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THE THESIS
ON
*"ANALYSIS OF PRODUCTIVITY OF
CO-OPERATIVE DAIRY & MILK
SUPPLY UNITS OF GUJARAT STATE"*

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FOR
PH. D. DEGREE
UNDER THE FACULTY OF
COMMERCE
SAURASHTRA UNIVERSITY
RAJKOT - 360005.

UNDER THE SUPERVISION
OF
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STATEMENT OF DECLARATION

I, the undersigned, Mr. TUSHAR D. JATAKIA, a student of Doctor of Philosophy, Department of Business Management, Saurashtra University, Rajkot, hereby acknowledge that the research work in this thesis is my own endeavour and that the work being supervised by Dr. HITESH J. SHUKLA, Associate Professor, Department of Business Management, (MBA Programme) Saurashtra University, Rajkot.

That the appropriate data and the required informations were procured from the milk dairy units under the research work. I, therefore acknowledge that the thesis has not been in any case submitted to any other institution of higher learning for any degree award.

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CERTIFICATE OF ACKNOWLEDGEMENT

This is to certify that Mr. TUSHAR D. JATAKIA has carried out the research work as presented in this thesis under my guidance and supervision and that the presentation is his own original contribution.

Further, that the work as embodied in this presentation has not been previously submitted to any institution for any degree award.

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PREFACE

I express my happiness to present this thesis entitled, “Analysis of Productivity of co-operative and Milk Supply Units of Gujarat State”. To the students of finance and accounts. Productivity is the basic and first step for real high income for employees and workers better standard of living for the people and development of the economy. It can play a tremendous role in any industrial development. So, I was encouraged to work on, productivity.

‘Productivity’ is a concept of production system and measures its success. It is the standard that indicates measures how efficiently the material, the labour, the capital and the energy can be utilized. Analysis and measurement of ‘Productivity’ can help to know the areas for taking corrective actions towards planning of business firm. Simply, Productivity is known as the relationship between output and all employed inputs measured in real terms. It refers to a comparison between what comes out of production and what goes into production that is the arithmetical ratio between the amount produced and the amount of all resources used in terms of manufacture. It may be measured for manufacturing organizations or their departments for which separate records are maintained.

The success of an industrial organization is determined by the level of efficiency in reducing cost and providing consumer services. Analysis and Measurement of Productivity can help to find out the areas where the corrective steps will have been taken in the way of planning of business firm. So far the manufacturing process is concerned, all inputs are important but the greatest interest has always centered in the relationship between production and labour, because it is the only input, which belongs to live human beings. ‘Productivity’ is one of those subjects about which much has been said and written in recent years. So, Productivity has become such a whisper word in these days.

India is basically, an agricultural country, and mostly depends upon the weather. Animal Husbandry is one of the branches of the agriculture moreover, the Indian culture is self – reliant, self sufficient and contended. In this past, every family

domesticated cows to fulfill their own need but dairy industry was not developed as a business, or as a profession. With the advent of the 19th century, the condition was getting changed and in real sense, the people of India adopted Dairy industry professionally.

The Dairy Co-operative movement in Gujarat is similar to the co-operative movement in India. “Amul” is the pioneer of the Dairy co-operative in Gujarat and in India also. Before the birth of Amul Dairy Anand, there was no systematic marketing for milk in India. As milk is perishable item, milk producer’s farmers had to sell their milk to the middlemen for whatever they were offered. Middlemen bought the milk from milk producers at a lower price and sold it to cities with the huge margin of profit. Many times, milk producers were compelled to sell cream and ghee at throw away prices. Thus, the middlemen exploited the milk producers, farmers.

Eventually, the Kaira District co-operatives milk producers, Union Ltd. Which is known as “Amul Dairy” – Anand was started in 1946. In the starting, the Amul Dairy collected just 250 liters of milk per day with the help of two co-operative societies of the union. Due to Amul Dairy, farmers were obtaining fair and sufficient reward on the basis of fat content of the milk. They were paid promptly also. So, more and more farmers jointed the union, and the union got much strength. It turned today into 7,56,600 litres of milk per day, being collected from 1073 village co-operative societies with the help of 6,15,415 farmer members Late Tribhuvandas Patel and Dr. V. Kurien have given the name of “Amul” as excellence in Asia and have brought the ‘White Revolution’ in Gujarat as well as in India. And the milk producers also supported and co-operated their efforts nicely and realized the spirit of co-operation in a real sense.

This research study has eight chapters. Chapter 1 is all about the conceptual framework of Productivity. It gives the whole idea about Productivity. Chapter 2 is all about the introduction of co-operative movement & co-operative dairy industry. Chapter 3 consists the chapter plan of research study. Chapter 4 displays the material Productivity of co-operative milk dairies of Gujarat state. It measures the efficient level of material management. Chapter 5 indicates the Labour Productivity of co-operative milk dairies of Gujarat state. It measures the efficient level of Labour

management. Chapter 6 shows the Overhead Productivity of co-operative milk dairies of Gujarat state. It measures the efficient level of Overhead management. Chapter 7 states the Total Productivity of co-operative milk dairies of Gujarat state. It measures the efficient level of Overall management. Chapter 8 gives an idea about the research findings and their suggestions.

This research study is aimed for the finding out the performance and efficient level of the co-operative dairy and milk supply units in Gujarat State. Economic development based on the growth of basic industries which includes co-operative milk dairy industry. The main objective of the research is to find out; whether productivity of co-operative dairy and milk supply units working in Gujarat has improved during the period of the study. The efficient level of co-operative dairy and milk supply unit is determined with the help of published accounting data in this research work. This work has been completed under able guidance of Dr. Hitesh J. Shukla, Associate Professor, Smt. R. D. Gardi Department of of Business Management (MBA Programme), Saurashtra University, Rajkot his motivation, kind co-operation and encouragement helped me a lot in completing this research study. I would like to thank Dr. Pratapsinh L. Chauhan, Professor and Head, Department of Business Management, (MBA Programme), Saurashtra University, Rajkot, Dr. Sanjaybhai Bhayani, Department of Business Management, (MBA Programme), Saurashtra University, Rajkot, Faculties & staff of Department of Business Management, (MBA Programme), Saurashtra University, Rajkot, Dr. Daxaben Gohil, Professor and Head, Department of Commerce, Saurashtra University, Rajkot, Mr. A. G. Patel, Professor, K.K.Parekh Commerce College, Amreli for giving me support. I also want to thank all the General Managers of various dairies for providing me the complete information and numerical data of their dairies. They are Mr. Ajay Sheth, Mr. Desai, Mr. Buch, Dr. Mahendra Patel, Dr. D. S. Patel Mr. Mehta, Mr. Dilipbhai Mehta and Mr. Joshi. Finally, I would also like to thank my father – Dilipbhai, my mother - Geetaben, my sister - Avani, my wife - Aarti, Darshan, Mayur, Dolly, Hiren, Manoj, Chandresh and other members of my family for their support and patience during the whole process. I thank them for their co-operation and understanding.

I accept responsibility for any errors in the thesis and welcome comments from readers. And last but not the least; I thank **CHAITANYA PANDYA**, Nilkanth Computers, Rajkot for Computer work.

Tushar D. Jatakia

[M. Com.]

**“ANALYSIS OF PRODUCTIVITY OF CO-OPERATIVE DAIRY & MILK
SUPPLY UNITS OF GUJARAT STATE.”**

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CHAPTER - 1

**CONCEPTUAL FRAMEWORK OF
PRODUCTIVITY**

CHAPTER-1

CONCEPTUAL FRAMEWORK OF PRODUCTIVITY

1. INTRODUCTION
 2. MEANING & DEFINATION OF PRODUCTIVITY
 3. CONCEPT OF PRODUCTIVITY
 4. PRODUCTIVITY MOVEMENT IN INDIA
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1. INTRODUCTION:

‘Productivity’ is a concept of production system and measures its success. It is the standard that indicates measures how efficiently the material, the labour, the capital and the energy can be utilized. Analysis and measurement of ‘Productivity’ can help to know the areas for taking corrective actions towards planning of business firm. Simply, Productivity is known as the relationship between output and all employed inputs measured in real terms. It refers to a comparison between what comes out of production and what goes into production that is the arithmetical ratio between the amount produced and the amount of all resources used in terms of manufacture. It may be measured for manufacturing organizations or their departments for which separate records are maintained.

The success of an industrial organization is determined by the level of efficiency in reducing cost and providing consumer services. Analysis and Measurement of Productivity can help to find out the areas where the corrective steps will have been taken in the way of planning of business firm. So far the manufacturing process is concerned, all inputs are important but the greatest interest has always centered in the relationship between production and labour, because it is the only input, which belongs to live human beings. ‘Productivity’ is one of those subjects about which much has been said and written in recent years. So, Productivity has become such a whisper word in these days.

For the first time the word “Productivity was stated in an article by ‘Quesnay’ in the year 1766.”⁽¹⁾ In the year [1883] ‘littre’ defined ‘Productivity’ as “faculty to produce” that is desire to produce.⁽²⁾ The basic classical concept of Productivity was defined by classical economist, Adam Smith, David Recardo and I.S. Mill in the 18th & 19th centuries in the form of “Law of diminishing returns to all resources”. In the 19th century, Fedrick W. Taylor’s thesis reflects that “Human work can be made infinitely more productive not by ‘working harder’ but by working smarter.”⁽³⁾ In the year 1900, Productivity is defined as a “Relationship between output and the means employed to produce this output.”⁽⁴⁾ In the year 1950, Organization European Economic Co-operation (OEEC) offered more formal concept of Productivity.

According to them, “Productivity is the quotient obtained by dividing output by one of the factors of production.”⁽⁵⁾ In United States, specialized agencies like International Labour Organization [ILO] an affiliated agency of European Productivity Agency [EPA] was established in 1953. In India, The National Productivity Council was established in 1958 in India. They arrange the “Productivity Programmes” with the help of their experts in their five regional branches. The Asian Productivity Organization {APO} with headquarters in Tokyo, Japan was established in 1961.

The term Productivity is used to promote the products i.e. goods and services just as marketing tool and for preparing budget and longer term projections, policies etc. In the present competitive scenario, Productivity becomes very crucial factor for growth and development in any commercial organization. In this reference, there is also one opinion that Productivity is more valuable than profitability because if you are in a productive position, then you should be definitely in a profitable position. So everyone is interested in Productivity. When any person determines to make a better living for himself and for his family, he realizes more on Productivity than on hard work.

2. MEANING AND DEFINITION OF PRODUCTIVITY:

“Productivity” may be defined as the between output & input. Output means the amount produced or the number of items produced and inputs are the various resources employed, e.g. land & building, equipment, machinery, materials labor etc.”
(6)

Though, ‘productivity’ is measured by the ratio of output to input. An idea of increased ‘productivity’ is obtained when losses are minimized and consequently cost of production is reduced. Thus, productivity can also be expressed as a ratio of loss (e.g., idle time, wastage of material etc.) to total quantity used or manufactured.

“Productivity is also defined as the ratio between output and input. Thus, it is nothing more than the arithmetical ratio between the amount produced and the amount of any

resources used in course of production. These inputs may be materials, machinery, manpower, management and land. So, Productivity sets the goal of the maximization of output by planned and most economic use of all inputs. The operational and executive action of the management as the effect of adding value to the input and making it to grow into output. It can be also said that Productivity is the measure of business growth, it is the measure of the effectiveness and efficient utilization of the resources used in production. Thus, a high added value would show higher Productivity of Business.

“International Labour Organization” (ILO) defines, Productivity as the ratio between “output of work” and “input of resources” used in the process of creating Wealth.”⁽⁷⁾

A process is,

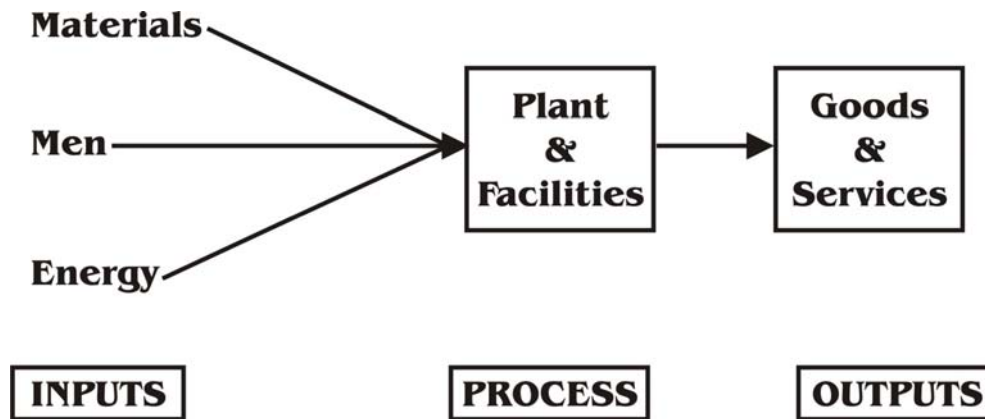
Fig 1.1



(Source: Dr. Shrinivas Gondhalekar & Dr. Uday Salunkhe, ‘Productivity Techniques’, Himalaya Publishing House – Mumbai, 1st Edition – 2002, ch. 1, p. no. 1)

INPUT – OUTPUT MODEL :

Fig. 1.2



(Source: O.P.Khanna, Industrial Engineering & Management Ch. Production & Productivity, Dhanpatrai & sons, Delhi – 1996, Ch.2, P.no. 2.4)

Simply, “Productivity” means “output divided by input”.⁽⁸⁾

$$\text{Productivity} = \text{Output/Input}$$

This definition applies to enterprise, an industry or an economy as a whole. “Productivity” is simply the ratio between the amount produced and the amount of resources used in the course of production.”⁽⁹⁾ The resources may be:

[Unit of resources is in brackets]

- Land (Hectors)
- Materials
- Plants, Equipments, Machinery and Tools (Machine hours)
- Men (Men hour)

- **‘Productivity’ of Land:**

Sachin used natural fertilizer for his land, after which the yield of rice increased from 200 quintals/hector to 300 quintals/hector. ‘Productivity’ of land has increased by 50%.

- **‘Productivity’ of material:**

One ton (1000 Kgs.) of hot rolled steel would yield 800 kgs. Of cold rolled steel; the rest being scrap. Shalini changed the process parameters that enabled 900 Kgs. Of cold rolled steel to be generated from same amount of hot rolled steel.

- **Productivity of Machine :**

Output of the machine shop was 100 pieces per shift. Prashant introduced few technical changes in the machine. These changes increased the output to 120 units per shift.

- **Productivity of men (people) :**

A worker producing 100 pieces is now able to produce 130 pieces after undergoing a training session. ‘Productivity’ of worker has increased by 30%.

- **OTHER DEFINITION OF ‘PRODUCTIVITY’:**

The definition and measurements of ‘Productivity’ has undergone a change over the years as role and relevance of ‘Productivity’ changed. ⁽¹⁰⁾

Centuary	Author	Year	Definition
Eighteenth Centaury	Quesnay	1766	The term ‘Productivity’ comes for the first time
Nineteenth Centaury	Litre	1883	“Faculty to Produce”
Twentieth Centaury	Early	1900	“Relationship between output and the means employed to produce this output.”
”	OEEC	1950	“Productivity is the quotient obtained by dividing output by one of factors of production.”
”	Davis	1955	“Change in product obtained for the resources expanded.”
”	Febricants	1962	“Always a ratio of output to input”.
”	Kendrick & Greamer	1965	“Functional definitions for partial, Total factors and total Productivity.”
”	Siegal	1976	“A family of ratios of outputs to inputs.”
”	Sumanth	1979	“Total Productivity” model.-the ratio of tangible output to tangible input.”
”	Goldratt and smith	1987	“Productivity is minimizing the use of resources required to produce an output desired by the customer.”

‘Productivity’ of a production system is analogous to the efficiency of a machine. Just as it is desired to increase the efficiency of a machine, it is also to raised aimed to raised Productivity within the available resources.

- **CALCULATION OF 'PRODUCTIVITY':**

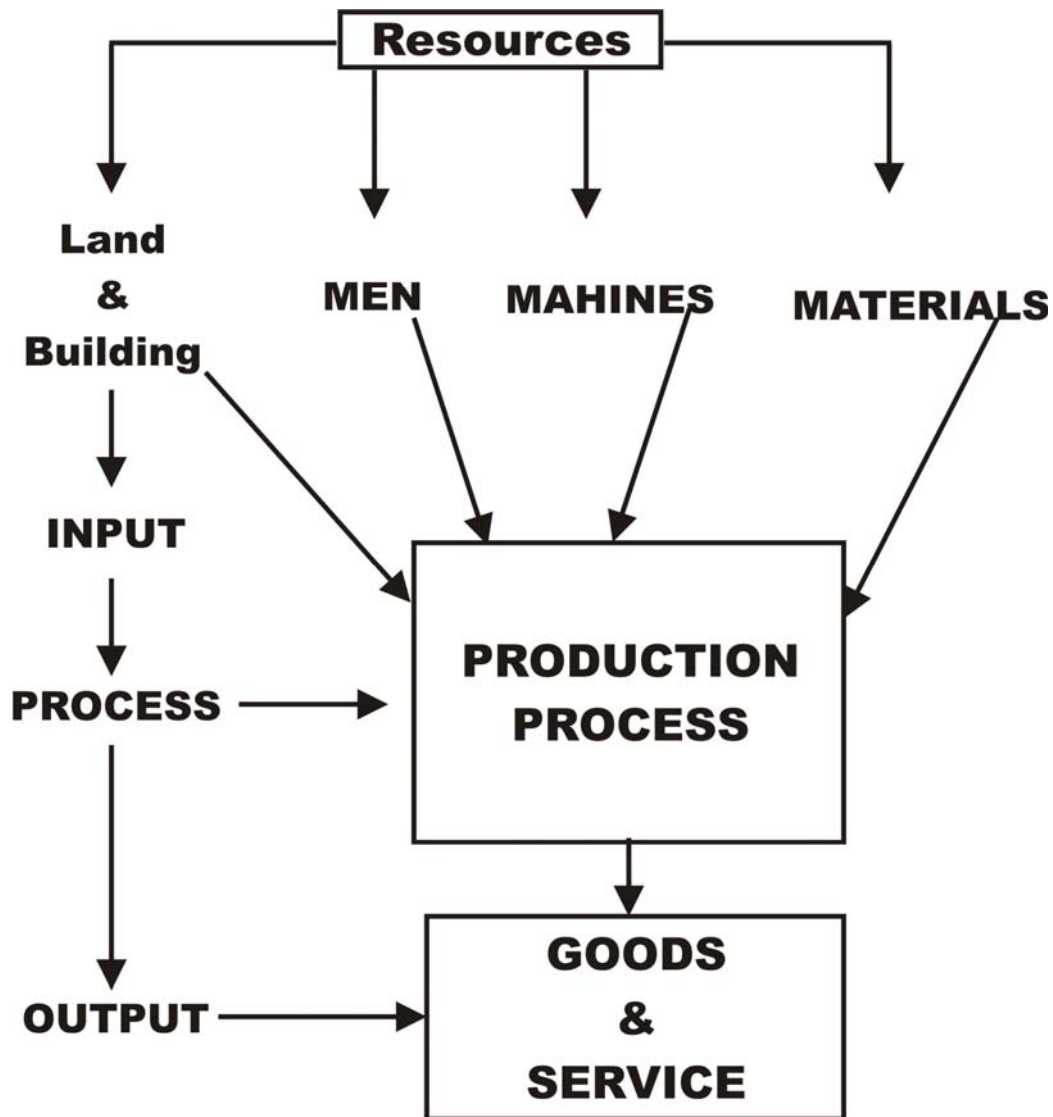
	Plant 'A'	Plant 'B'
No. Of Workers	200	300
No. of items produced per unit time	10	20

Therefore, 'Productivity' = $10/200 = 1/20$
= $20/300 = 1/15$

(**Source:** O.P.Khanna, Industrial Engineering & Management Ch. Production & Productivity, Dhanpatrai & sons, Delhi – 1996, Ch.2, P.no. 2.4)

- **INPUT – OUTPUT BLOCK – DIAGRAM :**

Figure 1.3



(Source: Dr. B. Kumar, Industrial Engineering, Khanna Publishers, Delhi, 3rd Edition – 1982 & 4th edition – 1985, ch. 1,2-3, p.no. 4)

The world 'Productivity' is bandied about so frequently that it assumes the proportions of a many – splendored cure – all. It can be yanked back into perspective by considering what it is not and what it is:

- It is not a technique to make workers work harder. It is an attitude that supports workers to work together and more effectively.

- It is not a concept of production quantity. It indicates the relationship of output to input, increasing production output may or may not improve Productivity, depending on the inputs utilized to achieve that production increase.
- It is not a measure of profitability. It points out the efficiency of operations and thereby suggests their profitability but inefficient operations can occasionally be profitable if the product gets a favoured market status.
- It is not a guaranteed way to reduced inflation. It may be a tempering factor but it is only one among many economic factors that determines the price trend.

The simplest statement of ‘Productivity’ is that, it is just the ratio of output to input. An increase in the ratio, when properly adjusted for price changes, indicates greater production efficiency. It is thus a sensor in the production control feedback loop. If a ratio lower than desired is a cue to initiate corrective actions.

In this section, we want to define ‘Productivity’ more precisely and examine its various levels in the economy. Our intent is to provide some order in the jungle of terminology surrounding the term ‘Productivity’. ‘Productivity’ can be expressed on a total factor basis or on a partial factor basis.

- **TOTAL FACTOR PRODUCTIVITY :**

A total productivity is a single figure that states the efficiency of an entire organization. Its formulation consists “an inclusive statement of the value of the products produced and a summary value of its inputs.” Dollar dimensions are generally used for both the numerator and denominator to grant diverse products and resources to be shown in equivalent terms. So, “total factor ‘Productivity’ is the ratio of outputs over all inputs”.⁽¹¹⁾ A Total Productivity is calculated with under written formula :

$$\text{Total Productivity} = \frac{\text{Goods + service}}{\text{Materials + Labor + Overhead + Capital + Energy}}$$

From this basic presentation, adoptions can be made to represent more closely the functions of a particular organization. The purpose of customizing the index is to show the firm's objectives. Eventually, many versions have been developed. For instance, one organization might believe that purchased of raw material represent someone else's Productivity effort and should therefore be excluded from the user's input. Other firms with large material inputs might disagree that the exclusion is justified. Still another firm might have small and constant energy usage, suggesting that the energy input can be ignored in the model. An aluminum producer would of course feel differently. One of many possible models has the following formula:

- **TOTAL PRODUCTIVITY INDEX :**

$$= \frac{\text{Sales} + \text{Inventory change} + \text{Plant}}{\text{Material} + \text{Labor} + \text{Service} + \text{Depreciation} + \text{Investment}}$$

In an effort to increase productivity of labour, company may install more machinery. Then productivity of labour will go up bringing down the capital productivity. Partial productivity that normally uses only one resource at a time fails to grasp this paradox.

Historically labour and capital were considered to be the most important contributors in the process of production. Therefore in the Total Productivity Model developed by John W. Kendrick in 1951, he has taken labour and capital as only two input factors.

For example: - production worth 100 lacs Rs. was manufactured and sold in a month. It consumed Rs. 20 lacs labour hours and Rs. 55 lacs worth capital.

$$\text{Then, Total Factor Productivity} = \frac{100}{(20 + 55)} = 1.33$$

Advantages	Disadvantages
1. Data is easy to obtain.	1. Does not consider impact of materials and energy inputs, though materials normally form 60% of the product cost.
2. Appealing from the viewpoint of the corporate and the National economist.	

- **TOTAL PRODUCTIVITY MODEL:**

Total Productivity Model developed by David J. Sumanth in 1979 is further extension of earlier models, Sumanth considered 5 items as inputs, those were Human, Material, Capital, Energy and an item called other expenses. This model can be applied in any manufacturing or service organization.

Model can be summarized as follows:

Productivity-Concept, Measurement and Improvement

$$\text{Total Productivity} = \frac{\text{Total Tangible Output}}{\text{Total Tangible Input}}$$

$$\begin{aligned} \text{Total tangible output} = & \text{Value of finished units produced} \\ & + \text{partial units produced} \\ & + \text{Dividends from securities} \\ & + \text{Interests from bonds} \\ & + \text{Other incomes.} \end{aligned}$$

$$\begin{aligned} \text{Total tangible input} = & \text{Value of human inputs (employees)} \\ & + \text{capital inputs} \\ & + \text{materials purchased} \\ & + \text{energy inputs} \\ & + \text{other expenses (taxes, transport, office etc.)} \end{aligned}$$

Advantages	Disadvantages
1. All quantifiable inputs are considered.	1. Data is difficult to compute.
2. Sensitivity analysis be done.	2. Does not consider intangible factors of input and output.
3. Provides both firm level and operational unit level productivity.	

(**Source:** Dr. Shrinivas Gondhalekar & Dr. Uday Salunkhe, ‘Productivity Techniques’, Himalaya Publishing House – Mumbai, 1st Edition – 2002, ch. 1, p. no. 7)

- **COBB DOUGLAS FUNCTION:**

Cobb and Douglas recognized labour and capital as two major resources and developed a mathematical expression taking output as function of these two resources.

The function is called as Cobb-Douglas function. Which can be put down as:

$$Q = a L^d K^f$$

Where, Q = output,
L = Labour input,
K = Capital input,

A, d, and f are constants to be estimated.

An interesting factor of this model is

That $d = \frac{\delta Q}{\delta L}$ and $f = \frac{\delta Q}{\delta K}$

But $\frac{\delta Q}{\delta L}$ is partial productivity of labour

And $\frac{\delta Q}{\delta K}$ is partial productivity of capital

Thus Cobb-Douglas function provides a simple measure to understand trade off between labour and capital.

(Source: Dr. Shrinivas Gondhalekar & Dr. Uday Salunkhe, 'Productivity Techniques', Himalaya Publishing House – Mumbai, 1st Edition – 2002, ch. 1, p. no. 9)

- **AMERICAN PRODUCTIVITY CENTER (APC) MODEL:**

American Productivity Center has been advocating a productivity measure that relates profitability with productivity and price recovery factor.

- **THIS MEASURE IS DERIVED AS FOLLOWS :**

$$\begin{aligned} \text{Profitability} &= \frac{\text{Sales}}{\text{Costs}} \\ &\quad \text{OR} \\ &= \frac{\text{Output Quantities x Prices}}{\text{Input Quantities x Unit Costs}} \\ &\quad \text{OR} \\ &= \text{Productivity x Price Recovery Factor} \end{aligned}$$

(Source: 'Productivity Techniques' ch.1 P. No. 10)

The APC model is different from other models in its treatment, by inclusion of Price Recovery Factor.

- **PRICE RECOVERY FACTOR:**

It is a factor that captures the effect of inflation. The changes in this factor over time indicate whether changes in input costs are absorbed, passed on, or overcompensated for, in the price of firm's output.

Thus inclusion of this factor will show whether gains or losses of a firm are due to changes in productivity or it merely indicates the fluctuations in the prices of the material consumed and sold.

- **PARTIAL PRODUCTIVITY :**

Productivity measurement at the unit level or entire organization level yields a figure that considers the efficiency of all resources. It is akin to the return on equity figure which shows the effective utilization of invested capital. These indexes are strategic yardsticks. Efficiency of individual operation and effectiveness of specific capital expenditures are lost in the inclusive indexes. "A more valuable rating for the utilization efficiency of specific resources is achieved by calculating the productivity index for individual factors, that is called "Partial Productivity".⁽¹²⁾ The other definition of 'Partial productivity' is "Ratio of output to one class of input."⁽¹³⁾

In a labour – oriented industry, the productivity of workers or employees is crucial. The conventional method to determine 'labour productivity' is to weight each product produced by its standard time and summarize the weighted values to achieve the total output, this is then the numerator that is divided by the total labour hours to calculate the labour factor productivity index. Labour productivity is measured using utilization of labour-hours, where as Capital productivity is measured in Rupees. A measure of 'Partial factor productivity' as a labour factor is found out from:

$$\text{Labour Productivity} = \frac{\text{Production in standard hours}}{\text{Possible (or actual) man hours}}$$

CASE

As a part of new assignment, Parag of Pop-Corn Products was asked to identify areas for productivity improvements. He collected data on all the inputs and outputs of previous year's operation being transformed into equivalent of money units. The table below gives details with all figures in Lacs Rupees.

Table 1.1

	Rs. '000000
OUTPUT	1000
INPUT	
Material	200
(Human) Labour	300
Capital	300
Energy	100
Other Expenses	50

(Source: Dr. Shrinivas Gondhalekar & Dr. Uday Salunkhe, 'Productivity Techniques', Himalaya Publishing House – Mumbai, 1st Edition – 2002, ch. 1, p. no. 5&6)

Parag plans to calculate value of partial productivity to aid in his study.

Please help him in his endeavor.

Solution:

Partial productivity of various inputs is as follows :

Material Productivity	=	1000/200	= 5.0
Labour Productivity	=	1000/300	= 3.3
Capital Productivity	=	1000/300	= 3.3
Energy Productivity	=	1000/100	= 10.0

$$\text{Productivity of Other Expenses} = 1000/50 = 20.0$$

Advantages	Disadvantages
1. Easy to understand.	1. Misleading if used alone.
2. Easy to get data.	2. Can not explain over all cost increase.
3. Diagnostic tool to pinpoint a rear of improvement.	3. Profit Control is not precise.

3. CONCEPT OF 'PRODUCTIVITY' :

At Westinghouse, they were given top priority emphasis on 'Productivity' and 'quality' improvement, not only it was necessary for the well-being of our corporation, but also they believe that it was vital for the economic survival of our nation and for our national security.

About three and one-half years ago, we started this corporate wide top-priority emphasis on 'Productivity' improvement for two basic reasons. First was our concern over increasing international competition. We didn't want this to be a one-shot effort but rather we wanted productivity improvement to become a way of life throughout the corporation.

In early 1979, we formed a corporate committee on 'Productivity'. Initially, committee spent many months studying the situation first in the United States, then in Europe, and then in Japan. Significantly, it was not anticipate at the outset, that most of their studies would find the Japanese to be so formidable. In my case, I have been visiting Japan for almost 20 years. But for the first 17 years, as a teacher and only the past three years, as a student. "This "Role Change" makes an immense difference".

(14)

While discussing the concept pf productivity, B. K. Bhara, is of the opinion that productivity is an index of efficiency disclosing the effectiveness of the combined factors used in producing goods or services. Productivity is thus the power to produce and considers the capacity for growth and all material progress of the business. Men, machines, material, capital power and services all give contribution to productivity

and the extent to which each does so may be determined by the ratio of output to input. The more technical definition of productivity has been given by Alderson and Sessions:

The term “Efficiency” points out one phase of the subject: to achieve the same result with less effort. The term “Effectiveness” belongs to a slightly different objective: to get an improved result from the same effort. The word “Productivity” is broad enough to cover both.

So, ‘Productivity’ is a trend of efficiency disclosing the effectiveness of the individual or combined factors used in producing goods or services. Thus, “Productivity is the power to produce and indicates the capacity for growth and all material progress of the business”.⁽¹⁵⁾ Men, machines, materials, capital, power and services all contribute to ‘Productivity’ and the extent to which each does so may be ascertained by the ratio of output to input. The output may be expressed in terms of quantity, sales value or cost and the input may be expressed in terms of quantity, weight of materials, hours worked or money value of each or combined factors of production.

4. ‘PRODUCTIVITY’ MOVEMENT IN INDIA:

With the launching of the First Five year Plan, the need for improving the efficiency and Productivity of workers was felt by the government and the employers. In 1952, an International Labour Organization’s Mission on ‘Productivity’ visited our country, and after a thorough study, they reported employers. the Mission initiated some Productivity work in Delhi, Bombay, Calcutta and Ahmedabad, which showed encouraging results. at Delhi, the improved Productivity enabled the overhauling time of the buses to be cut substantially and it would have been possible to increase the number in service by 50% without purchasing the additional vehicles. as a result of the work of the first I. L. O. Mission, the government of India decided in December 1953, to request this organization to provide technical assistance in the establishment of a ‘NATIONAL PRODUCTIVITY CENTRE’. In September 1954, another I.L.O. Mission visited India, made a number of visits to certain selected factories and recommended measures for improving Productivity in those establishments.

Employers and labour. The objects of the Council are to promote productivity consciousness in all sectors of the national economy, disseminate knowledge of the concepts and techniques of 'Productivity' and demonstrate their validity in practical application. The Council has concentrated its attention so far to Productivity in manufacturing industries, public utilities and commercial organization.

