.05 2.71	 1.01 27.25 27.52	 3.14 28.75 90.28
2.	Collection cost (₹/liter) Total procurement cost (₹ Lakh)		1.18 0.12	0.81 0.82	1.05 3.30
3	Processing cost (₹/liter) Total processing cost (₹ Lakh)	-	3.25 0.33	3.10 3.13	3.35 10.52
4	Ingredients (Citric Acid and salt) Unit Price (₹/Kg) Total cost (₹ Lakh)	-	 4.50 0.45	 3.95 3.99	 4.50 14.13
	Total cost (₹ Lakh)	-	3.61	35.46	118.23
	Main product- Paneer Quantity (tons) Unit price (₹/Kg) Total value (₹ Lakh)	-	4.40 260 11.44	44.44 255.50 113.54	138.16 266 367.51
	Total value (₹ Lakh)	-	11.44	113.54	367.51
	Apportioned cost of manufacturing of, Paneer- Unit cost (₹/Kg) Total cost (₹ Lakh)	-	72.27 3.18	70.58 31.37	75.10 103.76
	Value Added Paneer- Unit cost (₹/Kg) Total value (₹ Lakh)	-	187.73 8.26	184.92 82.18	190.90 263.75

Appendix No. XII- Manufacturing cost of Pedha, by co-operative dairy unit during the period of 2012-13 to 2015- 16.

Sr. No.	Particulars	Co-operative	
		2012-13	2015-16
1	Raw material used (Milk) Quantity (tons) Unit Price (₹/Kg) Total cost (₹ Lakh)	 2.33 24.75 57.67	 2.45 27.05 66.27
2	Collection cost (₹/liter) Total procurement cost (₹ Lakh)	1.09 2.54	1.18 2.89
3	Processing cost (₹/Kg.) Total processing cost (₹ Lakh)	6.80 15.84	7.48 18.33
4	Ingredients (Sugar) Quantity (tons) Unit Price (₹/Kg) Total cost (₹ Lakh)	 4.66 36 1.68	 4.90 41 2.01
	Total cost (₹ Lakh)	77.73	89.50
	Main product- Pedha Quantity (tons) Unit price (₹/Kg) Total value (₹ Lakh)	 46.60 323 150.52	 49.00 330 161.70
	Total value (₹ Lakh)	150.52	161.70
	Apportioned cost of manufacturing of, a) Pedha - Unit cost (₹/Kg) Total cost (₹ Lakh)	 141.46 65.92	 152.49 74.72
	Value Added a) Pedha - Unit cost (Rs/Kg) Total value (₹ Lakh)	 181.54 84.60	 177.51 86.98

Appendix No. XIII- Manufacturing cost of Khoa, by private dairy unit during the period of 2012-13 to 2015-16.

Sr. No.	Particulars	Private	
		2012-13	2015-16
1	Raw material used (milk) Quantity (liters) Unit Price (₹/liter) Total cost (₹ Lakh)	 4.81 27.25 131.07	 7.94 28.75 228.28
2.	Collection cost (₹/liter) Total procurement cost (₹ Lakh)	0.81 3.90	1.05 8.34
3	Processing cost (₹/kg.) Total processing cost (₹ Lakh)	9.90 47.62	10.35 82.18
	Total cost (₹ Lakh)	182.59	318.80
	Main product- Khoa Quantity (tons) Unit price (₹/Kg) Total value (₹ Lakh)	 80.84 222.50 179.87	 133.45 230 306.94
	Total value (₹ Lakh)	179.87	306.94
	Apportioned cost of manufacturing of, Khoa- Unit cost (₹/Kg) Total cost (₹ Lakh)	 174.26 140.87	 183.98 245.52
	Value Added Khoa - Unit cost (₹/Kg) Total value (₹ Lakh)	 48.24 39.00	 46.02 61.41

Appendix No. XIV- Manufacturing cost of Ice-Cream, by private dairy unit during period of 2012-13 to 2015-16.

Sr. No.	Particulars	Private	
		2012-13	2015-16
1	Raw material used (Cream + milk) Quantity (tons) Unit Price (₹/kg.) Total cost (₹ Lakh)	 87.92 89.07 78.31	 285.68 91.94 262.65
2	Processing cost (₹/liter) Total processing cost (₹ Lakh)	7.12 6.26	7.72 22.05
3	Ingredients (Sugar and Flavor) Quantity (tons) Unit Price (₹/Kg) Total cost (₹ Lakh)	 2.63 11.31 0.30	 2.97 12.45 0.37
	Total cost (₹ Lakh)	84.87	285.07
	Main product- Ice-Cream Quantity ('000' liters) Unit price (₹/liter) Total value (₹ Lakh)	 70.34 125 87.93	 228.54 150 342.81
	Total value (₹ Lakh)	87.93	342.81
	Apportioned cost of manufacturing of, Ice-Cream- Unit cost (₹/Kg) Total cost (₹ Lakh)	 108.91 76.60	 113.62 259.67
	Value Added Ice-Cream- Unit cost (₹/Kg) Total value (₹ Lakh)	 16.09 11.32	 36.38 83.14

9. VITA

Mr. Waghmale Harish Kuldeep

A candidate for the degree of

MASTER OF SCIENCE (AGRICULTURE)

In

AGRICULTURAL ECONOMICS

2017

Title of the Thesis : "Economic appraisal of dairy industry in Satara district of Maharashtra"

Major Field : Agricultural Economics

Biographical information

Personal : Born on 29th September, 1993 at Satara, Tal. Satara, Dist. Satara, Maharashtra state, India. Son of Shri Kuldeep Janardhan Waghmale and Sou. Rajashree Kuldeep Waghmale.

Educational : Attended primary education at Annasahebraje Bhosale Prathamik Vidyalay, Satara.

: Passed S.S.C from New English School, Tal. Satara, Dist. Satara. With First class.

: Passed H.S.C. from Rajendra Mahavidyalay, Khandala, Tal. Khandala, Dist. Satara with First class.

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Extra-curricular : i) Two times selected for Inter-university Cricket Tournament held at Barakatullah university, Bhopal.

ii) Selected for the Inter- collegiate Kabaddi tournament held at Babhulgaon, Nashik

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