• **THE PRINCIPLE ACTIVITIES OF THE NATIONAL PRODUCTIVITY COUNCIL CONSIST OF:**

- Planning, organizing and presenting training programmes directly and through Local Productivity Councils (LPC) and other bodies.
- Organizing local, regional and national seminars and conferences.
- Conducting 'Productivity' surveys and assisting the implementation of improvements.
- Sponsoring teams for 'Productivity' studies abroad.
- Publication of the 'Productivity Journal' and 'NPC INFORMATION' (monthly).
- Publication of Reports of studies Teams.
- Technical inquiry service.
- Development of Local productivity councils and guiding and supporting their activities.
- Preparation of manual training and case examples of the impact of 'Productivity' techniques.
- Supporting the activities of 'Asian Productivity Organization'

(Source : S.K. Srivastava, R.S. Nigam, Bishamber Sahai, Mrityunjoy Banerjee, 'Industrial Economics', S.Chand & Co., Delhi – 1967, Ch. 17, p.no. 240,241)

- **NATIONAL PRODUCTIVITY COUNCIL VISION :**

- NPC aims at combining its promotional mission with a totally professional mission with a totally professional approach to provide world class services needed by Indian industry to become internationally competitive in a global economy.
- NPC aims are propagating productivity as an evolving concept, which includes attention to special issues, and concerns relating to quality, environment, energy, integrated rural and community development, women workers etc. 'Productivity' shall increasingly be viewed in this context and not in the conventional sense of more production increases with constant resources.
- NPC's thrust is on providing modern and high quality productivity-related services to sectors not adequately addressed by others, especially the small-scale industry and informal sector.
- NPC is also a change agent, aiming to assist the central and state governments, local bodies and other organizations in improving the quality, efficiency and productivity of public services.
- NPC does not seek to supplant the private sector consultancy organization or specialized bodies, through it would complete with them to the extent that it helps keep its professional skills upgraded and maintain its market credibility.

(Source: Website: - WWW.npcindia.org)

5. IMPORTANCE OF 'PRODUCTIVITY' :

'Productivity' in industrial undertaking has a great importance in recent years. With the increased competition in national and international markets and the limitation of resources, the term "Productivities" has become a slogan for efficient planning, execution and management."⁽¹⁶⁾ In fact, it is regarded as a barometer or bench-mark of a country's industrial progress. "In the words of E. Claque, 'Productivity' in fact,

has given us not only bread and butter but also jams” ⁽¹⁷⁾ the relatively, “Higher standard of the Americans is the direct fruit of higher Productivity.” It suggests the cumulative influence of the operation of a large number of separate, though interrelated influence, such as technological improvements, the rate of operation, the degree of efficiency achieved in various processes, the availability of suppliers and the flow of materials and components, as well as the employer-employee relations, the skill and the efforts of the workers and the effectiveness of management.

‘Productivity’ is a mathematical concept and it is quite useful in comparing the efficiency in the use of resources in two or more undertaking. This is done by calculating and comparing the ‘Productivity’ indices in different industries. These indices help in the formation of price policies by the Government Undertaking and fixing of fair wages for the workers. These are important for a comparison with the industrial undertaking in different countries and for estimating the progress made in the various sectors of the economy. Thus, ‘Productivity’ has its role in national and international policy making.

‘Productivity’ indices are significant in inductive and analytical study of industrial conditions and prospects. “Dr. Mehta has discussed the technique and utility of various indices in this respect. These are Temporal Productivity Indices, Spatial productivity Indices, Cross-Sectional Productivity Indices etc.” ⁽¹⁸⁾

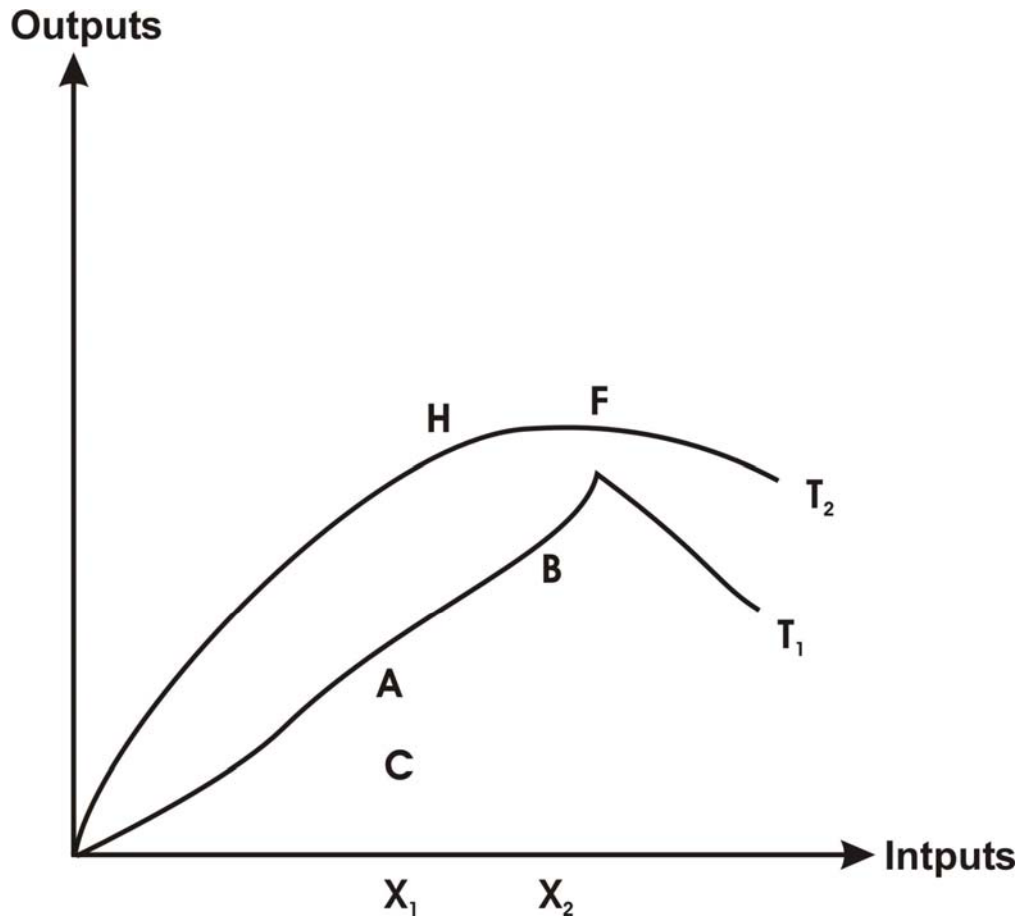
The importance of productivity to economic growth and development can hardly be over-emphasized. It remains the basis problem of economic progress, as it is needed at both the early stages of development as well as in the permanent process of re-equipping the production apparatus of any nation.

Wen (1993) employing the use of a diagram revealed that these are three sources of growth. First is the traditional source of growth that is covered by the move from X_1 to X_2 . The second source of growth is rooted in institutional innovation that removes restraints in resources allocation such that more output is produced with the same amount of inputs. The move from the interior point C to the frontier point A describes growth on account of institutional re-engineering. The third source of growth is

technological progress which shifts the production function outwardly, that is from T_1 to T_2 since initially is not available.

Source of Growth:

Figure 1.4:



(Source: Wen, 1993 P.No. 3

S.K. Srivastava, R.S. Nigam, Bishamber Sahai, Mrityunjoy Banerjee, 'Industrial Economics', S.Chand & Co., Delhi – 1967, Ch. 17)

'Productivity' as a source of growth has moved to center stage in analyses of growth of developing economics in recent years. Earlier, the focus was mainly on the growth of capital through greater utilization of resources. As investment ratio have increased essentially in most developing countries and the scope for further increase becomes

more limited, attention has naturally turned to productivity improvements which gives a complementary way to growth by getting more out of limited resources.

The key to growth is an increase in 'Productivity' (Wonnaco++and Warnaco++, 1986)

Thus:

To this effect, 'Productivity' is discussed at every stage because of its direct relationship with the standard of living of a people. At the level of an individual, it is rational to argue that, the standard of living of any man is the extent to which he is able to give himself and his family with the things that are necessary for sustaining and enjoying life. The greater the amount of goods and service produced in any economy or imported into such economy, the higher its average standard of living will be. Uche (1991) identified four important channels by which higher productivity impacts on standard of living. Larger supplier both of consumer goods and of capital goods at lower costs and lower prices.

At the national level, stable growth in "Productivity" underwrites non-inflationary increases in wages as well as solves problems of unemployment, increased trade deficit and an unstable currency. (Exchange rate) In business, 'Productivity' improvements can guide to more responsive customer service, increased cash flow, improved return on assets and greater profits. In the context of economic theory, more profits will convert to availability of investible funds for the purpose of capacity expansion and the creation of new jobs; hence, increased productivity tries to solve the unemployment problem. Enhanced 'Productivity' will equally contribute to the competitiveness of a firm or an economy in both domestic and foreign markets. For example, if labour productivity in one country decreases in reference to productivity in other countries producing the same goods, a competitive imbalance will be arised involving divergence in cost function. If the higher costs of production are passed on, the economy's industries will lose sales as customers are justified turning to the lower cost suppliers. Alternatively, if the higher costs are internalized by manufacturing units, their profit will decrease.

A part from the link between 'Productivity' and the general well being of a nation, 'Productivity' is of great significance in economic interpretation. For example, when

it is mixed with population and output trends, it is considered in economic growth models to assume output and employment, as well as the distribution of manpower and other resources between different sectors of an economy or industry. In advance, 'Productivity' gives the basic estimate for interpreting the relative dynamic of different economic activities. Again, interests in 'Productivity' and what is happening to it are technical changes because economic growth, technical change and 'Productivity' are inter connected.

6. CLASSIFICATION OF PRODUCTIVITY :

In the context of modern management the term 'Productivity' is used with numerous adjectives. There is productivity of management, which actually indicates the efficiency of management in planning, co-ordination and control. There is material productivity showing the quality of material used and its handling; then there is productivity of labour, productivity of machine, productivity of marketing etc. Again there are terms like, "**Actual Productivity**," "**Potential Productivity**", "**Volume Productivity**" and "**Real Productivity**."

"'Actual Productivity' is the current level of productivity that may be higher or lower than the expected rate of productivity." ⁽¹⁹⁾ It depends upon the existing combination of the various factors of production. "'Potential Productivity' is the rate of efficiency of productivity that we would desire to achieve in order to have a self-sustained rate of economic growth". ⁽²⁰⁾ The term "'Volume Productivity' belongs to cost concept". ⁽²¹⁾ When output is understood on a large scale, unit cost (fixed cost) is declining. Contrariwise, when output diminishes, unit cost may be desired to go up. A question might be raised: Does 'Productivity' rise with large scale output simply, because costs happen to be low? Not necessarily. 'Productivity' might remain unchanged in the long run because low cost does not mean higher 'Productivity'. "'Real Productivity' suggests a basic and permanent change in the volume of output, which can be obtained by the use of a certain amount of labour force." ⁽²²⁾ This is usually, caused by the changes in the technique and planning of production.

“According to Bloom and Herbert, improvement in real ‘Productivity’ may be the greatest in times of business recession when production is falling”.⁽²³⁾ But this contention has not yet been tested quantitatively, and is of doubtful validity.

7. MEASUREMENT THE ‘PRODUCTIVITY’ : ⁽²⁴⁾

The measurement of Productivity depends on two essential factors. First, the compiling of performance data based on principles which were considered to make the Budget and the basis of measurement. A basic principle of Management Control is that “The person to be measured must never be responsible for controlling the basis of measurement. This principle is cardinal rule. Secondly, the basis of measuring the operations and performance must be continuous, fixed on a prescribed format.

- **MATERIAL PRODUCTIVITY:**

Material is the most important part in producing a product in the factor. Material productivity is determined by any one of the ratios.

$$\begin{aligned} \text{Productivity} &= \text{Material cost / No. of units produced} \\ &= \text{Indirect material cost / Direct material cost} \\ &= \text{Direct material cost / Production cost} \\ &= \text{Direct Material consumed / No. of employees} \\ &= \text{Rejected or waste or scrap / Total material consumed} \end{aligned}$$

- **LABOURMEN ‘PRODUCTIVITY’:**

Where most of the work is done by hand labour, measurement of labour ‘Productivity’ is essential. Usually, all factor labour, both direct and indirect, should be included:

Labour ‘Productivity’

$$\text{In terms of hours} = \frac{\text{Production in Standard hours}}{\text{Possible (or actual) man hours}}$$

$$\text{In terms of money} = \frac{\text{Sales value (or cost) of output}}{\text{No. workers}}$$

$$= \frac{\text{Direct wages}}{\text{Sales value}}$$

$$= \frac{\text{Indirect Wages}}{\text{Direct wages}}$$

$$= \frac{\text{Direct Wages}}{\text{No. of units}}$$

- **MACHINE PRODUCTIVITY:**

In a high mechanized factory, capacity utilization of machinery is more important than full utilization of other factors. Machine Productivity is determined by.

$$\text{Material Productivity} = \frac{\text{Output in standard hours}}{\text{Planned (or actual) machine hours}}$$

- **TOTAL ‘PRODUCTIVITY’:**

Material, Labour and Overhead in terms of money value and combined productivity can be obtained by the ratio of output to input in terms of money.

Overall Productivity is measured by:

Return on capital Employed = Profit / Capital Employed

= Profit / Sales X Sales / Capital employed

= Cost of Output / Cost of Input

8. ADVANTAGES OF HIGHER ‘PRODUCTIVITY’:

It is fact that the higher is the ‘Productivity’ the higher is the volume of production and sales, the lower is the cost and the higher is the profit. ‘Higher Productivity’ provides greater stability to the concern and additional incentive for expansion and investment, widespread market, better paying capacity and overall prosperity. Thus, “Higher Productivity is not only beneficial to the concern but also beneficial to workers in the industry, consumers and finally to the nation”.⁽²⁵⁾

Advantages of higher or increased Productivity can be described as under:

Higher Productivity ensures opportunity for raising the general standard of living, including opportunity for

- Large supplied both of consumer goods & capital goods at lower cost and lower prices.
- Higher real incomes.
- Improvements in working and living conditions.
- Strengthening the economic foundation of human being.
- Decrease in cost prices.
- Increased sales and profit.
- Development and growth of industry.
- Better opportunity for new market.

- Better working conditions for the worker and possibly, deduction in working hours.
- Higher wages and incentives.
- High morale of workers and staff.
- Better quality and low price for the customer.
- Increase of national wealth.
- Increase of per capita income and
- Improve standard of living for the people.

9. 'PRODUCTIVITY' AND PRODUCTION:

The word 'Productivity' is often confused with the word 'Production'. Many people think that the bigger the production, the bigger the 'Productivity', that is not necessarily true. Let us clarify the concept of "Production and Productivity."

"'Production' is related to the activity of producing goods and services." While "'Productivity' is related to the efficient utilization of resources (inputs) in producing goods or services (outputs)"⁽²⁶⁾

'Production in quantitative terms is the quantity of output manufactured. While Productivity is the ratio of output produce to the inputs used. So, Production and Productivity are different terms from each other.

CASE

Shalini was busy going through production and machine hour consumption report of the past three months.

Table 1.2

MONTH	INPUT (Machine Hours)	OUTPUT (No. of Units)
MARCH – 2006	90,000	99,000
APRIL – 2006	1,00,000	1,00,000
MAY – 2006	1,50,000	1,35,000

(**Source:** Dr. Shrinivas Gondhalekar & Dr. Uday Salunkhe, 'Productivity Techniques', Himalaya Publishing House – Mumbai, 1st Edition – 2002, ch. 1, p. no. 4)

The above data clearly points out that there has been an increase in 'production' with a simultaneous increase in machine hour consumption. Shalini was not sure whether it

really indicated a rise in ‘Productivity’ or merely an increase in ‘Production’. She obtains an answer in this under written fashion.

- **SOLUTION :**

‘Productivity’ (Per Machine Hour) = Production Units / Machine Hours

‘Productivity’

For March - 2006 = 99,000/90,000 = 1.1

For April - 2006 = 1,00,000 / 1,00,000 = 1.0

For May - 2006 = 1,35,000 / 1,50,000 = 0.9

Table 1.3

MONTH	INPUT (Machine Hours)	OUTPUT (No. of Units)	PRODUCTIVITY
MARCH – 2006	90,000	99,000	1.1
APRIL – 2006	1,00,000	1,00,000	1.0
MAY – 2006	1,50,000	1,35,000	0.9

(Source: Dr. Shrinivas Gondhalekar & Dr. Uday Salunkhe, ‘Productivity Techniques’, Himalaya Publishing House – Mumbai, 1st Edition – 2002, ch. 1, p. no. 4)

It can be said from the table that while ‘Production’ is rising from March to May, ‘Productivity’ is declining. Normally, when manufacturers are booming it is worth increasing ‘Production’ so as to cover market-share even if ‘Productivity’ does not improve. Oppositely during the slack time when selling becomes difficult, increasing Productivity will only result in increasing unsold stocks. It is that’s why important to concentrate on increasing the ‘Productivity’ as it helps in maintaining the

‘Profitability’. Today, organizations are trying ‘Productivity’ improvements as cost reducing and profit centre as well.

10. ‘PRODUCTIVITY’ AND ‘PROFITABILITY’ :

‘Productivity’ & ‘Profitability’ are two basic factors. The success of business firm can be measured or evaluated from a number of factors and there are many quantitative as well as qualitative criteria that can be used for this purpose.

‘Productivity’ has been defined clearly at many times and in many ways. For example, “Prof. Michel Porter of the Harvard Business School said in his book, “The Competitive Advantage of National” that: “The only meaningful concept of competitiveness at national level is national productivity.”⁽²⁷⁾ This theme was echoed by the Ministry of International Trade & Industry Commission on Industrial Productivity in the opening sentence of its report entitled ‘Made in America-Regarding the Productivity Edge’: “To live well, a nation must produce well.”⁽²⁸⁾ Taking this down to the micro level, the secretary-General of the APO has said: ‘Firstly and perhaps fundamentally, there must be total commitment to productivity endeavor at the enterprise level’.⁽²⁹⁾ At the macro level, there is a need to review the equality of infrastructure and the development potential of the various industries as well as to know systematic programs for technology and skills promoting and management improvement. At the socio-cultural level, constant efforts are needed to establish a more positive attitude towards ‘Productivity’

‘Productivity’ is defined as “the ratio of output to inputs, in the form of goods and services and input are the resources which are put to convert into output.”⁽³⁰⁾ It is the quality or state of being productive. It is the standard that shows how efficiently the material, the labour, the capital and the energy can be utilized. Measurement and analysis of productivity can help to find out areas for positive actions towards planning of organization.

‘Profitability’ is defined as “the rate profit earned on capital employed and production measured in terms of labour, materials and other individual resources of the business.”

⁽³¹⁾ There is definite positive relation among time series data measuring ‘Productivity’ change the ‘Profitability’ will also change. If the ‘Productivity’ increase to the extent of cost increase, ‘Profitability’ remains unchanged or if the ‘Productivity’ decreases, the ‘Profitability’ also decreases. It can be also said that if the selling prices are increased, the profitability of an organization will also increase but it will have a zero effect on the productivity. “Dr. J.P. Shrivastava says: “In between cost and profitability, there are actually so many other factors besides ‘Productivity’ ”. ⁽³²⁾

11. ‘PRODUCTIVITY’ AND ‘PERFORMANCE’:

The word ‘Productivity’ is often confused with the word ‘Performance’. Many people think that ‘Productivity’ and ‘Performance’ are same but ‘Productivity’ and ‘Performance’ are different from each other. ‘Efficiency’, ‘Productivity’ and ‘Performance’ – these are terms, we want to use in exchangeable in discussing behavior and achievement. “‘Productivity’ refers to a ratio of outputs divided by inputs but ‘Performance’ is a broader term incorporating ‘efficiency’ and ‘Productivity’ in overall achievement.” ⁽³³⁾ So, ‘Productivity’ is included in ‘Performance’. It can be said that “ ‘Productivity’ takes into account output in relation to input. ‘Performance’ takes into account output only.” ⁽³⁴⁾

$$\begin{aligned} \text{‘Productivity’} &= \text{Output / Input} \\ &= \text{Performance Achieved / Resources Consumed} \end{aligned}$$

In ‘performance’, we consider only the output. In other words, it is the ratio of the same parameters under different condition. A ‘Performance’ means the comparison of actual output with some standard or expected output.

$$\text{‘Performance’ Index} = \frac{\text{Actual work done}}{\text{Ideal or standard expected work}}$$

CASE:

It takes 3 mts. of cloth to make a coat. In a day, Darshan is expected to make 50 coats. He makes 40 coats from 111 mts. of cloth.

(**Source:** Dr. Shrinivas Gondhalekar & Dr. Uday Salunkhe, 'Productivity Techniques', Himalaya Publishing House – Mumbai, 1st Edition – 2002, ch. 1, p. no. 7)

- **SOLUTION:**

Darshan's 'Performance' = 40 coats.

Darshan's 'Performance' index = $40/50 * 100 = 80 \%$

Darshan's 'Cloth' 'Productivity' index
= $120 \text{ mts. } (40*30)/111 \text{ mts. } * 100 = 108\%$

'Productivity' of cloth = $40/111 = 0.36 \text{ coats/mts.}$

12. 'PRODUCTIVITY' AND 'PROSPERITY' :-

There is a certain relation between 'Productivity' and 'Prosperity'. As the 'Productivity' increase, all the industries will be become more profitable. Employees can be given attractive wages and other incentives. These benefits upgrade the employees' purchasing power and will help to create better standard of living. As the demand of products increase, industrial activities and national wealth also increase. By developing, social facilities, we make our society prosperous.

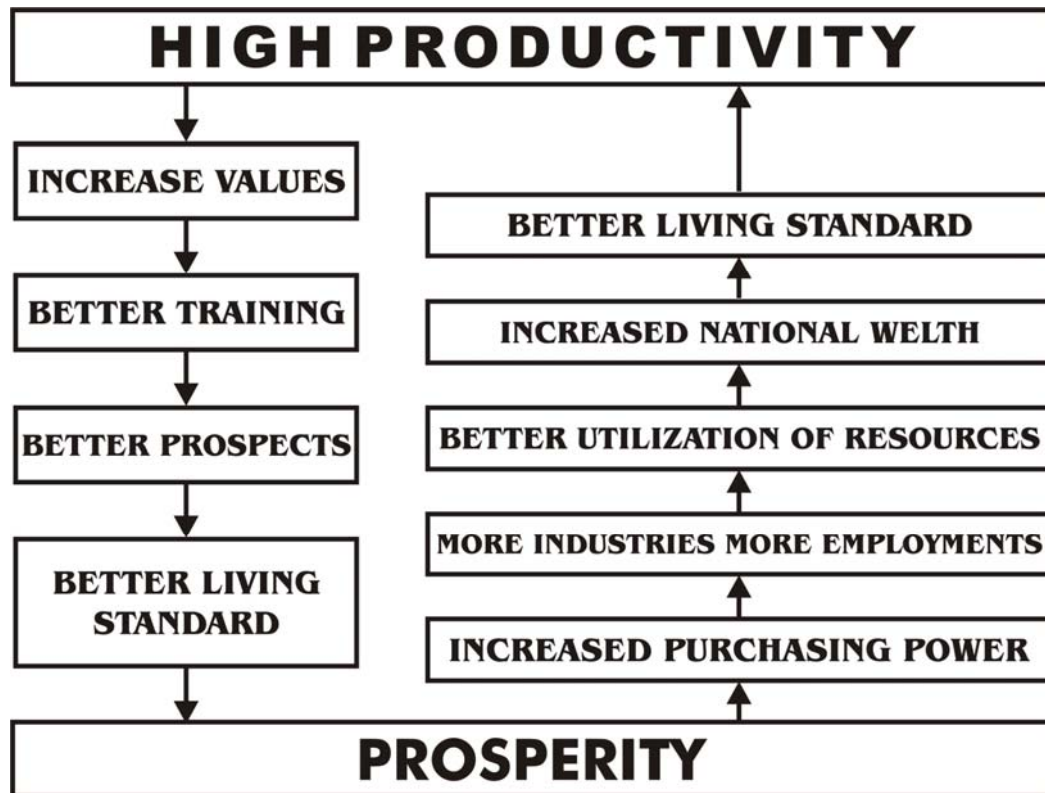
“'Productivity' means the ratio of output to all inputs”. While “'Prosperity' means the whole industry will be productive and as a point of view of wealth, the whole industry will be profitable.”⁽³⁵⁾

Thus, 'Productivity' and 'Prosperity' have strong relations between each-other. So that, 'Productivity' is most significant part in making life and nation very prosperous. The relation between 'Productivity' and 'Prosperity' will be shown by following

block diagram. There is a concept of 'Prosperity' which comes into existence by high 'Productivity'.

Block-Diagram:

(Figure 1.5)



(Source: Dr. B. Kumar, Industrial Engineering, Khanna Publishers, Delhi, 3rd Edition – 1982 & 4th edition – 1985, ch. 1, 2-3, p.no. 8)

13. 'PRODUCTIVITY' AND 'QUALITY':

In the present scenario, there is cut-throat competition in the business. We have to do many things like Production, Quality, maintaining, marketing, selling, advertisement, quantity oriented products, consumer services, consumer care etc. in the business. One of the reasons of competitive position of organizations is that the quality of goods and services produced does not fulfill the customer's expectations. When quality – the appropriateness of design specifications to function and use along with the degree to which outputs confirm to the design specifications is poor, the demand for goods and services can decrease quickly. But what does this have to do with 'Productivity'.

There is a clear connection between 'Productivity' and 'Quality'. Normally, when 'Quality' increase, so will 'Productivity' also. Why? Because, waste is eliminated. The amount of resources required to produce good output is reduced, so 'Productivity' will increase.

There is also one opinion that 'Productivity' and 'Quality' move in opposite directions. Think about, such processes as typing or data entry at a computer keyboard.

As your speed increases, what will be happen? You tent to make more errors, especially when you go "very fast". Logically, it may be noted that if you type slowly and carefully, you will make few errors. And that is your quality work. So, there is a tradeoff between speed and accuracy. As, 'quality' increases, speed decreases and 'Productivity' also decreases.

How can these two contrasting positions concerning, 'Productivity' – 'Quality' relationship be solved? We believe that the answer is in the concept of capability. It can be said that as long as there is unused capability in the individual or the productive system and then increases in speed can be obtained without declines in 'Quality', or alternatively, 'Quality' can be improved without changing speed.

14. FACTORS AFFECTING TO 'PRODUCTIVITY':

- **FACTORS AFFECTING NATIONAL PRODUCTIVITY :**

- Human Resources
- Technology and capital Investment
- Government Regulation
- **HUMAN RESOURCES:**

The general standard of education is an essential factor for any nation and their national 'Productivity'. The use of computers and other latest equipments and system require better-educated employees. Government can help by sponsoring more education especially in field that directly related to 'Productivity'. Employees should be motivated to be productive. Salary is not enough, they need to have good, and safe working conditions and to be considered as the most vital part of the organization. Labour Unions and Management may be opposites in negotiating pay and benefit but can co-operate in seeking 'Productivity' improvements to the benefit of all.

- **TECHNOLOGY AND CAPITAL INVESTMENT:**

The most important factor in long run in reference to productivity improvement is technology and new technology depends on Research & Development. For industry or services to put new technology into use, they must invest in new machinery and equipment. The government can do the following: ⁽³⁶⁾

- Support R & D in industries and universities.
- Encourage personal saving and reduce taxes on profits so that people can invest in new facilities.
- Allow depreciation rates that will create and provide cash flow for new investment.
- Directly encourage new investment through increased investment tax credits.

- **GOVERNMENT REGULATION:**

An excessive amount of government law may have a injurious effect on 'Productivity'. Government can do much to remove unnecessary law and to make cost – benefit analysis to decide the necessary regulations such as those on health and safety.

• **FACTORS AFFECTING PRODUCTIVITY IN MANUFACTURING AND SERVICES:**

- Product or System Design
- Machinery and equipment
- The skill and effectiveness of the worker
- Production volume

- **PRODUCT (OR SYSTEM) DESIGN:**

Through better product design, a product can be simplified by removing some of its parts, it is obvious that the material are made of will no longer be needed. Nor will the equipment, tooling and labour to make them be required. Value analysis can bring out many product design changes that improve 'Productivity'. Research and Development is an essential contributor for improving product design. Standardization of the product and the use of group technology are other design factors that make possible greater 'Productivity' in the factory.

- **MACHINERY AND EQUIPMENT:**

Once the product is designed, then how it is made offers the next chance for 'Productivity' improvement. The equipment used machines, tools, conveyors, robots which all are important. Computer has helped to design the products (CAD), it helps

in operating complicated machine tools (CNC machine) and it controls the inventory of material and parts. It has become an essential ingredient for 'Productivity' improvement.

- **SKILL AND EFFICIENCY OF THE EMPLOYEE:**

The trained and experienced worker can do the same work in a much shorter time and efficiently than a new employee work. However, even the well – trained employees must be motivated to be productive.

- **PRODUCTION VOLUME:**

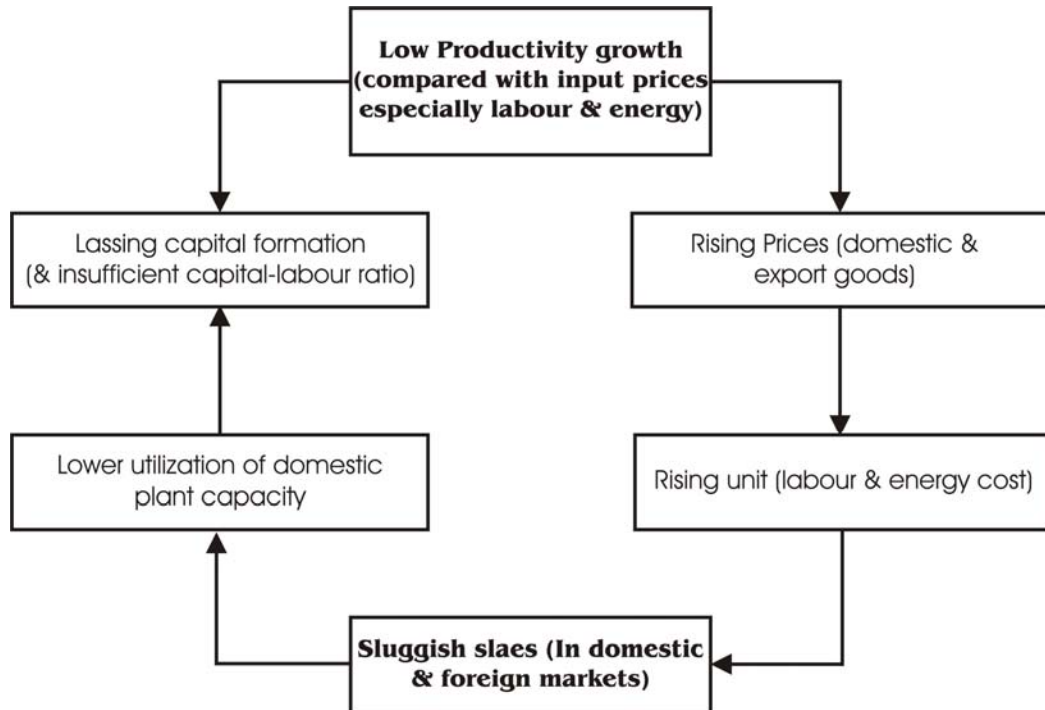
Suppose that the volume of output is to be doubled. The number of direct workers would have to be doubled and a few indirect workers might also be required. But there would probably not be a requirement for more engineers, research scientists, and headquarters for staff people or other support personnel. So, if the output is doubled, the 'Productivity' of these support people is in effect doubled.

15. 'REASONS FOR LOW PRODUCTIVITY':

The direct improvement of retaining higher costs of production by industries is to decrease production or keep production costs stable by lowering real wages. The remarkable economic problems like inflation, an adverse balance of trade, poor growth rate and unemployment are main reasons of low productivity. Scott (1985) confirmed this conjecture in his model for a low – productivity trap as shown in following figure 1.6. The significance of 'Productivity' as implied in following figure 1.6 is that increased productivity can indeed break the various cycle of poverty and unemployment and by direct argument low – productivity trap itself.

Model for a 'Low – Productivity Trap'

Figure 1.6



(Source: Scott-1985 p. 8

Dr. B. Kumar, Industrial Engineering, Khanna Publishers, Delhi, 3rd Edition
– 1982 & 4th edition – 1985, ch. 1, 2-3, p.no. 8)

There are so many different reasons for 'Low – Productivity' these are as follows: ⁽³⁷⁾

- Bad product design,
- Lack of standardization of 'quality', material & dimension,
- Improper machine, cutting tools and non-optimal cutting conditions, (of speed, feed & depth of cut),
- Poor planning process,
- Bad layout causing unnecessary & avoidable movements of men & materials,

- Operator's non-standard method of working,
- Unnecessary product varieties,
- Frequent changes in design of product,
- Improper planning of work,
- Shortage of raw – materials, spare – parts, cutting tools, jigs fixture etc.,
- Frequent breakdowns of the equipments, poor maintenance schedule & mishandling by the operators,
- Poor working environment,
- Absenteeism of workers without proper and prior information,
- Lateness, idleness & cureless workmanship & accidents,

16. IMPROVEMENT OF 'PRODUCTIVITY' ;

Success and failure have been remarked for all productivity inducing tactics. Quality circles orientation in some companies and drafted in other companies. Incentive wages were given with mixed results. Generally, smooth work flows and sharp material controls can boost output and reduce waste, but not always. Most quick – fix 'Productivity' promotions failed. These mixed results put many managers in wondering what to do.

"A three – phase process prepared to support the successes is known by the acronym A.(Awareness),I.(Improvement),M.(Maintenance). It recommends events to create Awareness, activities that cause Improvement points out and measures for the Maintenance of gains."⁽³⁸⁾

A.I.M. is thus a three – phase, technique – system process for improving 'Productivity'. It is a structured attitude that can be adjusted to set different situations, by emphasizing certain techniques over others. In fact, these phases should seem familiar because they have been ratified by management experts to improve operations. A.I.M. is different, however, by its narrow focus on the fundamental

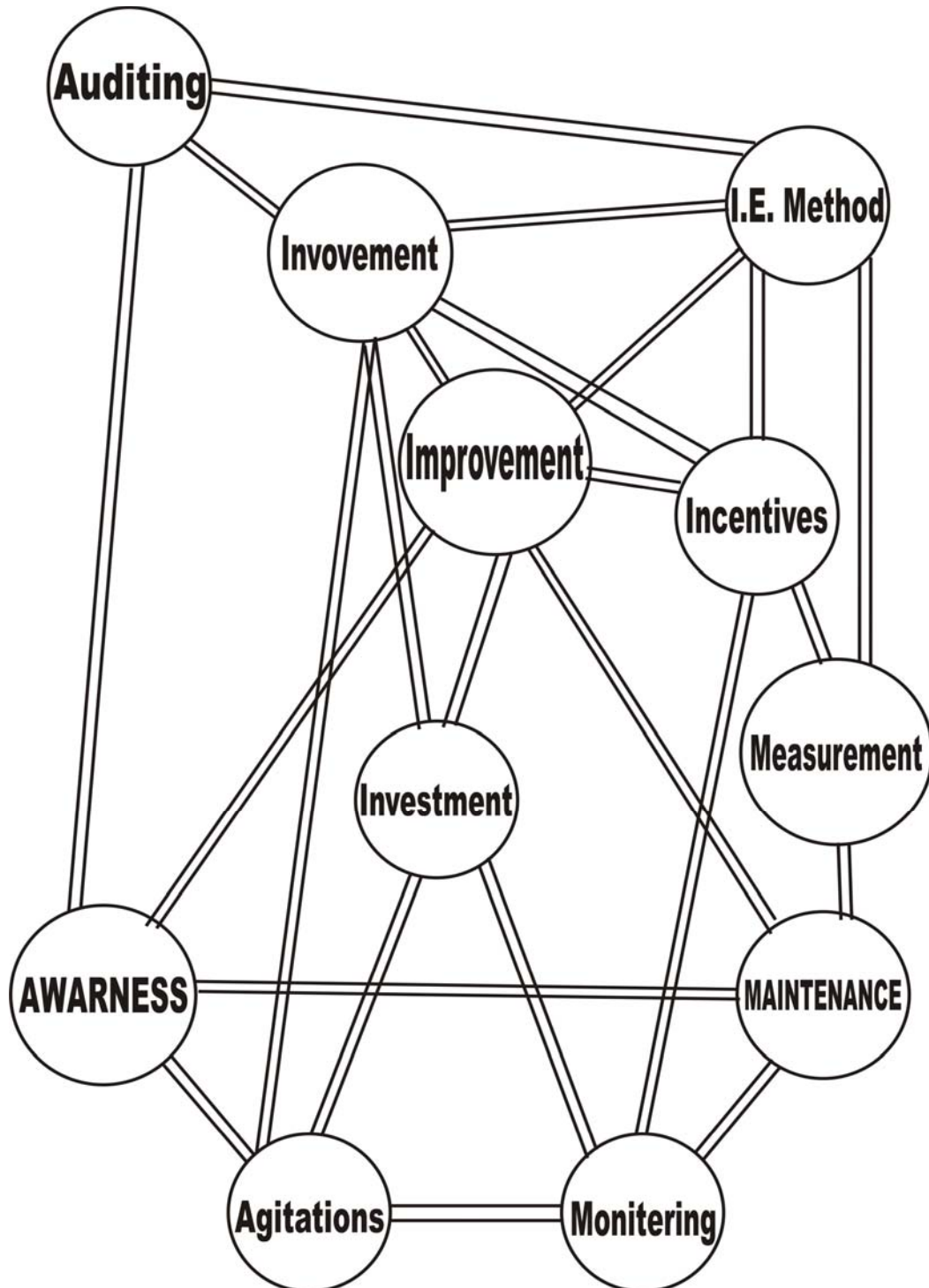
output/input ratio. It attracts attention to the importance of using resources efficiently, finds out measurable gains, and applies methods to maintain progress.

The “A.I.M. atom” in figure 1.7 indicates a framework for appraising various paths to ‘Productivity’ surrounding the Awareness – Improvement -Maintenance nucleus are implementation factors with connecting bonds that indicate opportune relationships.

Awareness – Improvement – Maintenance

“A.I.M.” Process :

Figure 1.7



(Source: James L. Riggs, Production System, 4th edition, Ch. No. 16, P.no. 660)

- **FIRST PHASE: AWARENESS:**

To become more productive, workers must want to do something new creative and different. New machineries and streamlined methods add nothing accept cost unless they are used properly, and this demands efforts by the users. Even a modest change needs willingness to adjust prevail. The first step toward reform is to convince people that improving productivity will be benefiting to them individually.

Overcoming the fear that advances in ‘Productivity’ necessarily lead to unemployment is essential. It is no enough to point out that jobs have historically increased in the more productive sectors of the economy. This observation is too impersonal. Employees and workers should be assured that their own jobs are not at stake. They should also realize that ‘Productivity’ gains can be protected from actions other than labour reductions, such as decreasing scrap and conversing energy. Then they are more likely to accept the other virtues of ‘Productivity’ growth.

Convincing employees that they should promote ‘Productivity’ is the prime function of the awareness phase. A simple explanation of what should be done and the value of doing it may be enough to get full support. On other occasion of what should be done and the value of doing it may be occasions, cynicism bred by unmet expectations from previous campaign must be overcome.

Because the composition and approach of work forces so widely, the seemingly simple act of starting the ‘Productivity’ push deserves careful planning. **A clumsy Kickoff can damage all subsequent moves. Two start-up tactics are indicated: agitation and auditing.**⁽³⁹⁾

- **AGITATION:**

To agitate is to excite. Getting everyone excited about 'Productivity' is the summary of awareness. Imagination is the only limit to discovering ways to attract attention. Possible techniques are mass meetings with famous speakers, contests, group gatherings to make pledges, retreats, and committees formed to develop team spirit competition, posters and published announcements, morning meetings for exercise and motivational tasks and so on. However, too much hoopla can cheapen the start-up, especially, if it has proceeded by similar extravaganzas for safety or zero defect promotions.

A lavish kickoff can churn up short – lived excitement that eliminates before much is fulfilled. 'Productivity' growth relies on sustained effort. A campaign that slowly and gradually creates momentum is likely to endure longer, but it still requires enough visibility to be properly launched. Clear evidence of managerial commitment is a powerful stimulant. Work – place innovations and installation of new technologies are ideal situation on which to launch a 'Productivity' drive, because they confirm that the organization is willing to invest in the existing work place and labour force.

- **AUDITING:**

An audit means to check one's level in the market internally as well as externally. A Productivity audit conveys a message about an organization's current status and its dedication to improving its 'Productivity'. An audit that surveys the labour force can concurrently take out information about work conditions and practices while it invokes a communal spirit. A diagnostic audit examines the factors that delay or animate productivity in an organizational unit. It is ideally made to check the most serious issues relating each unit.

As opposed to managerial audits, which collect financial and operational data or attitude surveys, which indicate how employees feel about their jobs, their wages, fellow employees, work condition and other factors that effect job satisfaction. A productivity audit measures utilization level of resources, efficiency level, identifies

promising areas for improvement and supports employee involvement. Although a productivity audit may also seek employee apprehension regarding human relations and employment benefits that effect morale and consequently may affect personal 'Productivity', the main issues are work conditions, methods, facilities and environment. An audit concentrates on factors which affect influence the quantity timeliness and quality of the output.

- **SECOND PHASE : IMPROVEMENT:**

The phase of awareness and improvement tend to blend together. Awareness of the benefits of productivity growth is reinforced as gains are registered from improved operations. Similarly, early demonstrations of easil implemented improvements create enthusiasm for more accomplishments. But such gains are not automatic. Even the most willing labour force also needs direction.

"Four improvement paths were stated in figure 1.7: Investments Incentives, Involvement and I.E. Methods"⁽⁴⁰⁾ which paths to imitate most energetically depends on the nature and condition of the organization.

- **INVESTMENT:**

Spectacular turnarounds have been ascribed to plant modernizations, remarkably the adoption of advanced technology. Enough success stories have circulated to get trust to the claim that the future lies in high technology.

The proper economic justification systems should be employed to all investment proposals. The first rule is to be objective. Such emotional considerations as puffed up pride from buying the latest robot should not enter this evaluation unless their monetary value can be fixed correctly. The second rule is to interpret the economic analysis should be commercial all associated cash flows over the life of the life of the investment, including taxes and takes into account any important uncertainties, such

as questionable estimates of future operating costs or rate of inflation. A third rule is to refer an investment's effect on 'Productivity'.

Most organization has reasonably good capital-budgeting process. Investment proposals are numbered by their relative profitability potential. But seldom proposal are awarded priority for their strong impact on future 'Productivity'.

- **INCENTIVES:**

A proper way to attract the attention of employees is to reel dollar bills. Attaching cash payments to productivity gains, normally known as a productivity sharing which is a powerful motive for live & active participation. It is the most obvious way to convince employees that they have a stake in productivity improvement. They unmistakably will gain as the organization gains.

Monetary incentives for manufacturing units of structures employee teams can be clearly connected to productivity gains but fair amounts are difficult to fix. In many times, simple and sincere praise for a job well done is more effective than a reward. There are many paths to recognize high achieves with no monetary awards. These "no monetary" awards cost money, of course, but they do not distort the existing wage structure. Although, productivity sharing recognizes productive performance and that stimulates more productivity.

- **INVOLVEMENT:**

The idea of everyone working together and enjoying it is so normally appealing that all managers try in their own fashion to establish some form of worker participation. Management theorist has explained the merits of a motivated work force. For employee involvement to be fulfilling, it must give workers a degree of control over their destiny without abrogating management's power to set resources-including workers.

Training to perfect currently required skills and to develop crossover skills pacifies both interests. The training sessions spice the work routine and build self-confidence. Workers with multiple skills allow more scheduling versatility and quick reply in emergencies perhaps the best productivity training is to develop of general purpose abilities that can be followed to all kinds of works.

- **I.E. METHOD:**

“ ‘I.E. [Industrial Engineering] methods’ is a catch all term that represents a very large family of procedural techniques and managerial practice used to make operations more productive” ⁽⁴¹⁾ These techniques and practice are the part of ‘Productivity’ movement.” They strike directly at poor quality, material and energy waste and inefficient operations.

‘Industrial Engineering’ is a profession devoted to productivity improvement. Although, I.E. is still carry the stigma of “efficiency experts”, being barely tolerated by some unions, their century old heritage of scientific management is ideally suited to present quest for high quality and productivity. The services of an I.E. staff are greatly leveraged by educating all employees to be conscious of the continual requirement to improve operations and to be able to use basic I.E. methods to make the improvements.

• **THIRD PHASE: MAINTENANCE:**

“To maintain is to support and to preserve from decline. Maintenance of productivity – improvement process depends on measuring performance and monitoring progress to sustain motivation and momentum.” ⁽⁴²⁾

Sometimes, it is more difficult to keep gains than it was to get them. And it is still more difficult to continue gaining. The flash of enthusiasm that goes with the kickoff of a productivity campaign almost guarantees some immediate advances. But as

spirits wane, momentum will decrease unless something is done to spark more interest.

- **MEASUREMENT:**

An improvement process is easier to maintain when the participants have a fix goal to aim it. It should be identified by all concerned as worthwhile and attainable with reasonable effort. When the goal is a popular challenge, rewards and friendly competition are considered accepted as helpers. Conversely, when a goal is independent and not met by workers, the stimulants conferred by management are mostly ineffectual.

Normally, once a goal is achieve, a new campaign with a higher goal will be launched, or a new goal can be set and followed with essentially the same process. For example, an emphasis on better customer services to boost productivity could be replaced be a goal to improve quality. Because it is obviously better to reach a goal and start over than to bog down in pursuit of an impossible goal, short-range, modest objectives are preferable. Success is the greatest motivator.

The existence of a goal implies a measurement system. Specific levers of measurable achievement are necessary. The scaling system can be used to supervise the progress. Feedback to workers about their accomplishments delivers both a reading on current headway and message about expectations. An objectives matrix or a comparable measurement system is a significant ingredient of the A.I.M. process.

- **MONITORING:**

A productivity improvement process without benchmarks is a race without a timer. To monitor is to watch or to check for a specific purpose and to regulate or to control an operation. Productivity monitoring should provide feedback, (preferably in visual from) that manufacturing units can use to regulate their efforts to improve operations.

Monitoring begins with the collection of data. Their accuracy, completeness and timeliness are improvement. Unreliable data can ruin confidence and mislead improvement efforts and manually decisions. Given dependable data, monitoring continues with the delivery of information is a usable form. Messages are most forcefully delivered by graphics.

A performance chart based on data from an objectives matrix can be used to record a manufacturing unit's accomplishments. Many different charting formats are available. It might be more disclosing to calculate the rate of change of the performance indicator in each period and plot these percentages on a bar chart, this would be a productivity index chart. The type of visual display that is most likely to encourage discussion and to keep interest should be selected.

“So far the point of view is concerned, there is an improvement of ‘Productivity’ is related with two factors:

- Technical Factors and
- Human Factors....”⁽⁴³⁾

- **TECHNICAL FACTORS:**

The technical factors which are planning, design and development production, operation or processing proper planning and scheduling help to utilize men, machines and materials to improve ‘Productivity’. A proper and economic design of a product may help in declining wastages, scraps and its durability and attracting customers. Where supervision is poor or management can't plan ahead, there may be inefficiency in operation. The management failures because of improper buying, wrong specification, lack of co-ordination among technical persons, inefficient maintenance of machine tools, incorrect specification of materials, adverse working conditions and bad human relations. As regard production factor, standardization and work simplification accompanied by mass production. It may be advantageous both to producers and customers. It is advantages to producer because it ensures longer life of machines, reduced tooling and setup time, economy in inspection, clerical and administrative work, easier services and maintenance, deduction in inventory and

investment and finally increased 'Productivity' leading to reduction in cost, increasing volume of output and consequently boosting profit.

'Productivity' increase cannot be a permanent feature without quality control. The main functions of quality control are to stop the fall in quality standard to prevent waste and finally to produce and distribute goods according to standard formula, drawings etc. It guarantees customers as to the correctness of the standard specification, durability and performance of the goods or services and ultimately maximizes the good will of the concern.

- **HUMAN FACTORS:**

A good and sound discipline is important in every organization. Management should manage labour, train them, encourage them and direct their efforts towards positive and concrete result. Towards this and there must be balanced wage structure, an adequate system of recruitment, induction, training and placement, a comprehensive labour welfare scheme, a well – drafted standing order, a scheme to ensure co-operation and participation in management goals and efforts, and finally, a periodical review of the entire situation for sustaining as well as improving human relationship.

A cost or management accountant may furnish valuable services for increasing 'Productivity'. He is a permanent member of the 'Productivity' team and his duty is to evaluate the technical data given by the technical experts, consider the cost and savings in alternative designs, sign, tools and fixtures etc. His duty is to keep a record regarding the cost of labour welfare projects, education and training projects of workers and review the situation regularly. He should also evaluate efficiency of men, machines or other services and set suitable norms or standards of 'Productivity' indices with which actual 'Productivity' may be compared. So, overall to improve 'Productivity', one should concentrate on these two factors. Here are some management techniques for improving 'Productivity'.⁽⁴⁴⁾

- Program evaluation and review techniques etc. for reducing the total time of completion of a project.

- Personal policy and incentive plans – to motivate the workers against absenteeism, idleness, lateness and careless working.
- Safety training for minimizing chances of accidents.
- Operators training – to improve upon working efficiency of the operators.
- Proper maintenance policy – to minimize the frequency of breakdown.
- Materials control – for economic batch quantity and steady supply.
- Product development and value analysis – to reduce the excess work content due to design defect.
- Work measurement – for fixing up standard of performance.
- Method Study – to eliminate the effects of bad layout.
- Simulations – for finalizing optimum number of facilities under stochastic conditions.
- Statistical quality control-for reducing rejection of finished goods and cost of inspection.
- Assignment method, stepping stone methods, modified distribution and Vogel’s approximation method etc. for assignment of jobs to proper machines.
- Sales for casting for planning of production schedule etc.
- Simplifications, standardization by Linear Programming methods for variety reduction of products.
- Travel charts, string diagram method etc. for proper plant layout.

All efforts towards productivity improvement have always been concentrated on the inputs i.e., men, material, money, time, machinery etc. and the process through which they go, to give the output.

- **SUMANTH'S FIVE PRONGED MODEL:**

“In 1982, Sumanth and Omachanu proposed Five Pronged Approach³, classifying fifty-four different techniques based on the basic types: Technology, Employee, Product, Process and Material.”⁽⁴⁵⁾

See the table 1.4

In areas of product and process improvement, Value Analysis aid in eliminating non-value adding function i.e. those function resulting in low performance at high costs from products and processes. On the technology front, extremely precise and accurate high speed machines and systems like CAD, CAM, FMA and TRANSFER LINES etc. have powerfully reduced the processing time. On the human front, incentive plan, job enrichment, fringe benefits etc. are used to support value adding inputs from people. Material control, MRP, material handling system etc. reduce the time, space, effort and money involved in manufacturing material available for its time and place utility.

Techniques like work-study, ergonomics etc. eliminate motions that are non-productive or make them easy to perform for the human factor.

At present, Lean Production System approach is a holistic one, which considers all areas of productivity improvements; gives a completely new perspective to the way that a business is managed. Applying this concept, a tremendous rise in productivity can be obtained. In order to sustain, a few other techniques like JIT, TPM, TQC, KAIZEN, Quality Circles etc. need to be applied simultaneously.

Each of the above techniques further consists of many other elements that will be discussed in detail at a later stage.

Table :- 1.4

Technology Based	Employee Based	Product Based	Task Based	Material Based
CAD	Financial Incentives	Value Engineering	Method Engineering	Inventory Control
CAM	Group Incentives	Product Diversification	Works Measurement	Material Requirement Planning
Integrated CMA	Fringe Benefit	Product Simplification	Job design	Materials Management
Robotics	Promotions	R & D	Job Evaluation	Quality Control
Laser Beam Technology	Job Environment	Product Standardization	Job Safety Design	Material Handling
Energy Technology	Job Enlargements	Reliability Improvement	Ergonomics	Material Recycling
Group Technology	Job Rotation	Advertising & Promotion	Production Scheduling	
Computer Graphics	Worker Participation		Computer Aided Data Processing	
Emulation	MBO			
Maintenance Management	Skill Enhancement			
Rebuilding Old Machinery	Learning Curve			
Energy Conservation	Working Condition Improvement			
	Communication			
	Zero Defect			
	Punishment			
	Recognition			
	Quality circles			
	Training			
	Education			
	Role Perception			
	Supervision Quality			

(Source: David J. Sumath , ‘Productivity Engineering’ & Management)

REFERENCES

1. David J. Sumanth, 'Productivity Engineering & Management'
2. David J. Sumanth, 'Productivity Engineering & Management'
3. David J. Sumanth, 'Productivity Engineering & Management'
4. David J. Sumanth, 'Productivity Engineering & Management'
5. Dr. shrinivas Gondhalekar, Dr. Uday Salunkhe, 'Productivity Techniques'
Himalaya Publishing House, Mumbai, 1st edition, 2002. Ch. 1, p. no.4
6. O.P.Khanna, 'Industrial Engineering & Management' ,Dhanpat Rai & Sons,
Delhi, 1996, ch.2, p.no. 2.7
7. Dr. shrinivas Gondhalekar, Dr. Uday Salunkhe, 'Productivity Techniques'
Himalaya Publishing House, Mumbai, 1st edition, 2002. Ch. 1, p. no.1
8. Dr. shrinivas Gondhalekar, Dr. Uday Salunkhe, 'Productivity Techniques'
Himalaya Publishing House, Mumbai, 1st edition, 2002. Ch. 1, p. no.2
9. Dr. shrinivas Gondhalekar, Dr. Uday Salunkhe, 'Productivity Techniques'
Himalaya Publishing House, Mumbai, 1st edition, 2002. Ch. 1, p. no.3
10. David J. Sumanth, 'Productivity Engineering & Management'
11. James L. Riggs 'Production & System', Planning, Analysis & Control.
John Wiley & Sons, New York 4th edition., Ch. 16, P.No. 640,641
12. James L. Riggs 'Production & System', Planning, Analysis & Control.
John Wiley & Sons, New York 4th edition., Ch. 16, P.No. 640,641

13. Dr. shrinivas Gondhalekar, Dr. Uday Salunkhe, 'Productivity Techniques' Himalaya Publishing House, Mumbai, 1st edition, 2002. Ch. 1, p. no.5
14. 'Production & Operations Management 3rd Edition, Ch. Meeting the competitive challenge in operations
15. B.K. Bhar, 'Cost Accounting' – Methods & Problems, Academic Publishers, Calcutta, 9th edition, 1993, Ch. 24, P.no. 24.1
16. S.K. Srivastava, R.S. Nigam,, Bishamber Sahai, Mrityunjoy Banerjee, 'Industrial Economics',S. Chand & Co., Delhi, 1967, Ch. 17, P.no. 236
17. S.K. Srivastava, R.S. Nigam, Bishamber Sahai, Mrityunjoy Banerjee, 'Industrial Economics',S. Chand & Co., Delhi, 1967, Ch. 17, P.no. 236
18. S.K. Srivastava, R.S. Nigam, Bishamber Sahai, Mrityunjoy Banerjee, 'Industrial Economics',S. Chand & Co., Delhi, 1967, Ch. 17, P.no. 236
19. S.K. Srivastava, R.S. Nigam, Bishamber Sahai, Mrityunjoy Banerjee, 'Industrial Economics',S. Chand & Co., Delhi, 1967, Ch. 17, P.no. 237
20. S.K. Srivastava, R.S. Nigam, Bishamber Sahai, Mrityunjoy Banerjee, 'Industrial Economics',S. Chand & Co., Delhi, 1967, Ch. 17, P.no. 237
21. S.K. Srivastava, R.S. Nigam, Bishamber Sahai, Mrityunjoy Banerjee, 'Industrial Economics',S. Chand & Co., Delhi, 1967, Ch. 17, P.no. 237
22. S.K. Srivastava, R.S. Nigam, Bishamber Sahai, Mrityunjoy Banerjee, 'Industrial Economics',S. Chand & Co., Delhi, 1967 Ch. 17, P.no. 237
23. S.K. Srivastava, R.S. Nigam, Bishamber Sahai, Mrityunjoy Banerjee, 'Industrial Economics',S. Chand & Co., Delhi, 1967, Ch. 17, P.no. 237,

24. B.K. Bhar, 'Cost Accounting', Methods & Problems, Academic Publishers – Calcutta, 9th Edition – 1993m Ch. 24, P.No. 24.3, 24.4
25. B.K. Bhar, 'Cost Accounting', Methods & Problems, Academic Publishers – Calcutta, 9th Edition – 1993m Ch. 24, P.No. 24.3, 24.4
26. Prof. Dr. Uday Salunkhe, Prof. Dr. Srinivas Gondhalekar, 'Productivity Techniques', Himalaya Publishing House, Mumbai, 1st edition, 2002, Ch. 1, P.no. 4, 5
27. Prof. Michel Porter, 'The Competitive Advantage of Nations'
28. 'Made in America', Annual Report of Ministry of International Trade & Industry Commission on 'Industrial Productivity'.
29. 'A Report of Asian Productivity Organization
30. David J. Sumanth, 'Productivity Engineering & Management'
31. David J. Sumanth, 'Productivity Engineering & Management'
32. Dr. J.P. Shrivastava, 'Cost & Profitability', Oxford and IBH Publishing Co., New-Delhi – 1982. P No. 42,43.
33. 'Productivity & Operation Management', 3rd edition
34. Prof. Dr. Uday Salunkhe, Prof. Dr. Srinivas Gondhalekar, 'Productivity Techniques', Himalaya Publishing House, Mumbai, 1st edition, 2002, Ch. 1, P.no. 7
35. Dr. B. Kumar, 'Industrial Engineering', Khanna Publishers, Delhi, 3rd edition – 1982, 4th edition – 1985, Ch.1. 2-3, P.No. 4,
36. O.P. Khanna, 'Industrial Engineering Management', Dhanpat Rai & Sons, Delhi – 1996, Ch. 2, P.No. 2.7, 2.8, 2.9

37. Dr. B. Kumar, 'Industrial Engineering', Khanna Publishers, Delhi, 3rd edition – 1982, 4th edition – 1985, Ch.1, P.No. 1,2.
38. James L. Riggs, 'Production System', Planning, Analysis & Control, John Wiley & Sons – New York, 4th edition, Ch. 16, P. No. 660.
39. James L. Riggs, 'Production System', Planning, Analysis & Control, John Wiley & Sons – New York, 4th edition, Ch. 16, P. No. 662.
40. James L. Riggs, 'Production System', Planning, Analysis & Control, John Wiley & Sons – New York, 4th edition, Ch. 16, P. No. 663.
41. James L. Riggs, 'Production System', Planning, Analysis & Control, John Wiley & Sons – New York, 4th edition, Ch. 16, P. No. 664.
42. James L. Riggs, 'Production System', Planning, Analysis & Control, John Wiley & Sons – New York, 4th edition, Ch. 16, P. No. 666.
43. B.K. Bhar, 'Cost Accounting', Methods & Problems, Academic Publishers, Calcutta, 9th edition, 1993, Ch. 24, P.No. 24.5, 24.6
44. Dr. B. Kumar, 'Industrial Engineering', Khanna Publishers, Delhi, 3rd edition, 1982, 4th edition, 1985, Ch. 1, P.No.2
45. David J. Sumanth, 'Productivity Engineering & Management'

Other Sources

- Website :- WWW.ProductivityMeasurement.com
Ch. 'Concept & Measurement of Productivity', -by Gboyega A. Oyeranti
Department of Economics, University of Ibadan, Ibadan.

- Website :- WWW.ProductivityMeasurement.com
Ch. 'Concept & Measurement of Productivity', -by Gboyega A. Oyeranti
Department of Economics, University of Ibadan, Ibadan.
- David J. Sumanth, 'Productivity Engineering & Management'
- David J. Sumanth, 'Productivity Engineering & Management'
- Website :- WWW.ProductivityMeasurement.com
Ch. 'Concept & Measurement of Productivity', -by Gboyega A. Oyeranti
Department of Economics, University of Ibadan, Ibadan.
- S.K. Srivastava, R.S. Nigam, Bishamber Sahai, Mrityunjoy Banerjee,
'Industrial Economics', S. Chand & Co., Delhi, 1967, Ch. 17, P.no. 235
- Prof. Dr. Uday Salunkhe, Prof. Dr. Srinivas Gondhalekar, 'Productivity
Techniques', Himalaya Publishing House, Mumbai, 1st edition, 2002.
Ch. 1, P.no. 4
- Dr. B. Kumar, 'Industrial Engineering', Khanna Publishers, Delhi, 3rd edition
– 1982, 4th edition – 1985, Ch.1. 2-3, P.No. 4
- Production & Operations Management, 3rd edition.
- S.K. Srivastava, R.S. Nigam, Bishamber Sahai, Mrityunjoy Banerjee,
'Industrial Economics', S. Chand & Co., Delhi, 1967, Ch. 17, P.no. 238,239.

CHAPTER - 2

**INTRODUCTION OF CO-OPERATIVE DAIRY
& MILK SUPPLY INDUSTRY**

CHAPTER -2

INTRODUCTION OF CO-OPERATIVE DAIRY & MILK SUPPLY INDUSTRY

1. CONCEPT OF CO-OPERATION & CO-OPERATIVE MOVEMENT.
2. GENESIS & DEVELOPMENT OF CO-OPERATIVE MOVEMENT – GLOBLE, INDIAN & GUJARAT
3. MEANING & DEFINITION OF CO-OPERATION & CO-OPERATIVE
4. CO-OPERATIVE PRINCIPLES
5. IMPORTANCE OF CO-OPERATION
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7. LIMITATIONS OF CO-OPERATIVE MOVEMENT
8. GENESIS, GROWTH & DEVELOPMENT OF CO-OPERATIVE MILK – DAIRIES – GLOBLE, INDIAN & GUJARAT
9. ABOUT THE MILK DAIRY CO-OPERATIVE:
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 - (iv) MADHUR DAIRY – GANDHINAGAR.
 - (v) SUGAM DAIRY – BARODA.
 - (vi) DUDHSAGAR DAIRY – MEHSANA.
 - (vii) VASUDHARA DAIRY – CHICKHALI (VALSAD).
 - (viii) SUMUL DAIRY – SURAT.

REFERENCES

1. CONCEPT OF CO-OPERATION & CO-OPERATIVE MOVEMENT

• CONCEPT: CO-OPERATION:

Man is a social animal. Co-operation is, therefore, the very soul of human existence. Nature has endowed him with the power of speech and thought and these distinguish him from animals. The ferocious animals are highly individuals and the non-ferocious though live in herds, are not able to help one-another as they are circumscribed by nature. They cannot order their lives, but they are ordered by nature. Struggle for existence, survival of the fittest, competition, violence and the strong oppressing the weak are the laws of the jungle life that the animals lead.

Man on the contrary, has conquered outer nature. He can fly to the top of the sky, dive deep in to the sea and run on the surface of the globe with a break-neck speed. He lives in a community and cannot, therefore, live for himself alone but has to live for others also and make the community as a whole happy by his efforts. He can substitute co-operation on scores of others. Adam and Eve whose wants were simple and limited could have lived alone. But that cannot be expected of a modern man in the present in producing the essential goods, individuals have to starve today. We are in fact living in a co-operative society where all collectively work and the benefits of collective efforts are shared by all. But this is not recognized as all services are commercialized and production is not with a view to provide the basic needs or to supply the wants, but is resorted to for profit. The law of demand and supply alone rules now. A society organized with profit as motive need not guarantee the production or distribution of all essentials of life to all. When there may be a scarcity in necessities of life, luxury goods yielding higher profit may be produced. Many may be starving and many may have too much to eat. Many maybe under-employed while others may be over-employed. In an economically under-developed country like India these differences are more marked. In the world of today this problem of extreme disparity among different sections of for competition in the animal kingdom, non-violence for violence, harmony in the place of discord. Individual enterprise no doubt is useful but it also leads to unhealthy competition and disturbs the harmony of

human existence. Collective enterprise will do away with this ill which the doctrine of *lasses faire* brings in to human relations.

In fact, our philosophy and religion lend support to co-operative co-existence. Real knowledge according to us consists in integrated whole. Real knowledge consists in finding a single unified existence in the whole of the universe. There is no better way of being a good citizen than to co-operate with one-another for satisfying the common needs of social and economic life in the interests of the whole community. Co-operation eliminates as well as eschews exploitation. Every true co-operator will tell himself, in the words of an old historian of the Movement, **“I shall have my hand in no man’s pocket and no man shall have his hand in mine.”**

The body is the nearest parallel to this conception. The human body consists of millions of cells, all drawn out of a single blood stream. They have disposed themselves in to various limbs and organs differing in form, shape, function etc., but all of them co-operate for the common good of the body as a whole. The Universe must be conceived of as a body of a Universal soul, of which body all being are limbs. Each for all and all for each is the law of the human body. Likewise, the society must be organized in such a way that, **“Each may work for all and all for each.”** This attitude to life as a single unit is calculated to remove hatred from the hearts of men, bridge the gulf between man and eradicate differences arising out of selfishness, greed etc. co-operation is, therefore, a mode of life and not a mere economic adjustment of human relations.

In fact, in a complicated society with diversified human activities specialization takes place in every field of human Endeavour. Today no one can satisfy all his wants by his own effort. He has to depend on the society has been solved by adoption of a socialistic pattern of society by some under developed countries, where production is for consumption and not for profit. In a way it is a co-operative enterprise by the state. In highly advanced countries like England, U.S.A., the predominance of individual enterprise and the doctrine of *laissez faire* may work. But even there we constantly hear of strikes and lock-outs. The introduction of co-operation in all economic activities would remove the inequalities inherent in free enterprise at the same time avoid the regimentation which may occur in a socialistic order. A co-operative

commonwealth is consistent with freedom of the individual and ensures also collective freedom.

Co-operation is revolution without the “r.” Men cease to exploit one another’s needs and instead join hands to eliminate profit co-operation seeks to oust the capitalist and the middlemen from their positions of control over the economy and to set up producers and consumers in their place. It reduces capital to the position of a wage-earner giving capital only a reasonable interest. Men associate on a basis of equality as human beings having the same economic needs and not as owners of capital and so they exercise power and control over their undertaking on a democratic basis.

Democracy is the very essence of co-operation for the reason that the co-operative will be failing in its purpose if the principle of democratic control were not observed. As said by the ICA [The International Co-operative Alliance] principles commission “The primary and dominant purpose of a co-operative society is to promote the interest of the membership.”⁽¹⁾ And what constitutes the interest of the membership is best determined by the members themselves. As accepted by the ICA congress of 1969, the least inattention to co-operative democracy will damage it and indifference to it will be fatal to it. Inattention and indifference arise mainly out of a feeling among members that their decisions are not implemented by the society’s officials. They arise also when the laws relating to co-operatives nullify the very principles of co-operation. As stated by the ICA principles commission, “In a fully developed co-operative unit, management must rest in the hands of the members and all decisions be taken by the co-operators themselves with no external interference”.⁽²⁾ “Autonomy they added “Is therefore a corollary of democracy”. And in the case of co-operatives which require guidance, the guides must first understand. “The deeply democratic spirit of co-operation.”

In spite of government assistance, co-operatives must be allowed to manage their own affairs. Otherwise there would be no real co-operation. As said by Dr. Bonow, the president of ICA, “we would have mistaken the casket for the gem if we were to perpetuate an arrangement where by the initiative and democratic character of the co-operative Movement would be impaired.”⁽³⁾

- **CONCEPT: CO-OPERATIVE MOVEMENT:**

The co-operative Movements all over the world have been especially concerned with the promotion of leadership from amongst their members and have for this reason emphasized those educational and other programmes which are likely to help in attaining these objectives. This concern was quite natural in view of the democratic character of the movements whose base of membership is derived from socially and economically underprivileged groups of people. While promotion of leadership from the existing members is highly important, it is equally important for the co-operative Movement to ensure the supply of leaders in the long-term future as well by directing their attention to the younger generation of the community. If the co-operative Movement is to maintain its ideological dynamism as well as steadily rising level of operational efficiency, it is but natural that the co-operative Movement should seek out those young people of the community who would be responsive to its appeal and who would, given some education and means of participation in its activities, qualify for future positions of leadership. In addition to these requirements of leadership, it is also essential for the movement to create awareness about its social and economic significance amongst the younger people so as to enjoy the sympathy and support of the future generation.

There are several ideologies each of which claim to bring about a change in social and economic situation of the country through specified means. The private enterprise system, called capitalism in common parlance, held sway during (the nineteenth) 19th century and provides even now in several countries a dominant form of social organization, albeit circumscribed or regulated by the state socialism and communism present other modes of thinking.

As against this, the co-operative Movement offers yet another ideology which, in the opinion of its adherents, would contribute to the establishment of a better society. The co-operative Movement was developed during the period of the Industrial Revolution in the west as an alternative to the exploitative capitalist system in which the industrial workers were unequal partners and where in the ill-effects of the Industrial Revolution were felt severely by the working classes and the farmers. From of a

consumer co-operative society established in Reschedule in England, the co-operative Movement has now spread all over the world and has developed in several economic forces. For the consumer especially in the western countries the movement has helped to create a healthy system of distribution of consumer commodities which guarantees the consumers fair prices, quality goods, and efficient services. By becoming an important distributive enterprise of consumer role in stabilizing prices of consumer commodities.

The object of the movement was the abolition of the wages system and the organization of industry in the form of producers' co-operatives. Each worker should own an equal share in the plant, workshop or farm in which he was employed. He should share equally in the products or the earnings of this output. He should become his own employer, controlling its operations and retaining its proceeds.

The co-operative Movement is known for the implementation of schemes of national development which require the participation of the people for the reason that any government is weakest at the village level and this is where the co-operative Movement is strongest. Therefore, co-operative must play their vital role in the implementation of schemes of national development. But that alone is not enough. Co-operatives must provide the people at the grass roots level with the opportunity of learning how to manage their own affairs of learning the processes of democracy and of becoming initiators of policy. True co-operatives cannot come about without the management of the co-operatives being vested in the members and the members only. I have no doubt that the younger generation will be attracted to the co-operative Movement if the management of the co-operatives is allowed to rest solely in the hands of co-operators in the true spirit of the co-operative principle of Democratic control.

2. GENESIS & DEVELOPMENT OF CO-OPERATIVE MOVEMENT - GLOBALY, IN INDIA & GUJARAT IN PARTICULAR:

The genesis of co-operative movement can be traced back to the first half of the 18th century. Industrial revolution in U.K. had increased the production of morality & values of mankind as man was replaced by machine. Because of lust and lure for the production, it had directly resulted in the exploitation of the mankind and so co-operative movement took birth in U.K. for removing the bad conditions of laborers. From England, co-operative movement spread out all over the world and had been changed in to the great movement which can be seen by the following table:

TABLE 2.1

CO-OPERATIVE MOVEMENT IN VARIOUS COUNTRIES:

No.	Typed of co-operatives	Country Name
1	Consumer's co-operatives	England, Russia and Sweden
2	Credit co-operatives	Germany, Italy, Sweden and India
3	Marketing co-operatives	Canada, U.S.A., and Australia.
4	Land Mortgage Credit	Germany, England and France.
5	Dairy co-operatives	Denmark, New-zeland
6	Farming societies	Russia, Yugoslavia and Palestine
7	Housing societies	U.S.A., Sweden and Israel
8	Producers co-operatives labour societies	France and England
9	Labour societies	Italy
10	Insurance co-operatives	England
11	Co-operative Education	England

(Source: Pranab Chakrabarty, Problems of co-operative Development – 1967. Ch.1)

- **CO-OPERATION & CO-OPERATIVE MOVEMENT IN FRANCE:**

The co-operative movement in France was subjected to great control in its initial stages by the government of the second Empire. With the gradual shedding of its political character, it came to be a social and economic force to the development of national economy. With the establishment of the Third Republic, the movement began to develop more freely, but with the beginning of the 20th century, the movement began to clear away and the several sectors of the co-operative movement received legal recognition. In France, there is no special co-operative state governing the working of co-operatives and co-operations with the different objects and functions fall under the jurisdiction of separate ministries and are governed by separate laws and the decrees passed under those laws by the respective movement will show that the agricultural co-operatives are different from others. Agricultural co-operation constitutes the largest single sector of the movement. Credit co-operatives alone made nearly £ 50 million available as loans to agricultural. Mutual insurance societies had issued nearly 31/2 million policies covering farmers' professional risks and administering a good deal of compulsory state insurance. The agricultural credit co-operatives were affiliated to 96 Regional or District central co-operative Banks which are united in to the Apex organization styled as "The National Agricultural Credit Bank" other Agricultural co-operatives are grouped in about thirty National federations or Unions.

They have a central credit organization of their own for the purpose of financing their activities which functions at village, district and state levels. Other sectors of the French co-operative Movement are by no means less significant. The co-operative form of organization has also been pressed in to specialized persons such as artisans, fishermen, retailers, school children and so on. This diversity of co-operative growth in France is also reflected in the Federal organization. There is a representative National Federation in every sector. Two institutions have been called as a result of the collaboration of the state and the co-operatives, and these are the National Bank of Agricultural credit and the central co-operative credit Bank for financing non-agricultural societies. The first one institution is a public institution, while the later is

a co-operative concern with state participation. More recently, the agricultural co-operatives have formed a Federal National center for educational purposes, while the consumer co-operatives have through their Federation started a credit scheme for young married couples to set up, their first homes. The workers' productive societies have also formulated a scheme of medium credit for the purchase of machinery and other equipment. In the field of agricultural co-operation, the syndicates have played a notable part and they still manage considerable influence over the movement.

- **CO-OPERATION & CO-OPERATIVE MOVEMENT IN ITALY:**

Louigi Luzzatti and Dr. Wollemborg are the two founders of co-operative Movement in ITALY. Both started credit institutions based on co-operative lines. Born in a wealthy family and well-educated, Louigi Luzzatti stated these institutions on the lines of schulze Delitzs Banks but he suggested that modifications in that system were needful to meet the needs of the people of ITALY. Dr. Wollemborg started a system of rural banks based on Raiffeisen pattern. As a minister of Finance, Signor Louigi Luzzatti brought a considerable experience in his working style of his banks. Before starting his institution, Signor Louigi Luzzatti studied about the working of schulze banks in Germany. He started the first bank at Milan in 1866 and became one of the shareholders. At the time, when Signor Lugi Luzzatti launched the co-operative Movement, he had to face great difficulties and even his close friends were in doubt though they agreed to join the movement.

- **THE DISTINCTIVE FEATURES OF LUZZATTI BANKS:**

From the very beginning, the banks adopted limited liability as Signor Lugi Luzzatti stated that unlimited liability is improper for Italian conditions. He entirely reversed schulzes, payable over long periods and prescribed a small share payable in ten months at the longest. He also allowed the shares to be issued at a premium proportionate to the increase in the amount of the accumulated reserves. This practice of selling shares at a premium was defended on the ground that the reserve belonged

as much to the share-holder as his shares and that as the one increased in amount, so must the other in value.

Applications for admission to the membership of the bank required the endorsement of two members. Since the share value was small and made payable in installments the Luzzatti banks depended mainly on borrowing in the form of deposits-both fixed and savings. The rate of the interest on saving deposits was slightly higher than the rate of interest paid by the post office saving Banks and hence substantial amounts of the deposits could be collected by these banks.

One important feature of the co-operative credit institutions in Italy was that the town and country banks were in friendly relations but worked in isolation. The urban banks financed the latter and the Bank of Milan worked as a financing bank to the rural societies or country banks.

- **CO-OPERATION & CO-OPERATIVE MOVEMENT IN FINLAND:**

Finland is recognized as a nation of co-operators. It is one of the most co-operatively advanced countries in the world. 80% of the people live in rural areas and their main occupation is agricultural. The dairy industry prevails as in the case of Scandinavian countries. Co-operation has been an important part in the economic life of the Finnish Families and it is calculated that 90% of them are connected with co-operative activity. The movement is highly complex and it is hard to summarize its achievements statistically.

When the co-operative movement started in Finland, the economy was still undeveloped. It began as a result of conscious and successful attempt of a minority of people to develop a modern system of agricultural and distribution as the economic structure of the country. The movement was fortunate from its very inception to attract able, educated and devoted leadership. With the proper leadership forthcoming, popular response was received quickly and strongly which flowed in to new forms adapted to the needs of Finnish economy.

When the national existence of the Finns was frightened by the Russian Czarist government in 1899, prof. Hannes Gibbhard took up the cause of co-operation and requested his colleagues and other educated people to establish an association as a means for the creation of better economic conditions and supporting solidarity among the Finns. The spontaneous Finnish development was in consumer societies and they are more accurately called general purpose societies.

- **CO-OPERATION & CO-OPERATIVE MOVEMENT IN YUGOSLAVIA:**

According to the census in 1931, big part of the population lived by agricultural in Yugoslavia. 10.6 million People were classified as agricultural. Out of 14 million. The average arable land per head was only about half a hectare [hectare is equivalent to 2.47 acres].

Since the world was II, a number of fundamental changes have been brought which effect agricultural in Yugoslavia. When the communists came to power in Yugoslavia after World War II, they have been giving more importance to the development of agricultural co-operatives to develop national economy. It is the policy of the state to societies the means of production in the field of agricultural by the organization of collective farms on the Russian model the land reform programme includes the greater mechanization of farms and the increasing use of machinery, through the centralized state machine stations and includes a hard exercise of control over marketing and took out the private trade except elementary transactions with peasants.

- **CO-OPERATION & CO-OPERATIVE IN ISRAEL [PALESTINE]:**

The first steps for starting co-operation in Israel (Palestine) were taken at the end of the last century when orange growers and vintners started their first co-operative for the marketing and processing of their product.

The most important contribution to the co-operative movement in Palestine or in world was made when the first collective settlement in Degania was started in 1908. Since then, co-operation in Palestine has developed in different branches of the movement. The co-operative law was replaced in 1933 by a new law which remains in force today.

The co-operative movement in Palestine plays a vital role in the social and economic life of the country. The object of co-operative movement naturally, “the formation of economy rather than changing the established order of society. The basic conditions for this concept are the continuous Jewish immigration and the social and economic integration of the new forces in the economy. One of the major functions of the co-operative movement has been the smooth absorption and the development of the country consumers’ co-operative societies and producer’s co-operative societies were started first both in rural and urban districts. The co-operative process proved highly useful. Because of the four main factors i.e. national social, ideological and economical, the new forms of co-operative enterprise came out.

Kibbutz is the first of comprehensive agricultural co-operation which is the voluntary commune of people settled on national land cultivated by the settlers themselves and managed on the basis of equality and complete co-operation in all aspects of daily life. Moshav ovdim, is a second original type of co-operative settlement which is based on the principle of national land cultivated by self-employed settlers but differs from the kibbutz in that the extension of co-operation is less comprehensive.

The Moshav shittuti is their original form developed in the field of agricultural co-operation which combines the principles of both kibbutz and Moshav ovdim. In reference to industrial producers and consumer societies provide livelihood to tens of thousands of people and play no mean role in the economy of the country.

The major forms of transportation are organized co-operatively. Credit co-operatives in Israel serve the needs of farmers and artisans as well as factory workers. The housing co-operatives not only provide the accommodation but also devote their attention to members’ cultural and social interests.

The co-operative movement is represented on the General co-operative council and it is affiliated to the International co-operative Alliance and participates in its activities.

- **CO-OPERATION & CO-OPERATIVE MOVEMENT IN U.S.S.R. (RUSSIA):**

Russia is a big country and is more than twice the size of china or U.S.A. The co-operative movement depends on the changes in the Government and its economic system of soviet Russia has droved its effect in diverse ways on soviet co-operation. So soviet co-operation differs so much from the co-operative movement in capitalistic countries. Co-operation developed very slowly because the Czarist Government looked upon it with suspicion, particularly the co-operative stores and the industrial co-operatives were taken as the beginnings of socialist economy.

At the turn of the nineteenth century there were a few thousand co-operatives which were almost agricultural co-operatives. The Russo-Japanese was gave a stimulus to the movement. The Government used these co-operatives as food distribution centers. Before the October revolution of 1917 there were 25000 consumer co-operative societies out of 54000 societies. During the year 1917 to 1918, many attempts were made for an agreement inside the co-operative movement with the socialist parties in respect of reorganization of the co-operative movement. The Decree of April 1918 was a compromise to some extent in this direction. During 1918 to 1928 co-operatives were expected to make a great contribution because they were the only organization which was capable to replace the private trader and to take over the distribution of marketable agricultural produce and raw materials.

From the staring co-operatives and Trade Union were given responsibility for making decisions on matters of detail. But this proved unworkable in practice because of mistuned standings on both sides. So co-operatives had lost their voluntary character. The difficulties of obtaining adequate supplies to feed the population, the Government made a new economic policy in 1922 under which, production and distribution of goods were decentralized, and the co-operatives, once again, regained their old autonomous character.

The first five year plan was formulated in 1928, which was based on state monopolies, rapid industrialization and collectivization and mechanization of agricultural. The effect of the first five year plan on the co-operative movement was very much more (good). There was expansion and development of industries, collective farming and rural consumers' movement of co-operation of business experience and the development of educational techniques. Co-operation is playing an important role in Russia. Freed from the competition of private enterprise, it has made a great contribution to the development societies and activities.

We can say that the Soviet Union is the only state in the world where the co-operative movement is recognized as the alternative to state organization in regard to public property.

- **CO-OPERATION & CO-OPERATIVE MOVEMENT IN CANADA:**

Agricultural co-operation possesses an important part in the co-operative movement of the country. There are three different lands like Alberta, Manitoba and Saskatchewan are under wheat culture. Wheat is the most important crop being grown in much larger quantities than the country's requirement. It is exported in large quantities to Europe and Asian Countries. This area is a land of long distances and scattered settlements. Because of this reason, railways and middlemen had power and domination over the farmers. With a view to fighting with such power and domination, co-operative movement amongst farmers was directed in the structure of co-operative marketing and purchasing associations which have got great success in Canada.

Canada is known as an agricultural country. It has a large surplus of wheat, livestock as well as dairy products. Canada exports wheat flour, dairy and poultry products, animals and animal products, apples and other fruits, tobacco and fish eat. The farmers as pincers had to meet the opposition of the native population and do the difficult task of exploration. This attitude creates a sense of self-help and mutual aid

among the farmers. With the disappearance of self sufficiency of the villages and application of science and improvement in the field of transport, communications, co-operative marketing of farm products supply of agricultural requisites and consumer goods increased very largely. Marketing co-operatives and agricultural purchasing co-operatives are parted under the same area of marketing and purchasing in Canada as the marketing co-operatives perform the work of supply of consumer goods as well to farmers. Thus there is a combination of supply of farm requirements and domestic requirements or consumer goods in the same co-operative in Canada.

- **CO-OPERATION & CO-OPERATIVE MOVEMENT IN U.S.A.:**

The co-operative movement achieves more on the trading side. It is an important part in the business life of Americans because it has followed the latest business methods. The co-operative movement of U.S.A. is predominantly agricultural. Marketing co-operatives lead all other types of co-operatives. Integration has been gained by federation of local societies in to terminal marketing of federations. In other commodities livestock, cotton and tobacco the bulk of marketing business is done by large centralized, societies. There is also overlapping of function between marketing associations and purchasing associations though both have undertaken processing activities. The purchasing associations undertake supply work and marketing activities also. The marketing associations undertake their legitimate work and the supply of agricultural requisites. Because of confirmed distributive outlets, American co-operatives are able to manufacture their own feeding stuffs and fertilizers. The current trend of development is towards further consolidation which is mainly noticeable in local dairy and vegetable groups. Regional groups are also knowing with one association which is particularly noticeable amongst the grain, poultry and the smaller form supply regional. Such reorganization appears to be important if co-operatives are to keep their place in the highly competitive national economy. Most major branches of the marketing movement dairy, livestock, and grain have set up national Federations to protect members interests and provide information and advisory services. Marketing co-operatives mainly run on an agency basis rather than on a proprietary basis. The American co-operative movement has been greatly

benefited from its intimate alliance with the Universities, to put the results of research in to practice and in a flow of university trained men in to co-operative movement. American co-operatives have been certainly helped directly and indirectly by the existence of a national farm credit system.

- **CO-OPERATION & CO-OPERATIVE MOVEMENT IN SWEDEN:**

The co-operative movement in Sweden is divided in to three parts such as agricultural co-operative movement and the consumers' co-operative movement and housing co-operative movement. There is no any link between these three parts of the movement is the staring point of it, Sweden is a small agricultural country, with 60% of its population engaged in agricultural. The procedure of industrialization has gone on apace and there has been a migration of labour to industrial centers from areas of large-scale farming. There were speculative trends for farm products in the market. It was harmful to both sides i.e. the producer and the consumer. Then, sub-vention and price guarantees given by the state and through the medium of co-operative societies, farmers began to organize themselves for the supply of farm requisites and sale of their products. A steady deployment of agricultural co-operative movement took place after the continuous efforts of it. In Sweden, dairy products contribute to the income of farmers. In the south region of the country, pig and poultry raising are common. There are co-operative slaughter houses, agricultural supply societies, creameries, fur breeder societies, starch producers' co-operatives, hemp growers and forest owners' societies, agricultural credit societies and mortgage banks as well. The following statistics show the importance of movement in Sweden.

The agricultural co-operative movement handles 98.3% of all milk production. It also handles a large part of timber trade and egg trade.

- **CO-OPERATION & CO – OPERATIVE MOVEMENT IN INDIA:**

There is a common belief that economics – and as such Co – Operation – is a modern science of comparatively recent origin, and alien graft in India. But, if only we care to check our history, it will be founded that this is a misconception. Economic activity has a pretty long past in India. Therefore, economics came to be well developed as a social science and can be come back to the ancient scholars of India. That the modern ideas in economics are almost related to the ideas and objectives of the ancient Indian scholars in that field is no longer questioned by modern students of economics.

Economic activity stops insulated individual action, for it implies an organized society where people living in continuous and necessary collaboration, and constant dependence upon one another. This collaboration may be patently visible or latent and covered by the social and political organization, but that it is, there is beyond doubt. Economic pursuits are impossible without the active association of one's fellow beings in the form of some sort of organization, and concerted action towards predecided goals. Co – operation thus becomes a concomitant of economic activity.

Economic activity dates back in India to very ancient times. Normally, therefore, Co-Operation too. The socio – economic fabric of our ancient village, primarily based on the Hindu Joint family system, is a splendid example of Co – Operative life – embracing as it did the social, economic and moral aspect of life – having existed from good old days. May be much of our knowledge of ancient Indian Village life lacks authenticity, drawn as they are from legends. Nonetheless a close study of even present day village life in any part of the country should convince any objective observer that a deep seated spirit of co – operation permeated all economic activities. This deep seated spirit found in the present day village societies could not have sprung overnight. It must have been acquired over the years, and had its roots in ancient times. But historical circumstances and a long spell of alien rule cuts us off from our rich past. And this led to our believing that economic and co – operation, like so many other things, as having a western origin and a recent growth.

In India co-operation was introduced in the early part of the twentieth century solely as a defensive institution to provide relief to the agricultural producers in their struggle against the exorbitant interest rates, charged by the moneylenders. Certain temporary attempts to manage co – operation in United provinces, Punjab, etc., at the end of the 19th Century got no any result in the expected direction in the absence of a special legislation. In 1892, Sir Frederick Nicholson was posted by Madras Government to review the theory and practice of agricultural and other land banks in Europe and devise ways and means by which a movement in a similar direction might be announced in the country. He came up with the formula “Find Raiffeisen” to throw out the rural poverty aggravated by chronic indebtedness and usurious practice at its worst. Accordingly, a committee under Sir Eward Law was appointed by the Government of India whose recommendations formed the core of the Co – operative credit societies act, 1904. By virtue movement in India got a start.

We heard of co – operation and co – operative societies for the first time in our country towards the far end of the last century when the Deccan witnessed the popular agrarian disturbances of 1875. The peasants of Poona and Ahmednagar emerged against the money – lending classes who were applying usurious rates of interest involving the farmers in perpetual indebtedness. The farmers took the law into their own hands and forcibly taken away their promissory notes and mortgage deed from the money lenders and spoiled them. Although the riots were soon pacified, it became manifestly clear to the Government that some substantial action was called to avoid recurrences of such actions of violence. The result was the enactment of many measures of relief to the farmers such as:

- Deccan Agricultural relief Act (1879)
- Land Improvement Loans Act (1883)
- Agricultural Loans Act (1884)

The Last two measures – they are in force even now are normally known as the Taccavi Laws, the former aiming at providing Long – term Loans and the Latter Short – term ones. But it was soon accepted that more legislation can not effectively control the working of socio – economic laws and redeem the Indian farmer from his age long indebtedness and bring credit within his easy reach. It was also simultaneously felt that what was really lacking was not so much capital for land improvement as the ideas and methods for utilizing it for productive objects. Although both the above mentioned acts were widely hailed they had their limitations and could not fulfill all the needs of agriculture. Thus emerge the requirement for adopting the co – operative method for meeting the exigencies of the situation.

In 1882 the Madras Government deputed Frederick Nicholson – a civilian to Germany to study the working of village banks organized there on co – operative lines for the benefit of farmers, and give his views on the advisability of adopting that method in this country as well. Nicholson gave his famous report, in two volumes, in 1885 and 1887, making a strong plea for the introduction of co – operative credit societies of the unlimited liability type obtaining at that time in Prussia. He ended his report with the observation that we must find Raiffeisen in India. His view was further forwarded in the report of the Indian Famine commission in 1901 which strongly advocated the formation of mutual credit association. Another committee under the presidency of Sir Edward Law, established by the Government of India in 1901, also recommended the organization of credit co – operative societies on the Raiffeisen model. In the meanwhile some earnest British civilians of the Punjab, U.P. and Bengal also started some serious to organize some pioneer co – operative societies within their spheres of activities. Mr. Mac lagan, I.C.s., In Bengal thus did pilot work in the north – eastern part of the country, and paved the way for the co – operative movement in our country in its modern and present form. The result of these efforts of the pioneers and the recommendations of the various committees was the Co – operative credit societies Act No. 10 of 1904 piloted by Sir Devzil Ibbotson through the then Legislative council. This marks the first milestone in the co – operative movement of modern India.

We have discussed in the foregoing chapter the early history of the co – operative movement in our country and the circumstances which led to the passing of the first co – operative legislation in India as the credit co – operative Societies Act of 1904 (Act 10 of 1904). Prior to this act societies for associations formed in madras, Bombay, U.P., the Punjab and Bengal were being registered either under the General societies Registration Act of 1860 (Act 21 of 1860) or the Indian companies Act of 1882. Under both these Acts seven or more persons could form a society for any Lawful object. The 1904 Act was based on the English Friendly Societies Act of 1896 and was made operative through our British India, In their introductory resolution on this Law the Government of India observed that “Legislation was needed to take co – operative Societies out of the operation of the general Law on the subject and to substitute provisions specially adopted to their constitution and purposes. In the second place it was acceptable to confer upon them special privileges and facilities, in order to encourage their formation and assist their operation; and thirdly, it was necessary to take such precautions as might be needed in order to prevent speculators of capitalists from availing themselves, under colourable pretext, of privileges which were not intended for them. Since this enactment was meant to take co – operatives out of the preview of the complicated companies Act, and was primarily meant for a large mass of illiterate agriculturalist of the country, the farmers made it pretty elastic leaving sufficient latitude to provincial government to frame suitable rules for the control and development of co – operative in their respective areas. Besides, this Act was intended to be a small and simple needs and requiring only small amounts of money, As the name itself suggests, it granted the format in of primary credit societies only and did not visualize a wider co – operative structure, it was enacted without any background, experience or public demand and therefore prescribed only broad outlines, leaving a great deal to be gradually worked out from the practical experience of the working, of co – operative societies. This Act provided for the creation of the post of a registrar in charge of the co – operative department charged with the work of organization, supervision, audit and working of the co – operative societies, formed on the basis of thrift, self – help and mutual aid.

Then it was realized that the Act was greatly restricted in its scope in different aspects and required drastic amend mends or even a total replacement by a new Act in as

much as it Granted only the registration of Primary credit societies and left non – credit institutions and federal Organization out of its preview. The co – operative societies Act of 1912 was passed which however retained the simplicity and elasticity of the Act of 1904. It marks the starting of the second phase in the progress of co – operative movement and it has functioned and continuous to do so even now as the time to time by the different state Governments of India. Thus we see that the Lacunae in the 1904 Act were made good and the defects remedied by this Act of 1912. The result was that some new power was infused into the co – operative movement after that many new types of societies were born and they multiplied also quickly.

Then, in this reference, Government of India appointed a committee was to appointing the committee was to see whether the movement was running well and on sound lines, especially at the higher levels. Some of the suggestion of that committee was good and creative and were considered essential. And it was the another landmark in the Co-operative movement in 1915.

As a result of the implementation of many of these directive points and suggestions, the movement registered a big expansion between 1912 and 1920-21 and all kinds of co- operative begin to grow. The movement was passed through great momentum, during 1919-29 particularly in the sphere of non- credit and industrial societies. The Royal commission on Agriculture indicated many steps for the orderly growth and development in the country in 1926-27. This commission remarked that, “If co-operation fails, there will fail the best hope of rural India”. In 1930-31, due to world – Wide economic depression, the movement suffered a major setback almost in the entire country. In this situation, the Government of India set up the central Banking Enquiry committee to report on the existing position and to state ways and means to improve it. Due to the guideline of this committee in 1935, Reserve Bank of India was established to see the movement at further level.

Slowly, and gradually, the financial position of co – operatives began to improve,. Then, equitable distribution of food grains and other items was assigned to co –

operatives by all the State Governments. A number of new co – operatives in the field of marketing, sale and purchase, housing, and cottage industries came into the picture. In 1944 and 1945, the Government of India appointed “The Gadgill Committee’ and “The Saraiya Committee” to find out the ways for more funds for further developing the agricultural finance and co – operatives. All the recommendations which were given by these two committees were accepted by the Registrars in 1947 and decided to put in to effect.

In the year 1949, the Thakurdas Committee strongly advocated a much larger financial facility to the co – operative societies by the Reserve Bank of India and Reserve Bank of India accepted this suggestion. Then, in 1954, The Govt. Committee brought about some redial and revolutionary changes in the co-operative movement from top to bottom.

Co-Operative movement in India is the result of a deliberate policy of the state and is vigorously pursued through formation of an elaborate governing structure. The successive five – years plans looked upon the co-operative movement as the balancing sector between public sector and the private sector.

And the success is evident. Today Almost 50 % of the total sugar production in India is come from sugar co-operatives and over 60 % of the total fertilizer distribution is handled by the co-operatives. The consumer co-operatives are slowly becoming the backbone of the public distribution system and the marketing co-operatives are handling agricultural produce with an outstanding growth rate. India is the highest milk and milk products producing country in the world due to milk dairy co-operatives.

- **CO-OPERATION AND CO-OPERATIVE MOVEMENT IN GUJARAT :**

The co-operative movement in Gujarat is similar to the mild Dairy cooperative movement of Gujarat. Due to the exploitation of the middlemen called the “Bhatiya”, the farmers decided to form their own association to save their interest. So, the first co-operative society was started in 1939 in Surat and that was the beginning of new era of co-operative Movement in Gujarat. Before the birth of Amul Dairy, Anand, there was no systematic marketing for milk in Gujarat and in India also and then, with the birth of “Amul” in 1946, the co-operative movement began as a revolution and then it emerged as a “White Revolution”. And in this reference, further it is described in portion of Genesis, Growth and Development of Dairy Co-operatives in Gujarat.

3. MEANING & DEFINITION OF CO-OPERATION & CO-OPERATIVE:

- **THE ORIGIN OF CO-OPERATION:**

The word embracing system of the social division of labour originated from occasional assistance mutually granted to one another by nigh, manufactured a ploughshare for Paul who was less efficient in this art. On the other hand, Paul, more efficient in leather work, fabricated a pair of shoes for John who was less gifted in this kind of production. It was all friendship and neighborly fellow-feeling. Out of these modest beginnings developed the marvelous specialization of industry as it operates to-day.

It would be nonsense to refer to those remote sources of the division of labour in dealing with present-day industrial conditions. Nobody is so unreasonable as to base any claims and pretensions upon the fact that the exchange of commodities and services was originally a display of pure brotherly sympathies.

We may admit that co-operation originated from friendly relations between neighbors. The villager John went to town to buy five pounds of coffee. His neighbor Paul asked

him to buy five pounds for him too. When John came back and handed the five pounds of coffee over to Paul. Paul reimbursed John for what John had expended for them. Perhaps the two also shared the transportation costs incurred by John. On the other hand, if the purchase of ten pound of coffee was done at a wholesale price, John passed the difference on to his friend, Paul and the later also enjoyed the advantages inherent in wholesale buying.

- **DEFINITION:**

H. Calvert has defined co-operation as “a form of organization wherein person voluntarily associate together as human being on a basis of interest.”⁽⁴⁾

- **IDENTITY OF CO-OPERATIVE:**

- **DEFINITION:**

“A co-operative is an autonomous association of persons united voluntarily to meet their common needs like economical, social and cultural needs and aspirations through jointly owned and democratically controlled enterprises”.⁽⁵⁾ Co-operatives are based on the values of self-help, self-responsibility, democracy, equality and solidarity. Co-operative members believe in the ethical values of honesty, openness, social responsibility and caring for others.

4. CO-OPERATIVE PRINCIPLES:

The needs of various type various countries according to different historical circumstances and difference environments. There has been something common which has held then together through the times. The co-operative principle has provided the common atmosphere.

Co-operative principles can be marked to Rockdale pioneers although its rudiments were in existence even in the times of Robert Owen. In the co-operative history, the business rules of the Rockdale pioneers have guided the formation, develop, and end

extension of small co-operatives the world. It was on the recommendations of a special committee of the [ICA] International Co-operative Alliance that a formal recognition was given to co-operative principles in 1937. The committee stated seven principles. They are open membership, democratic country, member transactions, political and religious neutrality, cash trading, limited interest on capital, and promotion of education. The committee considered the first four principles as essential and the rest as non-essential.

In 1963, due to changes in the social, social, economical and cultural conditions of the world, the need was felt to analyze the principles. The I.C.A. appointed in October 1964, a commission on “co-operative principles” under the chairmanship of D.G. Karve of India. First-four principles did not receive the last three and added two new principles. They are development of co-operation among co-operatives.

International Co-operative Alliance [ICA] adopted a statement on co-operative identity in 1995 and for the first time a universal defining of co-operative was given. It contains values of co-operative organization and the reconstructed principles of co-operation. In the present era of economies Liberalization, Privatization and Globalization [LPG concept], it is very difficult to protect co-operative will have to third identity in the present global and competitive market.

- **VOLUNTARY AND OPEN MEMBERSHIP:**

Co-operatives are voluntary associations. It welcomes all persons who are able to use their services and ready to accept the responsibilities of membership without any gender, social, political and religious discrimination.

- **DEMOCRATIC MEMBER CONTROL:**

Co-operatives are democratic associations controlled by their members who actively participate in deciding policies and taking decisions. Men and women working as elected representatives are accountable to the membership. Members have equal

voting rights [one vote for one member] in the primary co-operatives while other co-operatives are also designed in a democratic pattern.

- **MEMBER'S ECONOMIC PARTICIPATION:**

Members give their part equitably and control the capital of their co-operatives democratically. Members distribute surpluses for any or all of the co-operative activities.

- **AUTONOMY AND INDEPENDENCE:**

Co-operatives are autonomous and independent organizations controlled by their co-operators. If they enter in to other organizations, they ensure the democratic control and uphold their co-operative autonomy.

- **EDUCATION, TRAINING AND INFORMATION:**

Co-operatives provide education and training for their co-operatives, managers, employees and elected representatives so that they can give their part in to the development of their co-operatives. They give information about the need and importance of co-operation in our human life to the general public.

- **CO-OPERATION AMONG CO-OPERATIVES:**

Co-operatives work for their members and force the co-operative movement by working together through local, regional, national and international organizations.

- **CONCERN FOR COMMUNITY:**

Co-operatives work for the development of their communities through co-operative policies.

Because of present economic liberalization, privatization and globalization and increasing the sharp competition with the multi-national companies, the requirement of capital for co-operatives will be increasing day by day. The facility of soft loan from the government to the co-operatives is now not available. So, that there is a two way for co-operatives to create more & more funds. The first way is to collect capital from the market at the prevailing market rate. And the second way is to offer high rate of return to its members for the capital employed by them in the society, which is more preferable way. By adopting this principle, members' economic participation in co-operatives can be consolidated and thereby co-operatives can generate more and more funds internally.

5. IMPORTANCE OF CO-OPERATION:

Adoption of democratic system of the government after the political independence of 1947 and the policy of new planned economy provided a new vision for social and economic development of the country. So, the government launched a massive programmed of mixed economy inviting participation of private, public and co-operative sectors.

- Private sector with a thrust of capitalism,
- Public sector with a thrust of socialism or communism and
- Co-operative sector with a thrust of self-help though mutual help.

The importance of co-operatives in India was largely due to certain insufficiencies in the functioning of private enterprise as well as public enterprise in certain sectors of development. With the primary aim of making maximum profits, private enterprises were not much attached with social justice, self-reliance and a balanced development. It was unable to undertake the development of neglected sectors which had low investment returns on capital. The private sector emphasized on the concentration of wealth in few hands. Similarly, in the developing country like India, the public sector organizations, which were set-up to stop the concentration of wealth in few hands and

to augment resources for economic growth of the country, could achieve tangible results in only a limited number of sectors.

Because of the above limitations of private and public sectors, the administrators and the planners felt that co-operatives could play a very useful role in certain fields of productive activities, distribution of goods and services and allied activities. First promoters or planners like Robert Owen, William King and Ferdinand LaSalle planned a co-operative organization as a “new system of society”. They wanted to eliminate the entrepreneurs and the capitalist’s altogether. Henceforth, associations of the workers themselves should operate “useless exploiters”. Co-operative mainly aims at diffusion of ownership and participative decision making. This aim shows the values of democracy and socialism. Keeping the infrastructure of India in view, it is noticed by Jawaharlal Nehru that co-operatives are not omitted a free choice but also a necessity. The co-operative sector supports integrated rural development to raise the standard of living of people. Co-operative can contribute to the raising of agricultural production through supplies of credit, marketing, services, ware house facilities and the processing of the agricultural commodities.

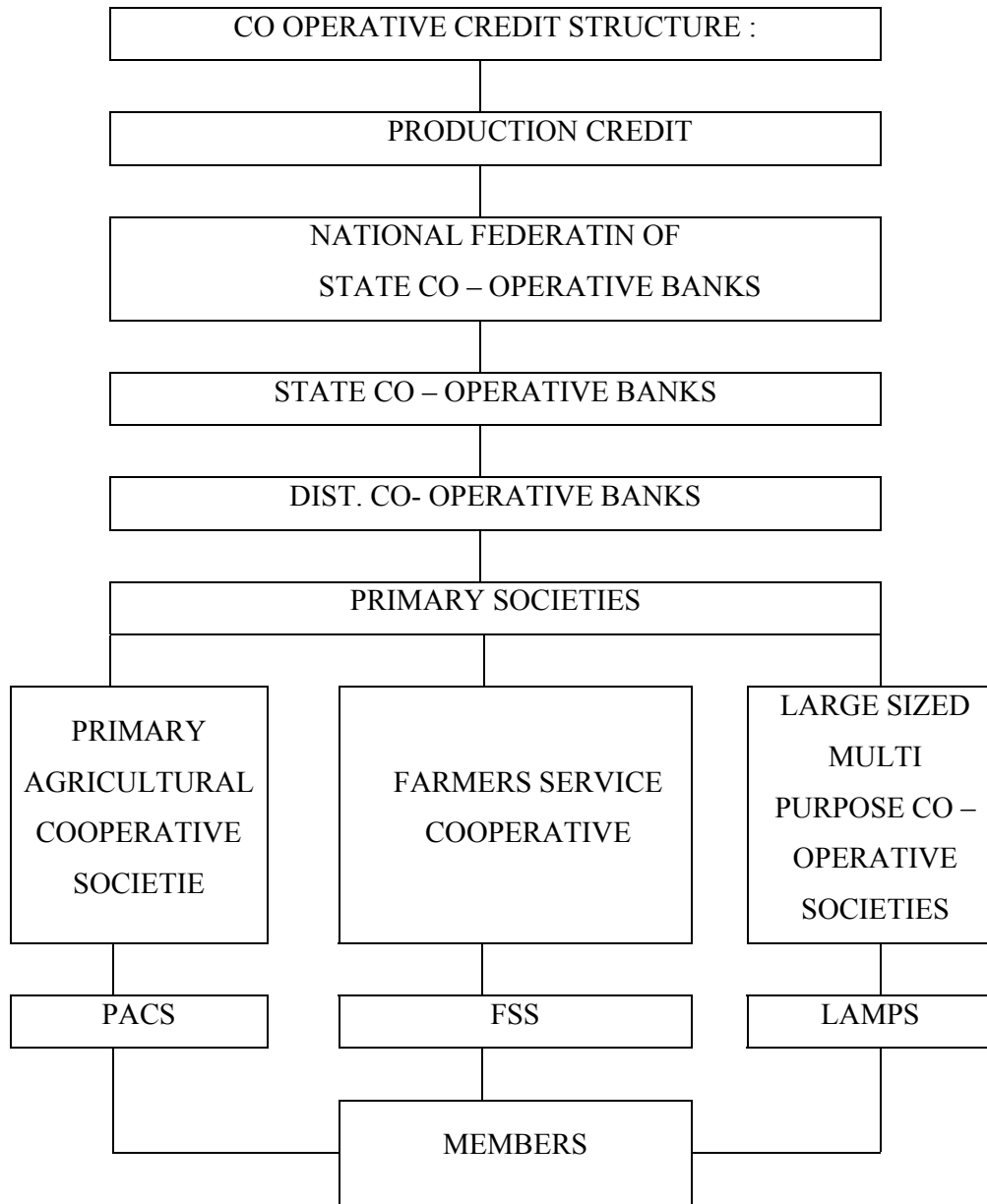
Moreover, it gives wide employment opportunities through labour intensive activities like day farms, poultry farms, fisheries, weaving, piggeries and rural industries, co-operative organization like “to the people, for the people and by the people”. Would certainly have to play an important role. In this regard, the Indian Government regards it as a useful factor for its socio-economic development.

Dairy co-operatives [processing co-operatives] are more potent than the other types of co-operatives because they give triple benefit like rural employment, supplementary incomes to small and marginal farmers and equitable distribution of income or nutritive food.

Dairy co-operatives provide not only inputs at reasonable price but milk process and market milk and milk products at remunerative prices so as to free the farmers from the clutches of the middlemen. The pre-season study, an outcome of co-operative dairies of Gujarat state.

6. VARIOUS TYPES OF CO-OPERATIVES :

Fig. 2.1



(Source: M. Saeed & A. A. Ansari, Co-operative Marketing & Processing)

- **AGRICULTURE CREDIT SOCIETY :**

India is a agricultural Country and Majority depends upon the weather. Agriculture is an important field in the developing countries like India. Its development helps in decreasing poverty creating employment and getting prosperity in the entire country especially in the rural region. So, co-operative credit structure has helped in the economic and social development of the country and has been the instrument for “Green Revolution.”

According to the above figure (Fig. 2.1) India has three tier structure of agricultural credit. At apex level, there are state co-operative Banks with District co-operative Banks. And at the bottom level, primary Agricultural co-operative societies (PACS) are working. These are the service co-operatives and multi purpose co-operatives. Farmer service co-operatives (F.S.S.) and Large sized Multi purpose co-operatives. (LAMPS) are also in action in Adivasi areas of the country for the upliftment of their standard of living. These co-operatives provide short term and medium term credit to them. While for long term credit, there are state level Agriculture and Rural Development Banks. This credit loan is given for production purpose as well as for ancillary activities such as poultry, fishing, sheering, rural craftsmen etc.

At the national level National Federation of state co-operative Banks Ltd. (Mumbai) was set up in the year 1965. It helps to save the interests of the state co-operative Banks and to improve their banking activities. In reference to that, the central Government in collaboration with Reserve Bank of India (RBI) has started the NABARD in the year 1981. It is the apex organization which looks after all the finance activities of the credit co-operative societies working in India.

- **NON-AGRICULTURAL CREDIT :**

- **URBAN CO-OPERATIVE BANKS :**

Urban co-operative Banks are self – sufficient, self – reliant and contended. These banks which are the only co-operative Institutions have neither the equity nor take any type of financial help from the Government. So, it can be stated that the Urban Banks

are the common man's bank. These banks provide finance to their members who are the main persons of limited means such as retail traders transport operators, salaried persons, self employed small business, small scale industry owner etc.

- **EMPLOYEES CO-OPERATIVES SOCIETIES :**

The workers or employees can get credit for their various needs from this type of co-operative Society credit co-operative societies and Employees co-operative societies are working on a large scale in India. Simply, then should be member of such co-operative societies. And they can get credit on a lower rate of interest from them.

• **AGRICULTURAL MARKETING:**

The co-operative Marketing structure is of 3 tier or 4 tier for different types of marketing activities. At the state level, there is a one marketing federation. And there are commodity wise different federation like cotton, vegetables, milk poultry, fisheries, oil seeds, food grains, fruits, salt, tobacco etc. majority of these federations are in action in distributing the agricultural inputs. Some of these are engaged in processing activities also. Then, at District and Taluka level, there are purchase and sale unions dealing with the state level marketing federation. And at the grass root level, primary level marketing co-operative dealing with district or taluka level union.

Marketing co-operatives are the most powerful organizations to help small farmers in improving their financial position through increased food production, collective bargaining and orderly marketing, with the supply of chemical fertilizer, improved variety of seeds, pesticides and other production requested they have stably increased and converted their operations to marketing of agricultural produce and distribution of consumer items in the rural regions. They are also doing a complementary role in the price support measures adopted by the Government.

At national level, there is a apex body which is known as National co-operative marketing federation. Its head quarter is at Delhi and it works for the benefit of Farmers with the help of their branches. In this reference, in the year 1963, National

co-operative Development Corporation (NCDC) was set up by the Government of India. It constructs warehouses for storage of agricultural produce.

- **PROCESSING CO-OPERATIVES:**

It is quite certain that if the farmers want to get sufficient prices for their produce, they should establish processing co-operatives to convert their production into finished goods. Such processing co-operatives can be described as under :

- **DAIRY CO-OPERATIVES:**

India is basically an agricultural country and depends upon the weather. So, animal husbandry and Dairying are helpful as a supplement to the agriculture farmers, milk producers can protect their right from exploitation by making the milk co-operative society. Moreover, the production of individual farmer is extremely small and so it has to be marketed. Before the advent of “Amul”, there was no organized marketing for milk in India. But with the birth of “Amul Dairy” – Anand in 1946, the co-operative Revolution comes into the action. And finally, it emerges as “White Revolution”. In its initial stage, about 250 liters of milk per day was collected through two co-operative societies. It turned today, into 7, 56,600 liters of milk, being collected from 1073 village co-operative societies with the help of 6,15,415 farmer members. The main aim is to increase milk production with good quality, procurement, processing, distribution and selling in such a way that it gives sufficient and fair reward to the farmer members – milk producers and good quality milk to the consumers at a lower price.

There is a 3 tier structure of Dairy Co-Operatives for Milk purchase, processing and sale, at the top level, there is a co-operative milk marketing Federation. It works as an apex body with the prime responsibility of marketing the milk and milk products manufactured by its district level union members. Then, at district level, there are district unions in action. Their main function is to process the milk which is collected from the village co-operative societies. They also provide technical input services to them. And at the bottom level, village level milk co-operative societies are working

which collect milk from the milk producers – former members. They are connected with the district level unions.

Moreover at National level, National co-operative Dairy Federation of India (N.C.D.F.I.) has been established at Anand to form the milk co-operatives and to offer financial and technical assistance to them. The government of India has also set up National Dairy Development Board (N.D.D.B.) and National co-operative Development Corporation (NCDC) to support the co-operative culture throughout India based on “Amul Pattern”.

- **SUGAR CO-OPERATIVES:**

To save the sugar producing farmers from the clutches of middlemen sugar co-operatives were started as early as in 1930-31. And today, they have done tremendous progress in the country. Here, it should be pointed out that major part of production of sugar comes from co-operative sector.

There is a two tier structure of sugar co-operatives viz. primary level sugar co-operative society and state level sugar co-operative Federation. Primary level sugar co-operative societies collect sugarcanes at reasonable and sufficient price; provide necessary inputs such as quality seeds pesticides, fertilizer etc., and modern system and technology. They gave fair reward to farmer members. Make sugar available to the customers at a fair price and carry out various activities to help weaker people of the society. While state level Federations are working as an apex body. They provide financial and technical support to primary societies, face also the problems of sugar industry and facilitate the smooth working of the societies.

• **OTHER CO-OPERATIVES:**

- **HOUSING CO-OPERATIVES:**

Every person desires to have a sweet home. But presently the scenario is changed. Due to scarcity of land, rising cost of construction and urbanization, it is not possible to make the house with an individual effort. So, co-operatives sector is the best way

for middle class and weaker people of the society. Housing co-operative fulfill their members dreams of sweet home in real sense.

There is a two tier structure of housing co-operatives viz. housing co-operative Federation at state level and primary level housing co-operative societies. State level housing co-operative Federations work as an apex body. They provide financial and technical assistance to the primary co-operative housing societies. And at the grass root level, primary co-operative housing societies are working. They credit loan to their members to fulfill their needs of sweet home in real term. They provide credit facility to their members at lower rate of interest.

At national level, National co-operative Housing Federation was established in 1969. The Housing and Urban Development Corporation also gives financial assistance to the housing societies.

- **CONSUMER CO-OPERATIVES:**

Consumer co-operatives give the protection to their members against the inflation, eliminate the evils of private market and exploitation. Here, it should be necessary to state that co-operative Movement in the world was started in the year 1844 with the consumer co-operatives to give essential commodities at no profit – no loss basis.

There is a three tier structure of consumer co-operatives. At the top level, state level consumer co-operative Federations are working. Then, at district level, wholesale consumer's co-operative stores are in action. And then, at the bottom level, Urban Primary consumers' co-operative stores are working. Moreover, some service co-operative societies are working under the public distribution system and some fair price shops are also functioning.

- **INDUSTRIAL CO-OPERATIVES:**

Industrial co-operatives come into the picture to give employment to the Adivasi and other Weaker People of the society in the rural and urban areas. They give the raw-

Material and other technical inputs to their members for the manufacturing activities on one hand and set the proper channel for marketing the products on the other hand.

There is a three tier structure of Industrial co-operatives. At the top level, state level co-operative Industrial Federations are functioning. They are working for the development of the primary level Industrial co-operative societies and for District level unions also. Then, District level Industrial unions are in action. They help in the arrangement of marketing facilities. They also make available raw-material. And at the grass root level, primary industrial co-operative societies are working. They give employment to their members. They also provide facility for manufacturing activities to their members also.

7. LIMITATIONS OF CO-OPERATIVE MOVEMENT:

The co-operative Movement has been in existence for 100 years. The progress has been unimpressive and working capital of co-operative societies but the numerical progress does not disclose the real condition and a closing is far from satisfactory. The following limited support the above statement.

- **ABSENCE OF SELF –HELP & SELLS –RELIANCE:**

The basic principle of self –help & self –reliance, which is base of the crisis of own fund , co-operative Due to crisis of own fund, co-operative sector has to suffer the Government intervention because it is depending upon the Government for funds. This dependency will cut –off the autonomy of co-operative sector.

- **ABSENCE OF MEMBER’S INVOLVEMENT:**

The co-operative movement has started for many years in India, but it has not become the member’s activity. In their wards. Members are not involved in the activity. As their rights and they. They are not careful about the benefits and importance of the co-operative movement. They remain careless towards the working of the society. They don’t use their votes in the co-operative society’s election. Due to the absence of

member's involvement, the nation has failed to achieve an honesty and confidence of the members.

- **LATENT SOCIETIES:**

Third disturbing feature of the co-operative movement is that at least 25% latent [percentage] societies are which exist only on paper. Necessary steps should be taken for liquidating the hopeless societies and should recognize and permit the tottering societies otherwise these are becoming centers of passive co-operators.

- **DOMINATION OF VESTED INTEREST:**

Which the enter of vested interest and politicians in co-operative organization, the basic good of the co-operative has been effected adversely. The leaders of –co-operative movement are mostly bust politicians, moneys, many lenders, Ex-jagirdars, and traders, many of whom are not really traders, many of co-operative ideas. These vested interests have become a bubble in the whirlpool of there police actives.

- **SCARCITY OF THE COMMITTED LEADERSHIP:**

In the past, many parts of the country were fortunate in obtaining the services of self-less and eager co-operators who devoted this energy to spread the mission of co-operation without honors. It is sad but true that that the co-operative movement has largely failed to attract men of integrity. As a result, co-operative organizations are continuing to be dominated by money-lenders and others who use the funds of the societies to promote their own ends. Thus, the qualitative aspect of the co-operative movement could not be achieved due to the dearth of the dedicated leadership.

- **FRAGMENTARY ATTITUDE:**

Due to the fragmentary attitude towards the working of co-operative movement, the movement has largely failed at rural level. Rural credit, farming, processing,

marketing, production and distribution of milk, animal husbandry, irrigation etc. are all the activities in which the base of co-operative has been attempted but the movement has failed to realize the organic inter-result has been disappointing and frustrating.

- **INEFFICIENT MANAGEMENT:**

Because of the inadequacy of trained, qualified and well remunerated personnel, the movement has suffered a lot right from its inception. In spite of standard of efficiency. Two major factors are responsible for this condition. Viz. (1) Recruitment is based on favoritism and communism instead of merit or competency. (2) Secondly, men of high caliber do not feel attracted towards co-operative field because of its unsatisfactory and inefficient working condition. Dr. Laidlow has rightly stated that co-operators must learn that they cannot cross the economic stream riding on ideological horse. This is also true in the context of present scenario.

- **INCONSISTENCY IN LAWS & BYLAWS:**

The model bylaws of the co-operative organizations which are in practice today have been formulated many years ago but discrepancies have been seen between these bylaws and co-operative laws and there is also no similarity in it. The provisions of co-operative laws and bylaws are sometimes controversial to each-other. There is also no uniformity of bylaws in same kind and same level of co-operative societies. The rules of co-operative societies and terms and conditions of its employees have not been fixed. Thus, lack of consistency in laws and bylaws is responsible for the obstacle in co-operative-movement.

- **LACK OF SUPERVISION, AUDIT & INSPECTION:**

Prompt audit, active sectors for the success of the co-operative movement. It is seen that many societies are neither properly audited nor actively supervised. The supervisors and auditors are so overloaded with their work so that they cannot do their job quickly and efficiently.

- **LIMITED PERCEPTION:**

The co-operative movement has not been given a proper place in the economies per its important role. It was never considered as part of bigger plan. As a result, this movement never reached to the people in right manner. Neither its growth took place according to any plan nor did it become a people's movement. So, they don't treat it as their own and come forward to promote it.

- **TIME-BAR CREDIT:**

The main object of the movement which is supply of credit to the farers and to save them from the claws of the money – lenders has not even fulfilled. The contribution of credit by co-operative organization has rarely reached at 50 percentage of total credit but the percentage of recovery of that credit is less than 50 percentage which is quite painful.

- **SLOW GROWTH:**

It doesn't do a good work in the field of non-credit spheres like production, processing and marketing of agricultural products, distribution of consumer goods, housing etc.

- **UNEQUAL GROWTH:**

There is an unequal growth of the co-operative movement in the state as well as nation. The fact is that about 60 to 70 percentage of the co-operative organizations have been concentrated in the three states like Maharashtra, Tamilnadu and Punjab while in the states like Bihar, West Bengal, Assam and Orissa, the coverage is below 20 percentage. In the same way, co-operative Movement in Orissa is more developed in coastal districts than western districts of the state.

8. GENESIS, GROWTH & DEVELOPMENT OF CO-OPERATIVE IN MILK DAIRIES. - GLOBALLY, IN INDIA & GUJARAT IN PARTICULAR:

• **GLOBALLY:**

- **GENESIS, GROWTH & DEVELOPMENT OF THE MILK DAIRY CO-OPERATIVES IN FRANCE:**

The Dairy co-operative in France are the oldest type of agricultural co-operatives and are highly organized. They distribute into three categories : (1) Societies selling liquid milk and operating near big cities such as Paris, Rom etc. (2) Butter – Making societies functioning in the west and North and (3) Cheese marketing societies operating in mountainous regions.

Milk societies collect milk from their members within a 20 (twenty) miles, pasteurize it and deliver it in big tanks or bottles to big cities. The butter and cheese making societies group themselves into a union for marketing it. The members are paid on the basis of fat content. In addition to their main activity, the Dairy co-operatives undertake the supply of feed to their members and improvement of breeds of cattle through artificial insemination. In the beginning, there are 2600 dairy societies and the individual societies are grouped in 40 regional federations which are affiliated to the National Federation of Dairy co-operatives. Local societies are also grouped in local unions which process their surplus milk and rilen cheese etc. They make the dairy products available throughout the country and also purchase centrally the requirements of affiliated societies.

- **GENESIS, GROWTH & DEVELOPMENT OF THE DAIRY CO-OPERATIVE IN FINLAND:**

In Finland, co-operative dairies were established in 1901. it was the beginning of the co-operative dairy movement in Finland. There were 699 co-operative dairies in 1931, 414 in 1950, 412 in 1951 and 327 in 1957. Thus, the number of dairies is gradually on

the decline because job the process of amalgamation and consolidation shares are distributed in proportion to milk deliveries at the rate of 1 share for every 2000 Kg. of milk. The society has a right to borrow loans from members repayable within a 10 years period. Each member has one vote. Members undertake to deliver all milk not required for domestic consumption. Payments mainly made on a fat content. The proportion of national output was as follows:

- Liquid Milk 85 %
- Butter 92 %
- Cheese 81 %

The local dairies are federated into 11 regional unions which are linked with valid – the Finish co-operative dairies Association. The regional and the national organizations managed two day – school fro the training of Junior Dairy Personal with the assistance of the state. They also run mutual insurance society for dairies and manage a dairy employees’ pension fund.

- **GENESIS, GROWTH & DEVELOPMENT OF THE DAIRY
CO-OPERATIVE IN U.S.A.:**

It is not easy to clear the federal structure of the complex dairy movement. The simplest way, may be to draw the clear picture about the federal development is to refer to a single state where dairying on co-operative lines has developed considerably. For this object, Minnesota State may be cited. In this state dairy marketing is the main business of some 520 are dairy societies of which all but 100 are butter societies, the rest include 65-70 milk bargaining and distributing societies, a few cheese societies and some dear in mixed dairy products. Eliminating inters – co – operative trade between federations and local the gross co-operative turnover was \$ 8590 million. Many societies in addition to dairy products market e995 and poultry and a small volume of requirements mostly feed, dairy equipment and groceries. The larger ones were conducting mixed dairy products or fluid milk and the smaller ones were butter and cheese making societies. There were 4 big regional societies in

Minnesota – a large dairy federation, a centralized milk bargaining society and a smaller dairy federation with a mixed membership of societies and individuals and a dried milk marketing federation. The largest of the regional dairy co-operatives is the land of the lakes creameries having a membership of 460 local dairy societies, cheese factories, other dairy plants and a breeding association in ministry, Wisconsin, North and South Dakota, Local societies have a membership of 1,00,000 farmers, the federation now owns and operates 18 milk drying plants, 5 X 2 ice – cream plants and 4 miscellaneous milk plants. It has a total turnover of \$ 40 million about 3/4th being in the dairy products are marketed in all parts of the U.S.A. through the societies branch distribution offices.

The American dairy movement can be parted into two broad group's viz. those societies handling fluid milk and those manufacturing dairy products. The former is again sub-part into two groups. Those that actually handle the milk and those which are simply price bargaining societies moreover, the manufacturing group can also be sub- parted into butter making, cheese making, milk drying and other manufacturing societies and also a few merchandizing federations formed solely to sell the finished dairy products of their related societies to regular commercial outlets.

The co-operative marketing of dairy produce is both the oldest and most important branch of co-operative marketing in the U.S.A. co-operatives managed about 3 Quarters of the million sold in markets under federal marketing orders. In this reference, it is need to point out that compulsory marketing orders are issued when 2/3rd of producers or those who produce 2/3 of the volume have admitted for order under the Agricultural Adjust Act, 1933 and such orders apply to specific areas in addition either 1/3 handlers must agree or the secretary/ of Agriculture must find that on order is the only practicable way to complete the objectives of the Act. These schedule have been used primarily for fluid , fruit and vegetables and have assistant co-operatives in these files. Co-operatives also manufacture over 40 % of the butter, 20% of the cheese, 5 % of the evaporated milk and over ½ the quantity of non- dry milk solids through their role in distributing these commodities is less important.

The fluid milk marketing social generally sell milk in a local market. Associations receive milk direct from the farmer members, milk producers through those that

supply milk to big cities milk receiving stations in outlying area to decrease transport cost by bulk handling the milk and to safeguard its quality by pasteurization before shipping it in insulated tanks. Milk distributing co-operatives used a wide variety of trade channels in moving their bottled milk, cream and other dairy products. The bargaining co-operative act purely as agencies attempting to ensure a satisfactory spoil of all milk to distributors and processors. A major part of milk marketed by bargaining co-operatives is sold under Federal milk marketing orders. Bargaining co-operatives assure their members alert and accurate payment fro milk and provide a dependable year – round market, systematized delivery of milk and keep members informed of market conditions. They frequently assist members in adjusting their production to market needs by seasonal price variations which prevent large fluctuation in production. They also control carriage of milk from plants and participate in quality improvement programmes. Merchandizing dairy products is a highly technical business calling for the assistance of specialists – lawyers, economists, market – analysts, accountants, transport experts and so on.

- **GENESIS, GROWTH & DEVELOPMENT OF CO-OPERATIVE MILK DAIRIES IN INDIA:**

- **PERIOD BEFORE THE INDEPENDENCE:**

India is basically, an agricultural country, and mostly depends upon the weather. Animal Husbandry is one of the branches of the agriculture moreover, the Indian culture is self – reliant, self sufficient and contended. In this past, every family domesticated cows to fulfill their own need but dairy industry was not developed as a business, or as a profession. With the advent of the 19th century, the condition was getting changed and in real sense, the people of India adopted Dairy industry professionally.

To fulfill the need of the dairy, the cattle breeding centers were started during the English rule. The first cattle breeding center was established at Allahabad in 1891. Later on, such type of cattle breeding centers were started at Bangalore, Poona, Kurnal and Hissar. In 1923, expert services of Imperial Dairy were started by the

British Government. Then after, the Bangalore centre was converted into Imperial Dairy Research Institute (IDRI) in the year 1941.⁽⁶⁾ After the First World War, such cattle breeding centers were handed over to central Government and after that they were put under the control of concerned state Governments. In these centers, cattle's breeding was done on a scientific basis and item like paneer was also started to be made. Thus, in India the Dairy Development was introduced in this fashion.

In the private sector, the following organizations have been granted to start Dairy Industry in a modernized passion:

- Polson Dairy – Anand
- Lords Dairy – Ahmedabad
- Ceventer Dairy – Aligadh

During the First World War, Polson Dairy started to produce butter with the help of hand made wooden butter churner to fulfill the requirements of the army. In the year 1919, 5000 pounds of butter making mechanical machine was installed. So, the industrialization of Dairy Industry was started in India from that period. But it can be said that: the progress has been made only after independence in real term.

As the Dairy co-operative are concerned, there were only some isolated efforts towards forming the co-operatives made in 1930s and 1940s.⁽⁷⁾ The first Dairy co-operative was made in Allahabad in 1913. Then, many co-operatives also came up in Crode district of Tamilnadu, in Surat District of Gujarat and in several areas of Maharashtra. But because of inadequate organization and management it could not get the expected progress. The interference and involvement of the vested interest of private traders in co-operatives resulted into exploitation of milk producers.

But then after, in 1946, with the birth of ‘Amul Dairy’ – Anand, the co-operative movements have been started in India with a better impact and it comes into their original tempo. In the beginning, Amul Dairy was procuring just only 250 litres of milk per day for Mumbai and today, it procures 7.56,600 litres of milk per day. Really, it is a great progress. It is one of the biggest dairies of Asia which has brought

a tremendous revolution and has been providing its excellent services throughout the India and also in the world.

After the “Amul Revolution”, Polson Dairy has started a butter factory in Khagol, near Patna and then many private traders like Nestle in Moga, Glaxo in Aligadh, Horlicks in Nabha, Hindustan Lever in Atta etc. were started. ⁽⁸⁾ Thus, the industrialization which started in 1929 has been developing.

- **PERIOD AFTER THE INDEPENDENCE:**

After 1946, the Indian Central Government and concerned state Governments have given top priority to the below mentioned four fundamental points for the development of Dairy Industry:

- Development of District co-operative Society.
- Establishment of cattle breeding units in Urban Area.
- Establishment of Dairy farms to increase milk production.
- Establishment of factories for producing by products in large volume.

The economy of villages has been improved because of the co-operative activities. New system was started for milk procurement and distribution. The cattle rehabilitation scheme was put into action to abolish slums in the urban areas. Thus, the first milk colony was established at Aarey – in Mumbai in the year 1949. There after, Dairy farms milk colonies were established in Kolkata and Chennai. Kolkata’s milk colony was near Harigatta and the milk colony in Chennai was at Madhyvaram. Their dairy farms were equipped with Artificial Insemination – (AI) and veterinary health and a housed with large numbers of cattle, mainly buffaloes. Their owners fed, milked and reared animals in the shed given to them and sold milk at pre-determined price to the milk colonies. To improve cattle, breed, every state had established cattle breeding centres. Factories were started to produce milk products where the milk

produced in bulk. Cottage creameries were established in village areas and dairies were started in many places.

With the establishment of National Dairy Development Board (NDDB) in 1965 and Gujarat Dairy development Corporation (GDDC) in 1970 and Gujarat co-operative milk marketing Federation (GCMMF) Ltd., in 1973, the development of dairy Industry got momentum surprisely in the co-operative sector. Then, NDDB has introduced a project called operation Flood (of) i.e. to create flood of milk in every nook and corner of the country. It gave a biggest impact to modernized dairy industry. The co-operative movement which is known as “Anand – Pattern” has become in ideal in the whole world. To adjust the regional and seasonal imbalances in milk procurement and marketing, the National Milk Grid (NMG) has been set up by NDDB under of – II during the year 1981 to 85 to collect the surplus milk from rural area and provide it to the urban regions. To develop above for broad fundamental factors of dairy development, the more development is needed in breeding, feeding health care, training, education and research etc. keeping these points in view, Government has introduced many schemes and programs for the improvement and development of dairy industry.

- **BREEDING:**

Though India holds highest number of livestock, the average milk yield is poor in comparison to the world’s average. This low productivity is due to gradual breed deterioration from general neglect over centuries.

To increase milk and milk product, the adoption of scientific system viz. artificial insemination (AI), cross Breeding and Embryo Transfer (ET), have been in action for pretty longtime. By adopting these systems, milk yield has increased at least 10 % to 25 % approximately in real terms. ⁽⁹⁾ After the Limitations of AI, ET technology comes into picture. ET is an improvement over AI. It creates better seed stock.

The following institutions have been set up to take the full benefit the above three systems:

- One Thousand Gaushalas.
- Central Council of Gausamvardhan (CCG).
- Seven Central Breeding farms.
- National bureau of animal genetic resources at karnal.

The first systematic and extensive cross breeding project was initiated in 1963. In karalla under Bilateral Indo- Swiss Project. The project coupled with the efforts of the state animal husbandry Department and the co-operative network has resulted in the population of cross bread cows exceeding that of desi cows. The NDDB has launched a pilot project in 1986. Its encouraging results led to the launching in 1987 of a multi agency science and technology projects on ET. Implemented by the department of Bio-Technology, ministry of science and technology, jointly with the ministry of Agriculture and Indian council of Agriculture.

- **FEEDING:**

Chronic shortages of food and fodder coupled with poor nutritive value of available feeds have decreased the productive capacity and fertility of India's livestock. Feed is the biggest input as it accounts for over half of its total cost, serious and controlled attention to feed can bring down this cost. 15 % increase can be noted in the existing milk product through adequate feeding of the present bovine population.⁽¹⁰⁾ Or the fully and efficient utilization of existing resources, newer technology is being considered and followed to upgrade crop residues in reference to balance cattle feed, which includes the underwritten points:

- The Enrichment of Straws through Ammonia Treatment.
- The Bye – Pass Protein Feed.
- Urea Molasses Mineral Block.
- U.M.M.B. Lick.

- **HEALTH CARE:**

Quick search, accurate diagnosis and their early treatment is the key. Factors to make dairy farming productive and profitable. Negligence in management of dairy animals, pre-disposes them to certain diseases which can cause heavy economic loss. In contrary, effective disease prevention and control can increase milk production by 20 % to 25 %.⁽¹¹⁾

In order to provide better health care to livestock, a network of veterinary hospitals, dispensaries and other veterinary aid centres have been set up the state Department of Animal Husbandry and situated within the 5 Kilometers in all over the country. They are conducted by qualified veterinarians and stockmen to protect livestock. Against the exotic disease, animal Quarantine and certification services have been started. A vaccine against Hemorrhagic Septicemia (HS) and theileria has been developed also.

- **EDUCATION RESEARCH & TRAINING:**

The success of dairy industry depends upon the human resources holding knowledge, work – skill, ability, adequate capacity, and culture. The educational institutes are therefore needed to train the professionals equipped with the above competencies and skills.

Many educational institutions were established throughout the India and they offer many courses in Animal Science & Dairy Science & technology. To development, a new scheme or programme known as Technology Mission on Dairy Development (TMDD) was introduced by the Government of India in 1989. So far the co-operative sector is concerned. NDDDB has established the institute of Rural Management (IRMA) in Anand in 1979 for training in management and consulting in rural development. Earlier in 1971 NDDDB has setup the Mansingh Institute for training at Mehsana in Gujarat and three other Regional Demonstration and Training Centres (RD & TC) at Erode Jalandhar and Siliguri to cover southern, Northern and Eastern regions respectively. Moreover to in part in plant training to students a Vidya Dairy was established by NDDDB in Anand under the operation flood programme.

- **PRESENT SCENARIO:**

Government of India has identified the importance and major contribution of livestock in the national economy and established a new separate department of Animal Husbandry in Dairying in the Ministry of Agriculture in 1990 at central level. In 1991, the new policy was declared – as part of the economy reforms, the Dairy sector was delicensed and greater competitiveness.

Today, India is highest milk producing country in the world and milk products. That constitutes 17 % of total agricultural commodity. India is the highest milk producer nation in the world, during the year 2004-05; co-operative milk procurement crossed 20 million Kg. per day for the first time, at a 15% increase over the previous year.

• **GENESIS, GROWTH & DEVELOPMENT OF DAIRY CO-OPERATIVES IN GUJARAT IN PARTICULAR:**

The Dairy Co-operative movement in Gujarat is similar to the co-operative movement in India. “Amul” is the pioneer of the Dairy co-operative in Gujarat and in India also. Before the birth of Amul Dairy Anand, there was no systematic marketing for milk in India. As milk is perishable item, milk producer’s farmers had to sell their milk to the middlemen for whatever they were offered. Middlemen bought the milk from milk producers at a lower price and sold it to cities with the huge margin of profit. Many times, milk producers were compelled to sell cream and ghee at throw away prices. Thus, the middlemen exploited the milk producers, farmers.

Though many farmers were illiterate, they knew that the system under which private traders bought their milk and milk products at lower prices and sold it to huge margin of profit was just not true and fair. In 1945, the Government of Bombay started the Bombay milk scheme. At that time, the “Polson Dairy” – the private dairy had got monopoly to collect milk from Kaira district to be sold at Bombay and exploited the farmers. The Government of Bombay found it profitable and Polson Dairy also kept good margin of profit. But, in spite of this situation, nobody had tried to determine the

price of milk to the benefits of the farmers. As such dissatisfaction among the farmers grew. So, they decided to have their own milk co-operatives to save their own interest. In this reference, they determined to supply the milk as an organization and not as an individual. The motivation for this came from Sardar Vallabhbhai Patel. In shaping and creating the Amul, the vital role of leaders like Morarji Desai, Tribhuvandas Patel, dedicated professionals like Dr. V. Kurien and Dr. Dalaya was very valuable. The Bombay Government in the milk industry. In this reference, the milk producers of Kaira district went on strike for 15 days. So, not even a drop of milk was sold to private traders. And they could not provide a drop of milk to Bombay. So, the scheme had collapsed, due to the strike of milk producers. After seeing the strong determination of the milk producers – farmers, the Bombay Government had to obey to the demand for the establishment of milk co-operatives.

Eventually, the Kaira District co-operatives milk producers, Union Ltd. Which is known as “Amul Dairy” – Anand was started in 1946. In the starting, the Amul Dairy collected just 250 liters of milk per day with the help of two co-operative societies of the union. Due to Amul Dairy, farmers were obtaining fair and sufficient reward on the basis of fat content of the milk. They were paid promptly also. So, more and more farmers jointed the union, and the union got much strength. It turned today into 7,56,600 litres of milk per day, being collected from 1073 village co-operative societies with the help of 6,15,415 farmer members Late Tribhuvandas Patel and Dr. V. Kurien have given the name of “Amul” as excellence in Asia and have brought the ‘White Revolution’ in Gujarat as well as in India. And the milk producers also supported and co-operated their efforts nicely and realized the spirit of co-operation in a real sense.

Amul Dairy Union collected thefrom its members and delivered it to milk commission of Bombay. But the milk commission had started irregularity. They could not give the payment to the union in time and rejected to accept the excess milk in winter season. And so, the union established its own processing plant to handle winter glut of milk. The union also set up the chilling centre in Anand in 1949. the production of butter and milk power was started in 1955. In the year 1958, milk producers’ factory was developed to produce sweetened condensed milk a new plant was started for the production of baby food and cheese in the year 1960. In the year 1964, for the first

time in the world, cheese and baby foods were being processed from buffalo milk on large professional scale. The prime minister, Shree Lal Bahadur Shastri visited Anand in 1964 and he announced the cattle feed plant of the union. Another milk powder plant was commissioned in 1965. Shree Lal Bahadur Shastri wished that milk co-operative as this “Amul Pattern” should be set – up in the other region of the country also. And with this aim, N.D.D.B. was established in the year 1965. With its headquarter in Anand. In 1970, N.D.D.B. introduced the operation Flood (O.F.) programme for the replication of Amul pattern of dairy co-operative throughout in India. For the marketing of milk, Gujarat co-operative Milk Marketing Federation Ltd. (GCMMF) was established in 1971 in Anand. To develop dairy industry on co-operative line, Gujarat Government established (G.D.D.C.) Gujarat Dairy Development Corporation in the year 1972. Amul Dairy set-up the plant for high protein weaning food, chocolate etc. in 1974. Thus, the Dairy co-operative revolution is continuing year by year.

The Dairy co-operative has three tier structures: (1) Village co-operative milk society which is mainly related with the production and collection of milk from the farmer members. (2) The district level union which is responsible for processing of milk. It is also responsible for giving technical input services to village co-operative societies to increase the milk production. And (3) the state level an Apex body which is given the responsibility for marketing of milk.

Presently, 12 co-operative milk dairies are connected and worked under Gujarat co-operative Milk Marketing Federation (GCMMF) Ltd., Anand. About 25 Lacs farmers are members of 120000 Village level co-operative milk societies. The average milk procurement comes to about 50 Lac Ltrs. Per day whereas 20 Lac ltrs. Per day is being marketed. The sales turnover including consignment sales is about 3,000 crores yearly.

- **PROBLEMS AND PROSPECTS OF DAIRY INDUSTRY IN GUJARAT:**

India is highest milk produce nation in the world, during the year 2004-2005; operative milk procurement crossed 20 million Kg. per day for the first time, at a 15 % increase over the previous year. However, the liquid milk marketing rose did not match enhanced procurement by only about 5 %. In 2004, world milk production was estimated to be 512 million tones; nearly 0.5 % higher than the previous year and India contributed about 15 % to this. In spite of this, Dairy Industry in general and Gujarat in particular, will have to face many challenges and problems that can be classified in to the following categories:

- **External Problems**

- **Internal Problems**

External problems are as under:

- **TRADITION:**

Dairies of Gujarat are particularly proved that the dairy co-operatives have encouraged and strengthened the understanding and practice of democracy. We are also proud that women have an increasing role not only in milk production. But also in the membership and leadership in dairy co-operatives. We are proud of this and above said achievements. At the same time, we must not rest our successes. The world is changing rapidly and if we are continue to serve the interests of India's dairy farmers, and then we must be aware of and respond to the dramatic changes in our own country and in the world as a whole. We must keep our purpose and principles constantly.

- **INADEQUATE MARKETING:**

When we see, the perspective – 2010, strategy for marketing, the result of the investment has not entirely measured up to our expectations. According, to the NDDB

the major reason for inadequate marketing, is that the co-operative unions and marketing federation too often lack qualified professionals in the key marketing positions. This problem is compounded by their lack of freedom in employing the right professionals.

- **RAISING QUALITY STANDARD:**

If, we truly want to be global players then we must not only meet-we must strive to surpass- the strictest international standards. It is not greatest and the most difficult challenge. At the present, the dairy industry continues to be all too indifferent to quality. If we are to raise quality, we have a address the entire system from producer to procurement – to processing through to marketing and the end customer or user.

- **INCREASE THE SCALE OF OPERATION:**

Co-operatives in the west are merging with other co-operatives or investor – owned firms. Regional dairy co-operative like land o’ lakes in the U.S. have become national through merger. In India and in Gujarat, co-operatives must begin to examine whether there are valuable synergies in coming together and formatting alliances. As global dairy evolves, we must be sensitive to change and must in turn consider new ways and forms of doing business.

- **BUILDING AND SUSTAINING A DATABASE:**

Sound policy depends on sound information. Government has so far unfortunately, failed to invest our national data on cattle milk and milk products and marketing. Without accurate and timely data neither commercial nor policy decisions can be taken with the degree of confidence. Global positioning implies that we face global competition. Without this our dairy industry can be at the best only be mismanaged.

- **INTERNAL PROBLEMS:**

When researcher has visited all the eight dairies, he found the under written internal problems from them.

- **NEED OF PROFESSIONAL LEADERSHIP AND MANAGEMENT:**

They believe that there is an urgent need of professional leadership and management at every level of the organization.

- **NEED TO CHANGE APPROACH OF FARMER MEMBERS:**

Researcher observes that there is a need to change the approach of farmer members because they consider the milk activity as a secondary activity and not as a prime profession.

- **CO-OPERATIVE LAWS AND BYLAWS:**

Researcher found during his study that our co-operative laws and bylaws are very old. There is a serious need of amendment in present co-operative laws and bylaws to protect the interest of all the stakeholders.

- **GOVERNMENT'S AUDIT SYSTEM:**

During this study researcher found that there is a need to reform present government's audit system. Today, many co-operative dairies have started their Internal Audit System because of this reason.

9. ABOUT THE MILK DAIRY CO-OPERATIVES:

There are eight dairies have been selected & visited in the research work which are given below, situated at different geographically areas covering the entire state of Gujarat.

(i) KAIRA DISTRICT CO-OPERATIVE MILK PRODUCERS' UNION LTD., 'AMUL DAIRY – ANAND': ⁽¹²⁾

The birth of “Amul” is linked to the freedom movement of India. It has founded in 1946 to stop the exploitation of milk producers at the hands of middle man. The co-operative movement began with a milk strike.

The first “Amul” co-operative was the result of a meeting of farmers in Samarkha (Kaira District, Gujarat) on January 4, 1946, - called by Shri Morariji Desai under the advice of Sardar Vallabhbhai Patel, to fight with the rapacious milk contractors. They took a decision that milk producers' unions in villages, federated in to a district union, and alone should handle the sale of milk from Kaira to the government under the Bombay milk scheme. The British government opposed the move. The farmers called a milk strike. After fifteen days, the government capitulated.

This was the beginning of “Kaira District co-operative Milk producers' Union Ltd., Anand. It was registered on December 14, 1946. it was started with 2 (two) village societies and 247 liters of milk. Day by Day, Milk Unions came up from other district of Gujarat too. Then, they formed the Gujarat co-operative Milk Marketing Federation Limited, (GCMMF) in 1973. Today, 12 (twelve) District co-operative Milk Producers' Union are connected with the GCMMF Ltd.

In the early day of Kaira Union, there was no dearth of cynics. There were so many questions about it. Which are as under? Could natives be handled sophisticated dairy equipment? , Could western style milk products be processed from buffalo milk? , Could farmers' co-operative be marketed these products to sophisticated consumers in cities? But, the Amul people confused the scoffers by processing a variety of high-

grade dairy products; several of them were made for the first time from buffalo milk and marketing these dairy products at national and inter-national level against tough competition. Marketers who believed that only English – sounding brand names would succeed in post –british, India were proved wrong by “Amul”. Its’ predicting, quality, networking, advertising, marketing are now much admired.

From the Sanskrit, “Amoolya” was suggested by a quality control expert in Anand in 1955 in variants all meaning are found “priceless” in several Indian languages. “Amul” is also the acronym for Anand Milk Union Limited [AMUL].

“Amul” products have been used in millings of homes since 1955. Amul milk powder, Amul Ghee, email spay Infant milk Infant milk food, Amul cheese, Amul chocolates, Amul Shrikhand, Nutrumul, Amulya Dairy whitener, Amul Ice-cram & Amul pizzas have made “Amul” the largest food brand in India Today.

Using IT innovation, Amul has chosen the supply chain management system effectively and efficiently over several decades. As CEO has highlighted “GCMMF” (Amul) is not a food company but it is an IT company in food business.” The main object of GCMMF (Amul) is to link up between milk producers and consumers so as to provide good return to farmer members and value for money to the consumers. It is sure that this task can be achieved only through IT innovation and building organization capture to manage the change.

The ultimate tribute to “Amul” was paid by Kate Prime Minister Shri Lal Bahadur Shastri. He advised Dr. V.kurien to replicate “Amul” model all over India during his visit to Anand in 1964. And as a resykt, The National Dairy Development Board (N.D.D.B.) under the Operation Flood programs was started by Shri Dr.V.Kurien. India now has 96000 and more village milk co-operatives with 110 lace farmer members. These creative efforts in dairy development have made India the largest producer of milk in the world to-day.

‘Amul’- hope and confidence beyond belief to farmers. Quality beyond price to consumers. ‘Amul’ –“The Taste of India” & in the reference to Gujarat economy, I

believe 'Amul' - "The Heart of Gujarat." 'Amul' - a priceless brand name Whichever Way you look at it.

- **OVERVIEW OF AMUL (GCMMF):**

"AMUL"- GCMMF is an apex co-operative organization owned by 2.1 million milk producers of Gujarat (India).GCMMF (Amul) comprising of 12 affiliated member dairies/District Unions and it has its own one Manufacturing unit called Mother Dairy at Gandhinagar, India. GCMMF Amul is the single largest organization in food industry engaged in marketing & distribution of the Liquid Milk and the Milk Product processed and manufactured by the member dairies under brand name of "Amul" and "Sagar" GCMMF also coordinates with manufacturing dairy units for production planning and raw material procurement and handle the distribution of milk from surplus unions to deficit unions. The total sales Turnover of the GCMMF exceeding Rs.23 billion (US\$ 500 million) per annum.

Milk producing Members (2.1 million) called Farmers, who are giving milk twice a day to respective village cooperative Societies. The Amul has taken initiative in installing around 3000 Automatic Milk Collection System Units (AMCUS) at village societies so as to Automatically Capture Member Information, FAT content of the milk. Volume of the Milk and Amount Payable to the Member.

The Milk Collection data will be transferred to the respective Member Union with the help of Information Technology Innovation, in a span of one hour in the morning as well as evening. Amul is in position to collect milk of around 5 to 6 million liters per day from around 2 million Members. This has increased the trust & transparency regarding Amul in the rural areas. There are 10395 organized village Cooperative societies in Gujarat which are affiliated to the respective District Union/Member Dairy who is preserving the milk in cold storage, processing it and producing several products such as, Processed Milk Butter, Cheese, Milk Power, Ghee, Ice-Cream etc. These products have limited shelf life and are distributed timely through out the country as well as abroad through GCMMF Sales Offices (50) and its Wholesale Distributor (WD) Network of around 3600 Wds.

(ii) RAJKOT DISTRICT CO-OPERATIVE MILK PRODUCERS UNION LTD., ‘GOPAL DAIRY- RAJKOT’: (RAJKOT DAIRY) ⁽¹³⁾

The government of Gujarat has stated the milk conversion project at Rajkot in the year 19956, with the help of UNICEF with major objectives of catering to the needs of the city population and meeting their day to day wholesale palatable milk requirement as also to provide nutritious diet to the under-nourished children. Rajkot dist. Co-op. Milk producers’ Union Ltd. Was registered during 1961 under the Co-operative Societies Act, to help the cattle keepers of the district consisting of migrating Repair and Barmaid communities. It was managed by Animal Husbandry Department of Government of Gujarat under Milk Conversion project, Rajkot.

The construction of building and installation of machinery was completed in 1963 at total cost of Rs. 1.0 corer. And in this fashion, the Rajkot Dairy started its work. In its’ initial stage the milk procurement capacity of Rajkot Dairy was 40000 liters of milk per day and 2 M.T during capacity of powder plant. And now, today the total milk 135000 procurement of milk per day. It is situated on Dudhsagar Marg, Rajkot-3.

The Rajkot Dairy was managed by the Government at that time. Thereafter, the Government Started two chilling centre, one at Vinchhiya and the other at Awakener- both are near Rajkot. The main aim was to increase the milk procurement and to reduce transportation cost. In its’ initial stage, the chilling capacity of these two centre was 5000 litres of milk per day.

In the year 1965, the Rajkot Dairy Started making Ghee and Government and UNICEF, to fulfill the needs of Rajkot city. The cattle feed plants was installed by the Government of Gujarat in 1967. It was built by N.D.D.B. [National Dairy development Board] on turn key basis. At that time, the union was in its’ initial stage, So the Government handed over the plant to Gujarat Agro Industries Corporation which was owned by the Government of Gujarat.

In the year 1970, the dep't. Of Animal Husbandry (AH) handed over the management of the Rajkot Dairy to the "Gopalak Sangh" on Rs.1 to ken charge. In this year Rajkot District Co-operative Milk Producers' Union was given a chance to run the dairy for one year on experimental basis. The experience was successful. So, the Government handed over the entire management to the union in 1971 and it handed over to the union with total assets, liabilities and manpower in 1972. In references to the above matter it is important to know that the Gopalak Sangh the was known as the Rajkot. Dist milk producers

The Union has been Union Ltd. Making 'Ghee' under brand name "Gopal Ghee" with agmark and skim milk powder under 'Gopal' brand with I.S.I. mark, since 1972. In the year 1978, the Union began to produce new bye-product of milk, popularly known as 'penda' and in 1980 it started to sell sterilized flavoured milk marketed under the brand name of "Gopal penda" and "Gopal Milk" respectively. These two bye products received tremendous success. The Union has produced 652000kg "Gopal Ghee" in the year 2003-'04. It has produced & sold 41000kg "Gopal penda" in the year 2003-'04. It has productivity 64355 litres "Gopal flavoured Milk" in the year 2003-'04.

The Union was unable to perform its activities during 1972 to 1977. So, the joint management with Gujarat Dairy Development Corporation Ltd. [GDDC] was established to implement the operation flood programme in Saurashtra and Kutch region. To achieve excellence in dairy plant, the management of Union was handed over to GDDC till 1982. Then, it was handed over to GDDC on leave and license basis for five years from 2-11-'83 to 1-11-'88, for effective implementation of O.F.II programme.

Finally, the GDDC handed over the management of Union to Rajkot Dist. Co-op. Milk producers' Union Ltd. On NOV.2, 1988. During 1990 the Union became the ordinary member from associate member of GCMMF (Gujarat Co-operative Milk Marketing Federation Ltd.)

It is true that RMU has had and impressive past, now it has not only started humming but also pulsating with vibrant activity. The unit is performing well year keeping a

track record of sustained growth and prosperity. For example, it earned the net profit of Rs. 31.17 lacs in the year 2003-'04.

It is really matter of pleasure that an effective marketing network has been established as a result of fine tuning of men and machine coupled with techno-management vision. Presently, it means in 2004-'05, the total milk procurement of Gopal (Rajkot) Dairy is 135000 liters per day by getting milk of 410 villages around 5 (five) districts i.e. Rajkot, Jamanagar, Amreli, Junagadh & Surendranagar. The union has reached 90000 liters per day in May-05. plant capacity utilization has effectively improved from 40% to 75% and expected to attend 100% in next 3 (three) years. The turn over of the dairy was 17.65 crores and the profit was 7.75 lacs in the year 1996-'97 while today, the turn over is 66.57 crores and the profit is 31.17 lacs. It means, the total turn-over and the profit has multiplied to more 4 times in between the period from 1996-'97 to 2003-'04.

Moreover, to reduce the production cost and to increase milk production, (Rajkot) Gopal dairy procures cattle feed called "Rajdan" from cattle Feed factory owned by G.D.D.C. and sell it on no profit no loss basis.

Moreover, (Rajkot) Gopal Dairy is giving the facility of Mobile veterinary service for the basic need through network system which ensures special visit to each village once in a week. Veterinary service also takes care of control measures like vaccination and special treatment during the emergency.

The (Rajkot) Gopal Dairy contributes 33% of premium for insurance of animals to insurance companies. The dairy also provides the group insurance scheme of farmer members also.

The (Rajkot) Gopal Dairy has got ISO-9001 certificate and HACCP-9000 certificate for quality product and management. So, under the total quality management programme, all employees are required to be alert to the quality of milk and milk products.

(iii) AHMEDABAD DISTRICT CO-OPERATIVE MILK PRODUCERS, UNION LTD. – ‘UTTAM DAIRY – AHMEDABAD’. ⁽¹⁴⁾

Under the leadership of Tribhuvandasbhai patel and Dr. V. Kurien and under the guidance of sardar vallabhbhai patel in Anand in kehd district of Gujarat, milk business was started on co-operative basis in 1946. There after a milk union by name. ajod came into existence in 1956 in ahmedabad district (ahmedabad district).

The co-operative dairy Development was not in proper shape till January 1985 in Ahmedabad district because of no. of different milk unions viz. Sardar dairy, ajod dairy, Ahmedabad gopalak , Gujarat gopalak were functioning independently in the district. Each of these unions was organizing village co-operative societies in most of the village resulting in the presence of 2 – 3 [two or three] district co-operative societies (DCS) in each village. This lead to undue competition between the societies at the village level.

Ajod union started to play high prices of milk to the producers as compared to the market price. They also failed to make regular payments to producers because of their inability to dispose the milk in market at a high price. Thus, due to lack of proper selling system and difference between market rate and procurement rate which was very high, they suffered a heavy loss of Rs. 80 lacs. The situation was so worse that it had no money to play to the milk producers. So, the board of directors decided to liquidate the union and to hand over the ajod dairy to the government of Gujarat.

At the same time, sardar dairy was not having a milk processing plant of their own and they were dispensing the collected milk directly to Abad dairy managed by Gujarat dairy Development corporation ltd. (GDDC) They were hardly getting 35 paise/ liter towards overhead expenses which were much more than that. As such, the union accumulated losses of around Rs. 1.1 crore in early 1985. Naturally, the board of directors decided to hand over the management of Sardar Dairy to Government of Gujarat. Government of Gujarat appointed G.D.D.C. as an implementing body by appointing an executive committee of 3 (three) members comprising of one member

each of GDDC Ltd. N.D.D.B. and registrar of co-operative societies of Government of Gujarat with the clear understanding that all the unions will be amalgamated into one union within two years. It was also decided that the management of the new union will be handed over to the elected Board of directors.

At that time, Sardar dairy has two chilling centres at viramgam and katosan with 20000 litres per day capacity and 1 cattle feed plant with 100 M.T. per day capacity at sarkhej under operation flood scheme. This plant was leased out to G.D.D.C. for five years. After taking over the management of sardar dairy, the management of the Ajod dairy had also passed resolution to hand over the management to G.D.D.C. with effect from dt. 11-4-85. The registration of both the unions stood cancelled and the registrar of co-operative societies issued orders banning the collection of milk.

- **ORIGIN OF 'UTTAM':**

To consolidate the co-operative dairy sector in Ahmedabad district, the registrar of co-operative societies based an order on 12th September, 1985 that ajod and sardar unions were amalgamated to form a single union, the Ahmedabad District Co-Operative Milk Producers' Union Ltd. (ADCMPUL) which is known as the uttam dairy.

The union purchases milk from its' dairy framers through village level milk collected producers' co-operative societies. The milk collected each day, chilled at four centers and then brought to the 'UTTAM Dairy'. The payment for the milk produced is made to the farmers on every ten days cycles viz. 5th, 15th, 25th of every month and the average payment comes to about 1.50 to 2.0 crores at every 10 days cycles.

After November 1985, instead of selling milk to the Government dairy which had problems like difference in weight, fat – SNF percentage variation etc. the new union decided to sell milk in pouches directly in the market. Standard under the brand name of 'UTTAM'. The people of Ahmedabad city and given warm reception to this milk. So, the sales of milk was increasing day by day.

The Uttam dairy took loan of Rs. 25 lacs from a co-operative bank and expanded the capacity of the dairy from 20,000 LPD to 40,000 LPD in 1986-87. Further, two new chilling centres each of 20,000 litres and dhandhuka under operation flood programme.

Due to the success of the co-operative structure and the request of Government of Gujarat to the registrar, elections were held in July, 1988 for a Board of directors to manage the new union. Under operation flood programme, NDDDB helped to build the litres capacity in 1989-90 in a limited area of 2.5 acre. The expansion work was done in a period of 10 months. Hence, during 1989-90 the dairy was able to handle 1.29 lac litres milk per day in flush season of 1989. Since then, there was no looking processing back for the dairy. At present the processing capacity of the dairy is 1.5 litres per day.

- **PRODUCTS MANUFACTURED:**

The dairy produces various milk/milk products under the UTTAM brand name and also manufactured various products under the AMUL brand name on behalf of Gujarat co-operative milk marketing federation Ltd. (GCMMF Ltd.) at presently the union covers 653 villages, 524 village co-operative societies & 76,512 farmer members in Ahmedabad district. The milk shed has a milk production potential of 518 thousand Kgs. And per day having a marketing surplus of about 2.29 LLPD out of the marketable surplus the union has capture a share of about 45%. The capacity available with the dairy for the manufacture of various products is as under:

- Milk processing : 1,00,000 ltrs per day
- Chilling centers : 1,00,000 LPD
- Butter : 6 T Per day
- Ghee : 2 T Per day

To handle the huge quantity of milk it has established four chilling center at various locations viz, Dehgam, Dhandhuka, Viramgam, Katosan, Bapada which cover a majority of the surrounding villages. This is essential considering that milk is a Fast perishable items and needs to be immediately chilled retaining its quality. Out of the

four the chilling center at Dhandhuka has got additional facilities of processing the milk and also packing facilities the milk at Dhandhuka caters to the market of Saurashtra & Bhavnagar etc.

The union has made use of most advance technology for manufacturing various milk products for providing better animal health care services and for building a socio-economic strength. It is equipped with latest sophisticated plant & machinery suitable for processing of milk & manufacture of product like table butter, ghee, flavoured milk etc. The company started making the flavoured milk only in January 2003 and is currently operating at about 40,000 bottles per day capacity. The flavoured milk is sold under the AMUL brand 'AMUL SHAKTI' and the company is planning to increase the capacity to about 1,00,000 bottles per day while the margin on Ghee & Butter is very minimum and margins on liquid milk is reasonable the same in flavoured milk is highest since the same cater to the mass and realization is at an average of about Rs. 35/- per litre.

The UTTAM dairy has been set-up on co-operative principles and has a commitment to provide remunerative price to the producers on one side and sell high quality of milk to consumers in Ahmedabad city at a fairly reasonable price. It is important to note that during 1985-86 the union was paying Rs. 47 per Kgs./fat to the producers and milk was sold at Rs. 5 per litre in Ahmedabad city. So, during the period of 20 years, the price paid to the producers has been increased to Rs. 210 kg./fat (4.25 times). While consumers' price has been raised to Rs. 15 per litre only (3 times). This could be achieved only due to proper planning of milk routes, increasing in milk procurement and low cost in handling through sheer managerial pragmatism.

- **ORGANIZATIONAL STRUCTURE:**

Ahmedabad District Co-Operative Milk Producers' Union Ltd. (ADCMPUL) is a district level federal co-operative societies and the structure of its Board is as under:

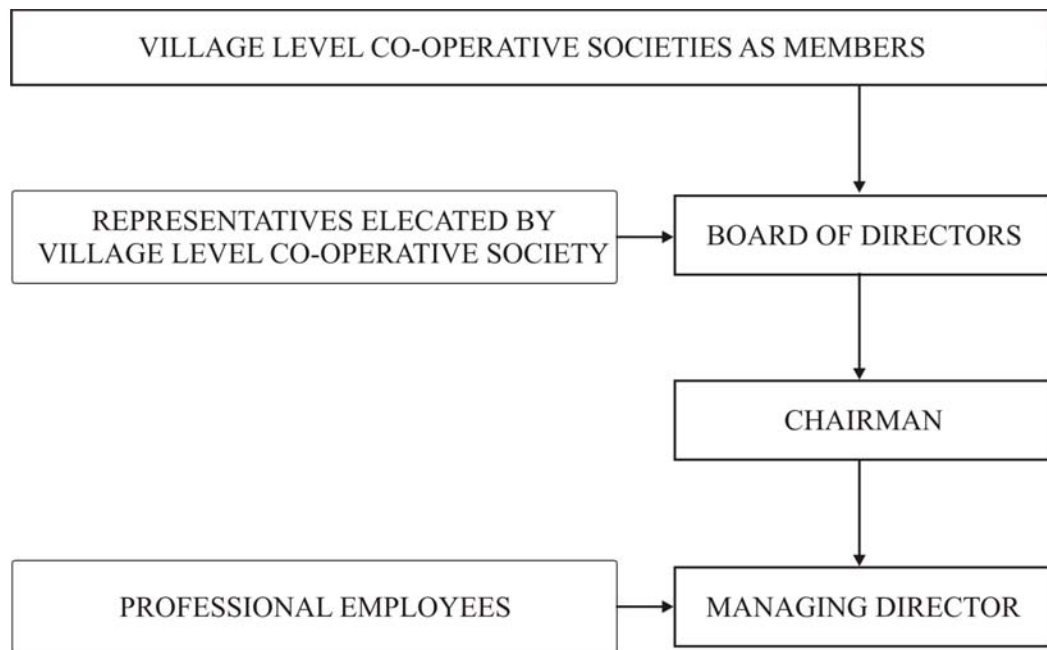
The total strength of the Board is 15 excluded the Managing Director of which 11 members are dairy farmer representatives who are elected by village level co-operative societies. The District Registrar of co-operative societies, Gujarat Co-

Operative Milk Marketing Federation Ltd. And NDDDB have one representative each in the Board.

The Board members are not owner Directors but are elected directors having awareness and good understanding of the agro-based industry, working of a rural society, expert knowledge of animal husbandry and problems of the farmers. It can be defined by chart as under:

ORGANIZATIONAL STRUCTURE:

Fig. 2.2



(Source: The Annual Reports Of UTTAM Dairy – 2004-05.)

- **MARKETING ARRANGEMENTS:**

All the co-operative dairies of Gujarat have formed a common marketing agency for their products. That is Gujarat Co-Operative Milk Marketing Federation Ltd. (GCMMF) with its headquarter at Anand. Accordingly, ADCMPUL is also selling its product to GCMMF which under takes the marketing function of all over India basis under the brand name of 'AMUL' and 'SAGAR'. While liquid milk is sold in pouches directly in various towns of Ahmedabad, saurashtra and bhavnagar district

under 'Uttam' brand name and outside it is sold under 'Amul' brand name through GCMMF.

On the marketing front the dairy has not appointed a large number of people as supervisors, senior superintendent and officers. But a new system was introduced so that milk can be sold through distributors who operate their own routes for delivery of milk and recovery of milk price. They get fixed commission to carry out this business in the area identified and dairy gets cash well in advance before its delivery is made. It greatly helps in the cash flow situation.

- **QUALITY ASSURANCE PROGRAMME IN EVERY FIELD OF MANAGEMENT:**

Since last three years various Quality Management Actions have been taken by higher authority. It improves the quality of manpower, machinery, products, marketing, and financial management. It covers each and every field of management under Internal Consultant Development Programme. (ICDP).

Dairy industry is a highly perishable industry where milk if not processed within four hours after excretion from animal udder, may get spoiled. So, all the staff is required to be alert any time. To improve the quality of entire manpower, dairy structure and staff were reallocated the work according to their taste and interest in different sections. The higher authority has also increased their wages to give sufficient reward of their work. To improve the management of the societies, all the talukas, of the district have been covered under ICD programme.

Financial management is one of the important part of management. Uttam dairy has to do the milk billing of almost 500 societies on every 10th day. It is interesting to note that during the last 20 years the payments has not being delayed for a day. Uttam dairy is a sign of efficient management and producers' satisfaction.

To save much money on interest, the dairy introduced a small saving scheme for societies (1% of milk bill) and similarly, a scheme was also introduced to increase

share capital (1% of milk bill). the Uttam dairy has got ISO 9002 certificate and HACCP 9000 certificate in the 2000-01 for quality product and management.

- **OTHER ACTIVITIES OF DAIRY:**

- **CROSS BREED FARM:**

Up gradation and improvement of buffalo/cow breeds located in the district is a prime important factor for the growth of this business. An efficient dairy animal is result of better breed. So, the union has established bull mother farm at Jagudan to undertake the activities such as raising of buffalo, cross breeding of male calves as the future bulls, frozen semen laboratory, progeny testing of buffalo and cross bred bulls, development of cross breeding farm and the use of embryo transfer techniques for animal breeding etc.

- **ANIMAL HEALTH CARE SERVICES:**

The dairy provides animal health services where any animal which is sick will be treated by the qualified veterinarians, mobile vans, wireless network and related infrastructure facilities.

- **INSURANCE SCHEME:**

The Uttam dairy contributes 33% premium for insurance of animals to insurance companies. Very recently, the management has introduced an insurance scheme for farmer members through insurance company. Under this scheme, farmer is insured for Rs. 20,000/- for natural death and Rs. 50,000/- for accidental death. For this, the dairy contributes an insurance premium at the rate of 33% of total premium. This scheme is gaining more popularity and over 320 village societies covering around 30,000 members have taken advantage of this social security scheme.

- **CATTLE FEED PLANT:**

The Union's Cattle Feed Plant at Sarkhej was installed with a capacity of 100 M.T. per day. It was leased out to GDDC for 5 years was returned to the union in October,

1989. After taking back this plant, efforts were diverted towards quality of 'Dan' and development of plant. At that time, the 'Uttam Dairy' was selling the 'Uttam Dan' around 265 M.T. per month. And now, by achieving 100% capacity utilization, they were selling around 1200-1500 M.Ts. per month.

- **FODDER FACILITY:**

The dairy is granting a 50% subsidy to farmers towards the fodder cutter while the paddy and wheat straw are being treated on scientific lines with help of technical experts with a view to improve the quality of fodder at farmers' door. The Urea Molasses blocks are distributed to farmers at a 50% subsidy. Shortly, mass fodder mini-kit units will be distributed to the farmer members of the societies. Under this scheme the farmers can get more green fodder at his farm.

- **TRAINING CENTRE:**

To improve the quality of manpower at village level, Dr. V. Kurien – chairman of NDDDB established a training centre on 5th April, 1993. Society secretaries, testers, management committee members, milk producers – male and female are trained regularly so that they can apply such training in their activities for better quality of their products. Due to constant efforts towards this way, the quality milk has improved to such an extent that the pouches can now be kept in refrigerated condition for period of five days instead of two days.

- **ACHIEVEMENTS:**

The Uttam Dairy has been awarded with the certificate of 'Excellence', 'Gold Medal' & 'Udyog Ratna Award' in appreciation for good work done by the dairy.

In short, 'Uttam Dairy' is determined to provide better services to farmer members, to pay good price to milk producers and to supply quality milk and milk products to consumers at a reasonable price.

(iv) GANDHINAGAR, DISTRICT CO-OPERATIVE MILK PRODUCERS' UNION LTD., 'MADHUR DARY-GANDHINAGAR'.⁽¹⁵⁾

Gandhinagar District co-operative Milk producers' Union Lid. Was established in 1970 to 1971 Shri Jethabhai Fulabhai Patel was appointed as a first chairman of the union co-operative member of the district frequently requested for the individual dairy plant to the N.D.D.B. and Dr. Kurien also. But the government and N.D.D.B. found that the Gandhinagar milk union can not run the individual dairy plant. So they state to the union to accept milk as a chillind center of Ahmedabad dairy or sabar dairy. Finally, as a result of a frequent request to N.D.D.B. and government, the undividuad dairy plant was permitted to the union. From 1971 to 1979 the milk union supplied the milk to Ahmedabad Municipal dairy. Due to insufficient milk supply and not having the individual dairy plant, the milk union had to pay penally; the financial position of milk union was weakening day to day. And the co-operative societies started to sell their milk to the private traders. Taking the finaacial position of the milk union in mind, the management of the union was handed pver to Gujarat Dairy development corporation (G.D.D.C.) on 8th April 1982. in the curlier stage, G.D.D.C. procured 13000 liters milk per day from 21 milk co-operative societies. G.D.D.C. had aiso the management of saurashtra's dairies. All the daties got the equal price of the milk according to their policy.

Gujarat dairy development corporation (G.D.D.C.) had not given sufficient price to gandhinagar district's producers. These producers were given the price according to saurashtra dairies G.D.D.C. had given the milk prices to gandhinagar districts producers according to their policy instead of their's milk quality. So, milk producers were not satisfied with their price.

Due to these conditions, district milk producers established the advisory committee. This committee urged many times to GDDC to give sufficient milk prices to the district milk producers. In this way, some persons also requested to the government to take away the administration of the dairy from G.D.D.C. and finally as a result of this movement, the Gandhinagar district milk producers had taken the administration of

the dairy from G.D.D.C. on 22nd September, 1988. at that time, Shri Dashrathbhai Nathabhai Patel was elected as the first chairman of the union.

During the period from April 1982 to sep. 1988, GDDC made wshloss of rs. 50 lacs. In the year 1988, the Madhur Dairy sold 13000 litres milk per day. In this initial stage the Madhur Dairu procured the confidence of the milk producers by doing the economical maunagement of the Madhyl Dairy and by giving the sufficient prices of milk and input facities to the milk producers. Year by year, the Madhyr Dairy came into the the profitable position. It paid up the cash 1055 which was given by GDDC. And VWV, today the total milk procurement of the Madhyr Dairy is 92365 kgs. Per day and the total selling figure of the dairy is 59455 lites per day. In the year 1996-'97, the total turn-ovear of the Madhur Dairy was Rs. 29.02 crores and the profit was Rs. 4.84 lacs And Today, the total turu-over of the dairy is Rs.73.87 crores and the profit is Rs. 73.87 crores and the profit is Rs.22.94 lacs. It means, the total turn-over of the dairy has multiplied to more 2 times and the profit has multiplied to more 5 times in between the period from 1996-'97 to 2004-'05. Moreover, the capacity of the diry plant has also been increased by the union. The capacity of the dairy plant was 60000 litres per day in the year 1996-'97. And today, the capacity of the daily plant is 200000 litres per day.

- **MARKETING:**

The union has accepted the responsibility about the nutritional value of milk, the quality standards and hygienic condition of dairy plants technically, which are getting tremendous response. In spite of throat cutting competition of private dairies, the union has remained the market leader and has achieved 80% market of the district. Today, 90 milk co-operative societies have working under the union In the year 2004'-05, The Madhur Dairy has procured 121275 kgs milk per day, with the help of 26800 co-operative farmer members. In this year [2004-05], the Madhur Dairy has procured 44265565kgs milk In this year the madhr dairy has marketed 53890 ltrs. Milk &5666 ltrs. Cow milk per day. The Madhur dairy has sold 7338 ltrs. Pastuarised chhaas per &1789kgs. Ghee per day. The Dairy has sold 102288kgs Madhur sweets

& 85094 ltrs. Madhur ICE-Cream during the year. According to survey, the dairy gives rs. 0.91 reward against rs.1

- **PRODUCTS MANUFACTURED:**

The Madhur Dairy produces and marketes milk and Various milk products under the “Madhur” brand name, and also manufactures and marketes under the “Amul” brand name on behalf of Gujarat Co-operative milk marketing Federation Ltd. (GCMMF Ltd.). The Dairy has offered buffalo milk, cow milk, and various milk products like chhaas, ghee, fdavoured milk sweets, Ice-cream, cow-ghee. Consistent quality assurance standards, hygienic condition and automated production process and attractive packing have helped to establish these products in the market.

The Dairy has a commitment to provide remunerative price to the milk producers on one side and selt high quality of milk to consumers in Gandhinagar city and Gandhinagar district at a reasonable price. In a short period. The Dairy Will launch three new milk products like “Madhur Shrikhand” “Madhur Matho” & “Mashur Dahi” in the market This could be achieved only due to proper planning of milk routes, ideal managerial ,increasing in milk procurement and low lost in handling through sheer managerial pragmatism.

- **QUALITY ASSURANCE PROGRAMME OR TOTAL QUALITY MANAGEMENT :**

Since last six years various quality management actions have been taken by the top management Dairy industry is a highly perishable industry. So all the staff is required to be alert anytime. Under the Total Quality Management programmer, the top management has started Internal consultant Development programmed [ICDP}. It has improved the quality of manpower, machinery, money, marketing and management.

The Madhur Dairy has got ISO-9002 certificate and HACCP-9000 Certificate for quality product and management in the year 2000-'01.

- **OTHER ACTIVITIES OF THE DAIRY:**
- **ANIMAL HEALTH SERVICE:**

The prevention of the health hazard presents a challenge, So Madhur Dairy is providing Mobile veterinary services to fulfill the basic requirement through network system which ensures special visit to each village once in a week. Veterinary service also takes care of control measures like vaccination and special treatment during the emergency. Emergency service is made available in no time throughout the year at a nominal cost.

- **INSURANCE SCHEME:**

The Madhur dairy contributes 33% of premium for insurance of animals to insure companies. The dairy also provides the sheep insurance scheme of former members also. Under this scheme, farmer is insured for Rs. 20000/- for natural death and for Rs. 50000/- for a clinical death. The dairy contributes an insurance premium at the rate of 33% to the total premium. At the end of year 2004 to 2005, 12881 animals and 17296 farmer members have taken the benefit of this scheme.

(v) BARODA DISTRICT CO-OPERATIVE MILK PRODUCERS' UNION LTD., 'SUGAM (BARODA) DAIRY – BARODA': ⁽¹⁶⁾

It may be interesting to know that the post Independence era witnessed a declining trend in milk productivity primarily because of lack of focus towards Dairy Development. At the same time Indian Dairy Industry was slowly getting evolved in a silent corner of Gujarat, where the small milk producers got organized to earn a remunerative price for their produce collective ownership. To take forward this "Model" N.D.D.B. got in to act operation flood.

With the view to relieve the milk producers from the exploitation by the private vendors and to give a remunerative price for their milk and to supply good quality of milk to the citizen of Baroda city. The milk union was established on 24th December

1957 under the strong leadership of Shri Maganbhai Patel; founder Chairman, and Shri Jashvantlal Shah, Dy. Minister of the state of Bombay.

Baroda Dairy since its inception in 1957 has been trying to uplift the rural economy by giving the highest possible price to their producers' members and raising their income. Baroda Dairy also satisfies their consumers by providing the best quality hygienically manufactured and packed Milk and Milk products at a reasonable price.

Initially six milk cooperative societies became founder members of this union which reached up to at present Shri T.K. Patel, the Doyen of co-operative dairy movement in Gujarat, laid the foundation stone of 50,000 LPD plant on 24th August, 1962. and Shri Morajibhai Dasai, then finance minister Govt. of India, inaugurated dairy plant. Which was commissioned on 25th April 1965?

The dairy plant is mainly a liquid milk plant having a capacity to handle 3, 51,000 LPD of milk in the peak season. At present, the dairy average of milk receiving is nearly 2,50,000 liters out of 955 functional DCS. Raw milk from more than 600 DCS is received at dairy dock and remaining DCS milk is received at the Chilling centre, Alhadpura, Bodily, located 75km. away from dairy.

In order to standardize indigenous type of milk product like peda, shrikhand, Gulabjamun etc. the R&D wing of NDDB has implemented project & unit of Baroda Dairy is one such. The sugam unit was set up under "operation flood" & was financed by arts-while Indian dairy corporation was managed by NDDB till 31-3-1992, it was commissioned on 1st April 1981. At the request of BDCMPUL, it was handed over to Baroda Dairy with effect from 19th April 1992.

The white Revolution augmented some three decades back by the National Dairy Development Board, Amend has now made our co-operative milk business able to face the great challenges to be put forth by the new millennium in the National as well as International markets. Hence, to further the goal of white Revolution, our UNION has taken up the Total Quality Management (TQM) System to be implemented in all the of Union which has helped us to progress Better than previous years.

- **Marketing:**

In spite of throat cutting competition from private players, the union has remained market leader and has achieved the highest average daily sale of 2,60,000 its. Against the previous year's sale of 2,46,000 its. To strengthen the marketing network and convenience of consumers selling its milk through 810 milk booths and 854 full time centers. The union has shown upward trend in its product over the year. The union has accepted responsibility to make aware about the nutritional value of milk the quality standards and hygienic condition of dairy standards and hygienic condition of dairy plants technically the union has implemented women carelessness programme, scholar children carelessness programme, Dairy Duran (Dairy visit) Door to door visit etc. which are getting excellent response.

- **PRODUCTS MANUFACTURED:**

Baroda District Co-operative milk producer's Union Ltd, manufactures and Market's milk products in the Baroda market. There are two brand names. BARODA DAIRY and SUGAM.

Citizens of Vadodara experienced the pleasure of treating themselves to high quality milk of treating themselves to high quality milk products with the introduction of "sugam" treats in 1981.

For the first time, sugam Dairy offered the various delicious milk products like shrikhand, Matho, Gulabjamun, penda, paneer and Ice-cream. These products became extremely popular in a very short period because of their superior quality. In no time, "sugam" became a household name in Vadodara.

Consistent and stringent quality assurance standards, hygienic and automated production processes and attractive pilfer proof packing have helped to establish these products in the market, "excellence in all activities" has always been sugam dairy's motto, discerning customers have therefore endorsed our products, and the success of Sugam Dairy is a tribute to their insistence on quality.

The management of Sugam Dairy acknowledges this gratefully and reiterates its commitment to continue offering high quality products to its customers.

Recently three new products are launched in the market. The new products are elite butter, Mava and pasteurized fresh cream. These products till now were not available in Baroda in the branded and products under strict hygienic condition and maintain the best quality. The consumer response has been overwhelming. Baroda Dairy is continuously working with new products and tries to come out in market with best milk products to cater the demand of consumers.

- **QUALITY ASSURANCE PROGRAMME:**

Dairy Industry is a highly perishable industry where milk if not processed within four hours after excretion from animal within four hours after excretion from animal udder, may get spoiled. So, all the staff is required to be alert anytime. To improve the quality of the enter manpower, dairy structure and staff were relocated the work according to their taste and interest in different sections.

To maintain the quality of milk and milk products, Baroda Dairy has got the scarification of ISO- 9001-2000 for quality product and ISO -14001 for environment and HACCP Certificate.

- **OTHER ACTIVITIES OF THE DAIRY:**

- **CROSS BREED FARM:**

An efficient dairy animal is a result of better breed. So, the Baroda milk Union has Bull calf rearing farm at village I to la. Through which Baroda Dairy supplies adult Bull for cross_ biding programe at village level Dairy co-operative societies. At present Baroda Dairy also reared Ger. cow at I to la farm from which plangent cows are sold.

- **ANIMAL HEALTH CARE SERVICES:**

The Dairy provides animal health care services where any animal health care services where any animal which is sick will treat by the qualified veterinarians, mobile vans, and related infrastructure facilities. Veterinary mobile service is provided by the dairy at farmers' door at RS, 50 per visit. It also provides a special visit on demand of farmers.

- **INSURANCE SCHEME:**

Baroda Dairy provides cattle insurance scheme as well as farmer member's Insurance scheme. It contributes member's Insurance scheme. It contributes 30% of premium as a subsidy for Insurance of Desi cows and Buffaloes. Dairy also gives 65 RS. Premium annually for farmer member's Insurance scheme.

- **CATTLE FEED PLANT:**

Baroda Dairy has a cattle feed plant at village in Ito la. It was started with the capacity of 150% MCT. Dan per day. Baroda Dairy is making two types of cattle Feed at village Ito la. They are Baroda Dan [simple] & by – pars protein Dan. In this year, Baroda Dairy has produced 25,454 M.T. Baroda Dan & 2,254 M.T. By – pars protein Dan & supplied to total 27, 708 M.T. cattle feed to village level Dairy co-operative societies. Cattle Feed is necessary for much animals as a balanced nutritive feed to enhance milk production & productivity of animals.

- **FODDER FACILITY:**

Baroda Dairy runs Funs Fodder Development programme for the need of milk producers. In this programme, it provides improved variety of fodder seed kits to farmer members at no profit no loss base. And also procured seeds from farmer members at good rate. Baroda Dairy also sales fodder seeds to different milk Unions and other institutes of all over country.

- **TRAINING CENTER:**

Baroda Dairy is also arranging in-house training programme for their staff members. Laboratory staff as well as other employees. Baroda Dairy also manages co-operative Development programme [CDP] and vision mission at village level Dairy Co-operative socialites. Through this programme education is provided to farmer members, employees of the DCS and committee members of DCS regarding Animal Husbandry practice, Artificial Insemination, Administration, Milk Quality, productivity etc.

(vi) MEHSANA DISTRICT CO-OPERATIVE MILK PRODUCERS' UNION LTD., 'DUDHSAGAR DAIRY-MEHSANA':⁽¹⁷⁾

In the year 1958, Ahmedabad Municipal Corporation Dairy was sent 600 to 700 litres of milk per day which were collected from 11 villages near vihar, tensile vijapur and district Mehsana. Ahmedabad Municipal Corporation Dairy took milk according to their requirements. So, Quota system had to use for the milk purchase. At that time in the year 1958, UNICEF surveyed about this situation. They declared that some quantity of milk stayed as marketable surplus in the Mehsana District. So, they gave the report about it and recommended that it should be planned of milk business on co-operative line based on 'Amul Anand Planned'. So that farmer members can take the benefit of it. After getting the report from UNICEF, the president of Mehsana Jilla Vikas Mandal and other leading persons of the district met. They reviewed the report and discussed about it. Then in the year 1959, after convincing each-other, Gram-sabha was held to take vote of people in the many villages of the district. Then Mehsana, District Co-operative Milk Producers, Union Ltd. Dudhsagar Dairy was registered on 8th November 1960 under Mumbai Co-operative Societies Act-1925.

After made registration Dudhsagar Dairy started to purchase milk from the farmer members. Dudhsagar Dairy collected about 600 to 700 litres of milk per day from 1125 milk products of 11 village societies in the initial year. And then the milk was supplied to Ahmedabad Municipal Corporation Dairy. It was the beginning of "White

Revolution". Then in the year 1962 Government of India had allotted one Milk powder plant to Mehsana out of six plants in reference to the China War. On 2nd April, 1965, that power plant was started by Food & Agriculture Minister-Shri C Subramanian. This plant was known as "Defense Project." Then year by year, Dudhsagar Dairy Started to growth 239 village Co-operative societies were registered in the year 1965-'66. And the milk quantity of procurement was also increased.

On 4th November-1970. the second powder plant was started by Shri Dr. V.Kurien at Mehsana. In 1974, the third milk power plant was started. At that time 125000 kgs. Of milk per day were collected from 425 village Co-operative societies with the help of 70000 farmer members. In the year 1984 the fourth automatic plant was started. This plant was well equipped with the latest machineries. At that time, 465000kgs of milk was procured from 900 village Co-operative Societies with the help of 125000 farmer members.

In 1995, sweetened Condensed Milk plant was established at Mehsana. Its' capacity was 8 M.T. per day. Then in the year 2000 the second plant was started at vihar with the capacity of 16 M.T. per day.

In 2003, Dudhsagar Dairy Started Milk paekaging Unit at Manesar in Hariyana. 2000000 litres of milk is supplied to the danseur for packaging and it is sold in Delhi Market. In 2004 the another plant was started at Manesar in Hariyana for packaging of milk and producing of Dahi and Ice-cream

And today the Dudhsagar Dairy procures 1550000kgs. of milk from 1160 village Co-operative societies with the help of 460000 farmer members. Really, it is a great progress of Dudhsagar Dairy from the period 1961 to 2006.

In the year 1964, the first chilling center was set up at vihar village with the capacity of 10000 litters of milk. Then, the second chilling center was stared at kheralu with the capacity of 45000 liters of milk in 1968. in 1971, the vihar chilling center was expanded from 10000 to 60000 litters of milk per day. In the year 1973, another chilling center was stated at Hansapur, village-tehsil patan. Then, another chilling

center was established at Haris village in 1976 with the capacity of 45000 litres of milk per day. Then, the fifth chilling centre was started at kadi in 1976.

- **TOTAL QUALITY MANAGEMENT:**

Total Quality Management improves the quality of manpower, machinery, products, marketing and financial management. It covers each and every field of management. Dudhsagar Dairy got ISO 9002:1994 and ITACCP certification in 1999. Then, in 2002, the Dudhsagar Dairy achieved ISO 14001:1996 certification for pollution free products. Then, the Dudhsagar Dairy also obtained ISO 9001:2000 and HACCP certification in the year 2003.

- **OTHER ACTIVITIES:**

Cattle Feed plant:- To enhance the milk quantity and to protect the health of milch animals, the cattle feed is necessary. So that in the year 1969, Dudhsagar dairy purchased the first cattle feed plant in Boriavi from Agro Industries Corporation. In this plant the cattle feed is produced as “Sagar Dan” In the year 1977, the second cattle feed plant was started at Ubkhal in association with National Dairy Development Board with the capacity of 200 M.T. per day. Today this plant has a 300 M.T. per day capacity.

-Animal Health Service:- The prevention of the health presents a constant challenge, Dudhsagar dairy is operating Mobile veterinary services to meet the basic requirement through network which ensures visit to each village once a week accompanied with a veterinary doctor and a attendant Two Mobile veterinary dispensary were started in the year 1966. In 1979 the mobile veterinary services were started to check up the animals at any time with the nominal cost.

- **Cross Breeding through A.I. programs:**

The milking capacity can be measured by the amount of milk dram in the pail. Dudhsagar dairy operated Artificial Insemination program in 1980 Today 399 village Co-operative Societies are covered under this program. Dudhsagar dairy provides supply of Frozen semen Doses. Liquid Nitrogen and other consumables to the co-operative societies regularly

▪ **Achievements:**

The Dudhsagar Dairy' has been a warded with the under written awards

- Best productivity performance Award 2001-2002
- Best productivity performance Award 1999-2000
- Best productivity performance Award 1997-1998
- Best productivity performance Award 1995-1996
- Best productivity performance Award 1994-1995
- Second best productivity performance award 1992-1993
- Best productivity performance award 1992-1992
- Second best productivity performance award 1988-1989
- Second best productivity performance award 1985-1986

▪ **FUTURE PLANS:**

- To achieve growth of milk production to 15.42 L kg PD by 2016 at an average annual growth rate of 4%
- To increase per animal milk production
- Clean milk production: To improve Bacteriological quality of milk production

- To exploit ERP and implement other animal and society management related software packages
- Irradiation of HS and FMD from Mehsana Milk shed area to the extent possible
- To start UHT packing for milk and other milk products

(vii) VALSAD DISTRICT CO-OPERATIVE MILK PRODUCERS' UNION LTD., 'VASUDHARA DAIRY- ALIPUR': ⁽¹⁸⁾

Valsad District Co-operative Milk producers Union Limited has been registered in 1973 and initiated Dairy Development Activities on ANAND pattern since 1975. A survey conducted by National Dairy Development Board in the year 1973-'74 suggested that the low yielding animals and poor economic conditions of tribal farmers coupled with adverse geographical conditions would come in the way of developing this district as milkshed area.

The milk union did not have any processing facilities of its own till November 1981 and all the milk procured from the Rural producers of this District used to be sent to the neighboring Dairy plant of surat District at surat. In 1981, Dairy plant of 30000 liters per day capacity was commissioned at Alipur village taking commercial loans from Financial Institution and assistance from the state Government

In the beginning there was not enough milk in the District, even to meet the requirement of new 30000 LPD capacity plant. People used to keep the cattle only for manure and whatever little milk they got was used for their own household consumption. The milk Union took up the responsibility to develop Dairying in this District and introduced cross-breeding of the local un-productive animals to harvest a new generation of high yielding animals achieve the break even point of the plant's installed capacity. Milk started flowing as a trickle which subsequently, a 100 KLPD capacity dairy plant came into existence in the year 1993-'94 under "OPERATION FLOOD-3" programmed, wherein National Dairy Development Board provided

required financial and Technical assistance. Since then the milk producers' of the valsad District particularly the women of small and marginal farmers and land less laborers have strengthened the movement called "VASUDHARA" (the stream of Goddess Earth) VASUDHAARA grew from strength to strength and had to again expand its capacity from 100 KLPD to 200 KLPD during april,'01.

The rural population particularly in tribal belt, under the Union's operations is poor and have very meager agricultural income. The tribal areas are facing with water scarcity during the summer season. Hilly and rocky surfaces play crucial part in non development to this was from agricultural point of view. The farmers are also marginal and do not have any other reliable source of income. "VASUDHARA" has focused on this segment and today it gets nearly 80% of its total milk from tribal societies Dairying has bee me major activity and a reliable source of income for the farmers of this tribal belt. The dairying has always been considered as a subsidiary income in agrarian economy and probably has not been given its due as a major economic activity. Vasudhara dairy has demonstrated that dairying can play a pivotal role in development of rural areas, particularly among the weaker sections having poor resources base and low risk taking capabilities. Today there are around 62000 tribal families [out of total 105000 members] in this districts directly participating in this dairy Co-operative. Vasudhara Dairy has grown as a pioneering organization which has charted its growth track through innovation and visionary actions in Milk procurement as Well as in the area of Milk marketing. Milk procurement has increased many fold. The network of milk producing village societies is increasing and developing rapidly. The footprint of Vasudhara Dairy has covered most of the villages in its area of operation. Vasudhara Dairy is having a strong presence in tribal areas of bath the districts i.e. Navsari district and valsad district. The focus of growth in fact, is in tribal belt. The population of village societies is 762 societies as on 31st march 2005. Out of which 533 societies are conducted and run by the women. Women Societies in tribal belt is 484 Which is around 73% of the total tribal Societies.

- **PRESENT STATUS OF VASUDHARA DAIRY:**

What started out as a trickle in 1981 has grown to be an ocean known as Vasudhara dairy? This glorious saga of achievement has become possible due to the “CAN DO” approach of Vasudhara Dairy team and a Zeal to do things in innovative and effective manners. At present Vasudhara Dairy stands tall for its pioneering creative concepts as well as its willingness to adopt newer ways and means for the business and its development. Vasudhara Dairy is committed to its cause of existence as sincerely as to the concern for the environment and to the ultimate customers. Vasudhara has been the best performing dairy on National level which is amply proved by the three National productivity council Awards bestowed on it. Vasudhara Dairy prides itself for dreaming and implementing the involvement of women in the milk business at Village level very successfully. Vasudhara Dairy has added one more feature in its cap by commissioning the production of “AMUL” Ice-cream at its busier plant in November 1997. This plant is modernized and expanded to two times from its original production capacity. In May 2002, another ice-cream plant is commissioned at Nagpur and is developed aggressively to cover the market demand. The saga just goes on and on. Vasudhara Dairy has also embarked on the global level of business quality by inheriting the TQM, HACCP and ISO Concepts. Today the Capacity of plant is 300 ton liter per day and with the help of total functional Societies Vasudhara Dairy procures 266420kgs milk averagely.

- **VASUDHARA: JOURNEY 2010:**

Keeping in mind the interests of the milk producers and the milk consumers affiliated to VASUDHARA Dairy, and also for the continuous development of the dairy, there shall be 1000 more milk Societies, commissioned by the year 2010. Out of which 780 shall be managed by women. Total milk producers covered shall be 150000 and 75000 shall be the milk collectors. The self Help Rural Women project and calf rearing project shall be extended so that the daily collection of Milk will be 500000 liters. To keep up the milk production the cattle feed plant with daily production of 300 metric tons will be commissioned. Taking care of artificial insemination and grass meadow, the expected milk production shall be 3 liters per buffalo and 8 liters

per crossed cow. The established capacity of the modern dairy plant shall be dairy 650000 liters of milk. With the help of 1200 agents and 100 full time centers the daily sale of milk shall be 190000 liters in the local markets separate 100 Agents shall sale daily 10000 liters of Butter Milk in local markets. With the help of Gujarat Co-operative Milk distribution Union Ltd. The excess milk shall be taken care of by Vasudhara Dairy's Boiler, Nagpur and Motapondha plants. This shall raise the Annual turnover to 600 crores for the organization. The cold chain concept also was adopted as early as in 1995, when Vasudhara Dairy became the first co-operative dairy in Gujarat to apply insulated vans to transport milk to the customers presently all the offices are gelding their milk required through insulted vans/Tempos.vasudhara dairy also made the record by establishing cold storages in the market place rather than expanding the cold room facility at its plant. In July 1999 2 cold rooms with the capacity of 30,000 lets/Each became functional at Nava sari & Val sad district. In this district, there are two chilling centre which are situated at vegan and Anna. Moreover at management is doing plan to set up other two chilling centers with 50000 lets/day capacity. The purpose was very clear that to milk available to the market with in the round the clock and ensure that the milk goes to the customer with best quality. Milk is kept under 8c to during storage period in cold rooms. In the retail points which sell its milk. These retailers will also be given freezes/coolers based on their need in order to complete cold chain and also to ensure that the milk delved red to the customers in true sense will have best quality. To sustain the viability of this dairy project, the management has taken some decisions which has a lasting and strong influence on its financial per for mince. The decision, to manufacture Ice-cream is one such example on commercial & professional front. Vasudhara Dairy established the Ice-cream plant at Bursar in November 1997 and up graded it to a level of best production facility in the industry. Initially the production facility in the industry. Initially the production capacity was 10000 lets of this capacity would have cost around Rs. 9 crores and could have taken 3 years of time approximately. Ice-cream manufacturing was started in this plant from 1 November 1997 under the brand name of 'AMUL' and is being marketed by "GCMMF". This Ice cream plant has been increased from 10000 lets/day to 20000 lets/day and is operating at a very high level of efficiency Boisar plant has produced Ice-cream at an average of 23316 liters/day and sold 23278 liters/day in the year 2003-04. during the year the average Amul milk sale stood at 18585 liters/day.

The second Ice-cream plant is acquired and commissioned at Nagpur in the month of May-'02. This plant has the production capacity of 2500 liters./day of Ice-cream. This plant has been expanded to a capacity of 5000 liters./day. This plant also sells Amul milk. The average production of Ice-cream was 7297 liters./day during the year. While the average sale of Ice-cream was 7382 liters./day. The long life “Amul cool” flavored milk sale was 3771 liters./day during the year. This plant also sold average of 33856 liters./day of Amul milk.

- **STANDARDIZATION AND QUALITY ASSURANCE PROGRAMME:**

Standardization and Quality Assurance programme improve the quality of manpower, machinery, products, marketing and financial management. It covers each end every field of management, under this programme. Dairy industry is a highly perishable industry where milk if not processed within four hours after excretion from animal udder, may get spoiled. So, all the staff is required to be alter anytime. To improve the quality of the entire manpower, dairy structure and staff were reallocated the work according to their taste and interest in different sections. Vasudhara Dairy has got ISO – 9001:2000 certification for standardization and products. The dairy has got these certificates from QAS – Australia for Alipur dairy plant.

- **OTHER ACTIVITIES OF DAIRY:**

- **CLEAN MILK PRODUCTION TRAINING:**

To meet with the changing expectations of the of the market, vasudhara dairy has initiated clean milk production programme. Under this programme, the focus is on quality of milk at the production level. 32 societies are covered at present under this programme. The result achieved are encouraging enough for taking up this programme on large scale. Special indoor as well as outdoor trainings are provided to the farmers, employees of the societies and also to the management committees of the societies. Trainings on various subjects related to the milk business in rural areas like management of society, skill development, leadership development, book keeping computer operations, animal husbandry management and also personality

development are undertaken on intensive basis. 20 vision mission programmes at society level are handled during the year. So far, 32 societies are covered under this programme. A special programme aimed at enhancing the institute building abilities among the management committee members of 51 societies has also been done during the year. This apart, milk societies are provided with state of the art equipments meant for increasing the record keeping efficiency as well as accuracy of milk weight and quality testing. Wide range of automatic equipments like – EMI, ACLR, AMCS, processor based milk collection system, Generator sets for stand by power requirement and also the solar panels to the areas, which have acute electricity problems are given to the milk societies. During the year 2004-05, 120 societies are adopted under this programme. The out come is encouraging.

- **PARTICIPATION OF RURAL WOMEN:**

Another new terrain vasudhara dairy ventured in to, was to involve the rural women in to the business of dairying at village level. It is the woman, who does all the work of grooming the cattle, feeding it milking it and pouring the milk to village society. Taking a clue from this, vasudhara decided to give the management rights of the village societies to women. Wherein all the activities of the milk society is taken care of by the elected management committee from the society which comprises all the women members. What started as a novel concept has become widely popular and got accepted very well by the women milk pours of the rural villages. Today, vasudhara boast of no less than 533 successfully run women societies out of the total of 762. Which turns out to be around 70% of the total milk pouring societies affiliated with vasudhara dairy. The membership strength is around 51,000 women in these societies. This number is growing rapidly and the result of this concept implementation is very encouraging.

- **SWAVILAMBI GRAMIN NARI:**

Swavilambi Gramin Nari which aims at making the rural woman independent, self sufficient and to provide self-employment through milk business. Under this scheme, vasudhara dairy has till date covered 11670 women members and has arranged to finance worth of Rs. 1401 lacs. The recovery rate of 75.37% of the finance is very

high and also indicates the sincerity with which the women members have been utilizing this scheme for their benefit.

- **CROSS BREED:**

Vasudhara's drive for higher yield per animal and improvement in the hygienic conditions around the farmers' residence and also around the cattle shed has germinated host of other schemes targeted mainly towards improving the Productivity of milk. Under Productivity Enhancement Programme, various programmes are implements aims at up gradation of cattle through network of 192 A.I. centers spread throughout milk shed area. Our union from the very beginning has believed in preventive way to increase the milk production like vaccination, de-worming, calf rearing pregnant cow care, conservation of fodder, supply of balance cattle feed, fodder seeds and mineral mixture.

- **CALF REARING SCHEME:**

Calf rearing scheme is aimed at improvement of the breed of cow at farmer level. Rather than buying the cows from outside agencies the women farmers are encouraged through this scheme to nurture the cow calf, right from its birth in scientific way. Vasudhara dairy provides all the guidelines and required support for this scheme that includes the vaccination, insurance coverage, nutritional feed and finance. This scheme has been in implementation since last 6 years and has been accepted by 3955 women members, taking finance of Rs. 117 lacs and rearing Rs. 48 lacs after successful utilizing the fund. The offspring is 1108 calf calving till date.

- **FODDER BANK:**

This scheme aims to provide dry fodder to the society members every time. When they required. Through this scheme members are given finance to purchase & stock dry fodder which can fulfill the requirements of the cattle round the year for food. This scheme was introduces in 1997-98. During the year 2004-05. through 56 women dairy co-operative society 14500 women members are given 9% interest loan to the tunes of Rs. 43 lacs, which should be repaid in eight installments to the dairy.

- **WORMICOMPOST SCHEME:**

The purpose of this scheme is to provide how to produce the organic fertilizer by utilizing agriculture, cattle and kitchen wastage at farmer's place. Vasudhara dairy gives necessary training and technical inputs to the interested members. This scheme is conducted and managed by self-help group. In the year 2004-05 a wormicompost pits are established at members place. This fertilizer is utilized by the members to increase their yield. in case a surplus production of such fertilizer, vashudhara dairy will buy back such production and will do the marketing of this fertilizer to the farmers' community using its vast network.

- **BIO-GAS PLANT:**

This scheme aims to serve multiple objects i.e. Hygiene, savings on fuel and preservation of environment. The waste and manure that the cattle shed greatest are utilized in best possible way by generating methane gas which is used for cooking purpose. The left over manure after the gas separation is again used as fertilizer for agricultural purpose. Till date vasudhara dairy has helped to put up 4,096 bio gas plants to women members. The finance deployed was Rs. 122 lacs and recovery is to the tune of Rs. 117 lacs.

- **TECHNICAL INPUT SERVICES:**

Vasudhara dairy also provides technical input services farmers for their animals viz. artificial insemination, first aid, vaccination, de-worming of cattle, infertility treatment, insurance coverage, cattle feed quality fodder seeds, urea treatment of paddy straw, chaff cutters etc. vasudhara dairy also helps farmer members on aspect of wasteland development, water shed management and compost pit etc. Farmer members are given protection of insurance cover under respective scheme.

- **INSURANCE SCHEME:**

Vasudhara dairy also provides insurance scheme for animals. It means that the dairy gives insurance facility to farmer members for their cow & buffaloes. The insurance premium rate is applied at the rate of 4.3%. The insured amount is Rs. 12,000 per animal. The vasudhara dairy gives contribution of 33% of the total premium for insurance of animals. In the year 2001-02, management has introduced the insurance scheme for farmer members which is known as “jan shree vima yojana.” Under this scheme farmer is insured for Rs. 20,000 for natural health and Rs. 50,000 for accidental death. Moreover, the farmer member has been given Rs. 25,000 in case of he/she will loose their any two physical parts of the body. In the year 2004-05, 11040 animals are covered and 8849 farmer members are covered under this scheme.

- **ACHIEVEMENT:**

Winning national Productivity council awards seems to have become a habit at vasudhara dairy. Vasudhara dairy has won these prestigious awards as 2nd best liquid milk plant in India for the years 1993-94, 95-96 & 96-97. Boisar Ice-cream plant has been awarded the best ICMU in stock age monitoring by GCMMF during the year 2003-04. During the year, Boisar Ice-cream plant also received the award for exceptional manufacturing performance for the year 2002 from Tarapur Industrial Estate Association [TIEA]

(viii) SURAT DISTRICT CO-OPERATIVE MILK PRODUCERS’ UNION LTD., ‘SUMUL DAIRY –SURAT’: ⁽¹⁹⁾

Surat city is situated on the bank of Tapi River which has been known as an important place since 16th century and has historical monument till 1939, the need for the milk of the city area was fulfilled by the farmers living in or around the city but the middle men, called Bhatiya exploited the farmers – milk producers in both ways i.e. selling of milk and purchase by cattle, cattle feed, fodder etc. Hence, the farmers determined to establish their own association to save their interest. So, the first co-operative society was started on 21st December, 1939 in Surat and that was the starting of new era of

co-operative movement in Gujarat. Then after, Surat district co-operative milk producers' union ltd. – sumul dairy – Surat was registered on 22nd August, 1951 with the support of 6 co-operative societies. Then in 1959-60, the committee was formed to make study of a modern dairy project. The committee prepared and presented a plan to Government of India, costing Rs. 35 lacs in 1961. In plan, the Government has sanctioned Rs. 11 lacs. The machinery needed for the project was not available in India. So it was to be imported. Union and FAO were approached for the same. But the sanction of the UNICEF was conditional and was not agreeable to the union under these circumstances, the financial assistance was sought and machineries worth Rs. 11 lacs were imported. Moreover, the foundation stone was laid on 13th April, 1966 for the project involving total assistance and Rs. 68 lacs from Government of Gujarat.

So, Surat district co-operative milk producers' Union Ltd. – Sumul dairy – Surat is a co-operative endeavor committed to help marginal farmers and downtrodden tribals to lead to a healthy and prosperous life and better standard of living through scientific animal husbandry practices. Today, sumul enjoys the pride to serve milk and milk products to Surat city and surrounding towns of Surat district. Sumul parivar salutes those crusaders who have a thought with and wisdom to unite under one umbrella almost 55 years ago in 1951, in order to get rid of exploitation by private milk traders of Surat and enlightened a co-operative flame. Today the tree is spreading its vast wing over 6,35,000 liters of milk; being calculated from 1041 village co-operative societies with the help of 2,18,975 farmers members.

- **EXPANSION OF DAIRY PLANT:**

The plant with the capacity of 50,000 liters per day was inaugurated by shree kurian on 24-1-79 to fulfill the requirement of increasing population, capacity was increases from 50,000 liters per day to 1,00,000 liters per day on 24-4-79 under O.F.II and subsequently to 4,00,000 liters per day in 1991 and for that Rs. 6,42,03,000/- was granted by N.D.B.B. under O.F. II to handle the problem of additional milk supply and to avoid milk holiday declaration, a powder plant with the capacity of 12.5 M.T. per day and was commissioned.

- **TETRA PACKAGING:**

Due to increased milk supply, to avoid milk holiday and to decrease refrigeration cost as well as to keep the collected milk in good quality, a modern tetra packaging plant was commissioned in 1994 but it was not found viable. Hence, the plant was handed over to Dhara with effect from 5-3-92.

- **POWDER PLANT:**

To face the question of disposal of excess milk supply and to avoid milk holiday, the union had decided to install a powder plant. According the most modern plant of 12.5 M.T. capacity started functioning.

- **BUTTER MILK:**

As the milk supply was to be sent the union, the activity of Ghee making was stopped at rural level and hence, the deprival of getting butter milk, therefore the SUMUL dairy started selling of butter milk with effect from 1-6-87. Today selling of butter milk stands at 45000 liters per day, approximately.

- **CHILLING UNITS:**

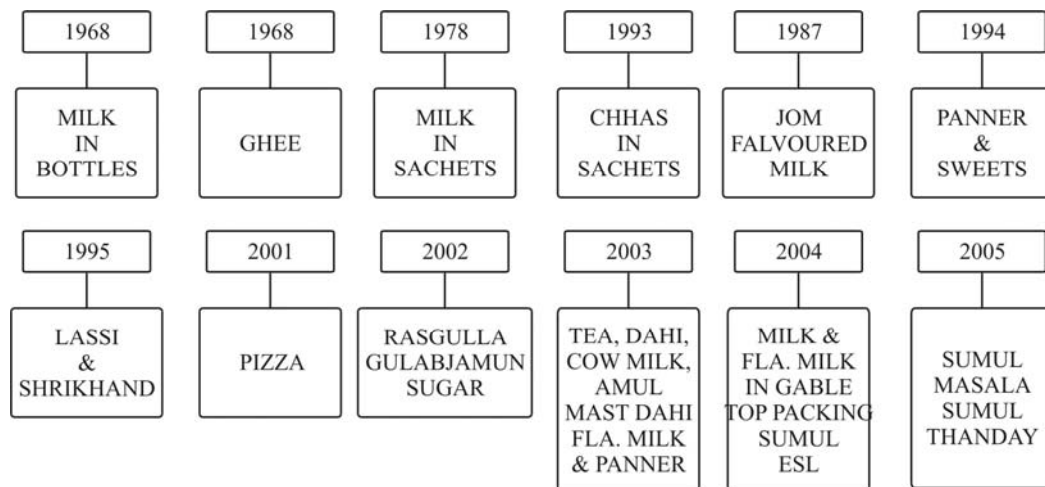
In order to produce milk and milk products of international quality, it is necessary that milk collection at milk society level should be of best quality. SUMUL dairy union has established operational milk chilling units. At present, 37 bulk chilling units are operational. Milk can be chilled at the milk society level and transported through round milk tankers. As milk being chilled at society level improvement in quality of milk is recorded. It also gives facility to store two or three times of milk collection and this can be transported as per convenience. At society level, arrangement has been made for milk collection at their convenient time.

First chilling centre was installed as Bajipura of 11th November, 1972 with capacity of 30,000 liters per day which was increased to 60,000 liters per day in April, 1984. The expansion there of is on hand to raise the capacity up to 1 lac liters per day. Similarly,

another chilling centre was set up at Uchhal in tribal area with the capacity of 10,000 liters per day on 1st April, 1982, increased to 30,000 liters per day afterwards. Due to excess supply of milk, expansion work of Uchhal chilling centre is on hand. A chilling centre Pardi with capacity of 2 lac liters per day is on the verge of completion and with the working of the same, the burden on the main dairy plant will decreased. Due to this facility the proportion of milk sourage will be decreased.

- **PRODUCTS MANUFACTURED:**

The SUMUL dairy plant having 40,000 LPD was installed in 1968 with Swedish Credit loan under technical expertise of NDDDB and today with gradual expansion of the processing and production facilities, Sumul can handle 6 lacs liters per dau and process and pack milk and milk products like Ghee, Butter Milk, Butter, Milk powder, Lassi, Masala Chhas, Jom flavoured milk, Dahi, Panner and Indigenous sweets. Recently, SUMUL dairy has launched Sumul ESL in Gable top packing which is a state of technology from America (U.S.A.) and first of its kind in India. It is a step ahead in customers satisfaction. They also pacj Amul Mati Dahi, Amul flavoured milk and Amul Panner. The milk business is generating more than Rs. 550 crores in the year 2004-05.



- **MILK MARKETING:**

The timely supply – twice a day – of milk & milk products is ensured through network of 2112 agents and 237 full time agents equipped with refrigerators channeled in 85 routes through out surat city and surrounding towns. The agents requires to deposit necessary amount as security deposit; and deposit daily cash at cash collecting centre/bank. The commission slip is accounted and issued at the month end. Seasonal & religious events are fore-planned to fulfill the extra demand. SUMUL dairy also supplies milk and milk products like Ghee, pasteurized Butter and Skimmed milk powder. Through Gujarat co-operative milk marketing federation (GCMMF) ltd. – Anand.

- **QUALITY ASSURANCE PROGRAMME:**

SUMUL dairy union has adopted international standards for quality management. QAS Australia has certified their quality management systems by issuing ISO – 9002, ISO – 14001 and H.A.C.C.P. certificates in the year 2000. The quality management system further upgraded and their organization is certified for ISO 9001:2000 and HACCP 9000:2002 in the year June, 2003 by SAI – GLOBAL assurance services, Australia. This is thus commitment of Sumul towards its customers for quality and safety of milk and milk products. By applying quality management system, union has standardized all process and procedure system for production of milk and milk products. Generally, it is easy to design system but difficult to implement it. But with the active participation and dedication of their workers and employees with better leadership and guidance of higher authorities, continuous training programmes under TPM and GMP, they have successfully implemented ISO standards. At every six months interval, total quality management system has to be audited and if found proper as per standard quality management norms then certification are renewed. They have achieved continuous renewals.

Accreditation of ISO 14001 certificate is a testimony of their commitment towards the community and country as a whole for better environment to live on. by complying with terms and conditions of ISO 9001:2000, ISO 14001, HACCP, quality management and environment control, sumul dairy union has undertaken different

measures for fully automation in their various production line, installation of automatic machinery in various production line is in progress, use of state of Art technology for protection of environment and also taken up large scale plantation in surat district.

- **OTHER ACTIVITIES OF THE SUMUL DAIRY:**
- **CROSS BREEDING – BETTER YIELD THROUGH A.I. PROGRAMMES:**

The Government of India had chosen for districts for breeding of buffaloes and surat is one of them. So, in the year 1966, three significant plans i.e. dairy projects, cattle feed factory and breeding centre were granted. In order to increase the quantity of milk and to keep regular supply round the year, it was decided to establish cow breeding centre on 1st april, 1989 in surat.

The milking capacity can be measured by the amount of milk drawn in the pail. One of the significant factors is the time that elapsed between calving and subsequent conception. With that viewpoint, SUMUL conducts artificial insemination programs through 162 fields A.I. centers. Most of the centers are handled by educated unemployed youth who are trained in the technique. SUMUL dairy organizes supply of frozen semen doses, liquid nitrogen and other consumables. The rural young and energetic boys are given training of A.I. technique at the sumul's A.I. training centre. This is a 50 days programme earlier managed by the N.D.D.B. in 1977. Thus, the young generation is available at the doorstep of the farmers to render the invaluable service, thus nourish the concept “cross breeding – better yield.”

- **CALF RALLIES:**

The main aim of this programme is to raise high yielding milch animals locally through milch animals/live stock improvement and cow bull/ buffalo bull progeny tested bulls programme.

- **CATTLE FEED PLANT:**

Surat was chosen as one of the canters where cattle feed plant was installed along with Rajkot, Mehsana and Ahmedabad. This plant was established on 10th april, 1970 on turn key basis by N.D.D.B. From the year 1988-89 with the support of “by pass protein Technology”, Sumul cattle feed plant was started to provide “Balanced Dan” to the cattle for obtaining more milk with less cost.

Cattle feed plant at chal than producing over 300 TDP cattle Feed ISO 9002 certified and upgraded and certified for ISO 9001:2000 in mureh 2004. Various cattle Feed products ideally suitable for dairy animals are being produced from quality and nutritionally sound raw material/ingredients. Milk producers have trusted these products over years.

- **FODDER SEED:**

Fodder constitute major expenditure in milk production, it should be adopt scientific approach by using high yielding fodder seed for fodder cultivation and also ensure adequate supply of leguminous and non-leguminous fodder to milch animals during the year. This will help the milk producers in getting maximum milk production at low cost. High yielding variety of fodder with high nutritive value keeps animals in its optimum health. Sumul dairy unin has provided 25% subsidy on hybrid fodder seeds supplied to milk societies.

- **ANIMAL HEALTH SERVICE:**

The prevention of the health hazard presents a continuous challenge, so sumul dairy is providing mobile veterinary services to fulfill the basic need through network of 26 routes which ensures visit to each village once a week accompanied with a veterinary doctor and a attendant veterinary services cover up treatment and necessary counseling advice for preventive measures. Veterinary services also takes care of vaccination and massive treatment during epidemic events. Emergency service is

made available round the clock through out the year at a nominal cost at the doorstep of farmer members. Veterinary camps are also organized occasionally.

- **CO-OPERATIVE DEVELOPMENT PROGRAMME:**

Since 1992-93 with active participation of Gujarat co-operative Milk Marketing Federation Ltd. co-operative Development programs are being implemented with sole objective of developing ownership sentiment amongst members and their obligation strengthening co-operative institutions, developing dedicated leadership, awakening amongst women members, developing new leadership. The result of various co-operative Development programs have proved marked changes in rural regions.

- **INTERNAL CONSULTANT DEVELOPMENT PROGRAMME:**

It is imperative to bring out permanent development to all facts related to dairy profession by giving top priority in animal husbandry programme development in surat district. Development issues are cleanliness at milk society, artificial insemination services, milk recording and testing cattle feed and fodder activities, self development and milk society, development planning and budget preparation exercises [vision mission strategy].

- **LIVESTOCK GROUP INSURANCE SCHEME:**

Either any disease or other calamity of milch animals leads to loss of earning to its owner. Sumul dairy union encourages insurance of milch animal so that under any eventuality cattle owner should not get deprived of his earning. Under this scheme, 7046 animals from 389 milk society are insured. Premium for which were paid to insurance company. Total claim for Rs. 78,37,100/- for 528 animal were distributed to their respective owners. As insurance claims being high, insurance company delays claim settlement. While submitting insurance claim, society should submit all details with accurate proof timely, so that delay in claim settlement can be minimized.

- **WOMEN SELF HELP GROUP:**

Women plays vital role in dairy farming. Enlightened women of the district has organized small self group in villages. Aim of self help group is to earn for the family. Funds generated is advanced as loan to group member and self help group member has not extend their hand for assistance. Thus, self help group has shown new path for economic development of women. These self help groups have encouraged other women to follow their path.

- **RURAL SANITATION PROGRAMME:**

Rural pollution could be minimized rural area. If sanitation is given due priority good sanitary practices during milk collection and production, life style will definitely control, prevention of disease, thereby reduce economic losses. Successful implementation of Rural sanitation programme has encouraged other milk producers for undertaking similar programme in their area.

- **WORMICOMPOST:**

In order to improve soil fertility and produce good quality crops, Sumul dairy has started wormicompost unit at Navi Pardi chilling centre complex. This is one the biggest worm compost unit in Surat district. Aim behind this worm compost activity is to educate farmer and encourage them to use bio-fertilizer. Sumul dairy has also established wormicompost unit at Bajipura and Uchchhal chilling centre also.

- **ACHIEVEMENTS:**

“Sumul dairy – Surat has been awarded may times. These awards can be stated in following passion:

Year	Award Title	Awarded By
1988-89	National Productivity Award	National Productivity Council, New Delhi.
1989-90	Sardar Patel Sausharta Award	South Gujarat University, Surat.
1990-91	National Productivity Award	National Productivity Council, New Delhi
1992-93	Jamnalal Bajaj Fair Practice Award	Council For Fair Business Practice, Mumbai.
1998-99	Certificate Of Merit From National Productivity Council	National Productivity Council, New Delhi.
1999-00	Appreciation Award For Total Productivity Maintenance	Quality Circle Forum Of India, Vadodara
1999-00	Total Productivity Maintenance Award	Ahmedabad Management Association, Ahmedabad
2000-01	Quality Excellence Award	Surat Management Association, Surat
2000-01	Jamnalal Bajaj Fair Practice Award	Council For Fair Business Practice, Mumbai.
2000-01	National Productivity Award (Dairy Development & Production Sector) – 2 nd	National Productivity Council, New Delhi
2001-02	Birla Cellulosic Award For Small Group Activity	Birla Cellulosic, Kharach
2001-02	National Productivity Award (Dairy Development & Production Sector) – 2 nd	National Productivity Council, New Delhi
2002-03	IMC Ramkrishna Bajaj Award Merit Certificate 2002	Indian Merchant Chamber, Mumbai.
2003-04	Ensure National Award For Energy	Energy & Fuel Users Association Of India, Chennai
2003-04	Best Organization Of The District	Surat Jilla Sahakari Sangh, Surat
2003-04	Best Garden Of The Company Of Surat City.	Surat Municipal Corporation, Surat.
2003-04	CSI-TCS Award For Best IT – Usage	Computer Society Of India
2003-04	Intelligent Enterprise Award	Computer Associates
2003-04	Professional Award To Managing Director	Memorial Charitable Trust, Anand.

REFERENCES

1. ICA Magazine
2. ICA Magazine
3. ICA Magazine
4. R. B. Tyagi, Recent Trends in the Co-operative Movement in India. Asia Publishing House, Bombay – 1915, ch. 1, P No. 7.
5. WWW.ICA.ORG
6. Prof. C.H. Joshi, Dairy Vigyan, Ahmedabad, Gujarat Growth Nirman Board, Inc. 1974, Page No.5
7. Prof. Tushar Shah, cited in Dairy India – 1997, “Institutional Alternatives in Dairying”, Published and edited by R.Gupta, New Delhi, Publication of Government of India, Page no. 42.
8. Prof. C.H. Joshi, Dairy vigyan, Ahmedabad, Gujarat Growth Nirman Board, Inc. 1974, Page No.5
9. Dr. R.p. Aneja and B.P.S. Puri edited by P.R. Gupta, “India’s Dairy Riddle Unravalled” cited in Dairy India – 1997., Publication of Government of India – New Delhi, Page No. 13
10. Dr. K. Pradhan, cited in Dairy India – edited by P.R. Gupta, Scientific Feeding Publication of Government of India – New Page No. 293.
11. Dr. C.N. Pandit – cited in Dairy India – 1992, Health Care, Published & Edited by P.R. Gupta, Publication of Government of India New Delhi, Page No. 213
12. The Annual Reports Of Amul Dairy – Anand.
13. The Annual Reports Of Gopal Dairy – Rajkot.
14. The Annual Reports Of Uttam Dairy – Ahmedabad.
15. The Annual Reports Of Madhur Dairy – Gandhinagar.
16. The Annual Reports Of Sugam Dairy – Baroda.
17. The Annual Reports Of Dudhsagar Dairy – Mehsana.
18. The Annual Reports Of Vasudhara Dairy – Aliput(Chickhli).
19. The Annual Reports Of Sumul Dairy – Surat.

CHAPTER - 3

RESEARCH PLAN

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RESEARCH PLAN

1. INTRODUCTION
 2. RESEARCH PROBLEM
 3. RESEARCH PLAN
 4. BROADER OBJECTIVES OF THE STUDY
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1. INTRODUCTION:

India, basically an agricultural country and mostly depends upon whether. Animal husbandry is one of the branches of the agriculture. Indian culture is self-sufficient and contended. Co-operative sector can play a vital role in the development of any economy. This has been proven in India as well as in other developed nations. From U.K., the roots of co-operative movement has been spreading across the globe to improve the quality of the lives of it's members and today it becomes as a powerful economic force in some countries. In this study, the researcher has tried to measure Productivity of the Co-operative Dairy and Milk Supply Units of Gujarat State. All the dairies working under the Gujarat Co-operative Milk Marketing Federation ltd. Anand are covered in the study except four dairies.

2. RESEARCH PROBLEM:

Milk Dairy Industry, being milk a perishable item and a heavy industry, required a big fund was established in co-operative sector in India and in Gujarat. It has been established during last 60 years, so it can be considered a mature industry in the economy of India and Gujarat. The basic aim of the study is to calculate and to understand the productivity trends of Co-operative Dairy Industry of Gujarat State.

6RESEARCH PROBLEM:

“ANALYSIS OF PRODUCTIVITY OF CO-OPERATIVE DAIRY AND MILK SUPPLY UNITS OF GUJARAT STATE”.

3. RESEARCH PLAN:

Research plan or research methodology includes the suppositions and values which provide as a rationale for research and the standard which a researcher uses for interpreting the data and reaching to conclusions. Here, in this study, it covers introduction of the model, sources of data, selection of base year, discussion of concepts and variables, valuation of output and input, testing hypothesis through chi-square test and Kruskal-Wallis one-way analysis of variance test and calculation of

other statistical techniques such as arithmetic mean, standard deviation and coefficient of variation.

4. BROADER OBJECTIVES OF THE STUDY:

The broader objectives of the research are to study the productivity trends of various co-operative dairy and milk producer units in Gujarat, the pioneer state of the co-operative dairy in India. These objectives are as under:

- To understand productivity growth of co-operative dairy & milk supply unit of Gujarat state.
- To know productivity indices of co-operative dairy & milk supply unit of Gujarat state.
- To analyze Material productivity
- To analyze Labour productivity
- To analyze Overhead productivity
- To analyze Total productivity
- To know the area for improving the productivity.

5. HYPOTHESIS:

Here in this study, two hypotheses are used, which are as under:

- Hypothesis based on chi-square test
- Hypothesis based on Kruskal-Wallis One Way Analysis Of Variance Test

- **HYPOTHESIS BASED ON CHI-SQUARE TEST:**

It is to understand the interplant productivity direction and growth. This hypothesis has been tested to overcome the difficulty of understanding and analyzing the result. The statement of null-hypothesis [HO] is, **“The productivity indices of the units can**

be represented by the straight line trend based on the least square method.”
Alternative hypothesis [H1] is, **“The productivity indices of the units can not be represented by the straight line trend based on the least square.”**

Normal level of significance considered by all researchers is 5%. It is also considered appropriate level of significance as it is neither high nor low. So, 5% level of significance is selected for this study also. If the calculated value of chi-square is less than the critical value, the hypothesis is considered accepted and if, in case calculated value of chi-square is higher than the critical value, the hypothesis is rejected and in such situation, alternative hypothesis will be accepted for the study.

- **HYPOTHESIS BASED ON KRUSKAL-WALLIS ONE WAY ANALYSIS OF VARIANCE TEST:**

Another null hypothesis that has been tested is based on Kruskal Wallis one way analysis of variance test. It has been tested to see whether there is any significant difference between productivity ratios of the co-operative milk dairy units, working in Gujarat. The statement of null hypothesis [HO] is, **“There is no significant difference between the productivity of the co-operative milk dairy plant.”** The acceptance of the said hypothesis would reveal that the productivity of various co-operative milk plant and units is approximately equal and rejection of this hypothesis means that the productivity ratios between the co-operative milk plant/units are significantly different. The statement for this alternative hypothesis [H1] is, **“There is significant difference between the productivity of the co-operative milk dairy units.”** The level of significance used for this study will also be at 5% and degree of freedom is [Total No. of units 8-1] = 7 in the study.

6. PERIOD OF THE STUDY & SOURCE OF DATA:

This study includes secondary data taken from published annual reports of the co-operative dairies and milk supply unit of Gujarat state for the period from 1996-97 to 2004-05 i.e. nine years. Various reports of Gujarat Co-operative Milk Marketing Federation [GCMMF] Ltd. – Anand and National Dairy Development Board [NDDB]

– Anand. Unstructured personal interviews of key persons are also used for this study. Most of research of the study was considered by means of secondary sources through extensive library research based on books, websites, periodicals, newspapers, government reports etc. Data obtained have been classified, edited & tabulated under various groups & sub-groups as per demand of the study.

7. TOOLS OF ANALYSIS:

Following tools have been used for the analysis of Productivity of co-operative dairy & milk supply units of Gujarat state:

- **PRODUCTIVITY ACCOUNTING MODEL:**

Productivity accounting is a tool or technique which measures and interprets productivity by the relation of total output to total input productivity accounting model is also known as output-input model. It is originally given by Hiram S. Davis⁽¹⁾ in this model; the variable output and input are stated separately.⁽²⁾ This model indicates that the output and input should be measured in monetary terms as the quantitative measurement of these variables involves many problems.⁽³⁾

- **CONCEPT OF VARIABLES:**

The basic variables which are output and input are used in this study. They are as under:

- **OUTPUT:**

Output is one of the important and basic factor for measuring the productivity. It can be measured in quantity or physical units but as earlier we have seen their limitations, it is measured in monetary terms or money value. In this reference, M.J. Clay and B.H. Walley says, “In any case, it is not possible to consider physical units as a standard against which to compare different input variables widely.”⁽⁴⁾ They further states, “If the idea of equivalent production is introduced, this still stays as a problem of comparability with input variable unclear. So, physical units must be discarded

as a measure. Output is the only common factor between product, raw-material, labour, overhead and capital. Therefore it must be considered in monetary terms.”⁽⁵⁾ Moreover, N.K. Prasad suggests, “Quantities data are better measurement of output but where different products are produced and product mix and the types, specifications and quantities of the products are liable to change regularly, the data are rendered uncomfortable.”⁽⁶⁾ Hiram s. Davis also supports to the above opinions by saying these words, “How is industrial productivity to be measured when multiple resources are always involved and product mix is extremely common? There is only one unit of measure by which there unlike inputs and output can be added into meaningful totals.”⁽⁷⁾

After taking the above all statements and opinions into the mind, it would be wise decision to use monetary value of output instead of quantity or physical unit as a measurement of output in Co-operative dairies of Gujarat. Now the question is that, if the unit produced or sold should be considered to disclose as output. M.J. Clay and B.H. Walley have marked that, “the balance is titled in favour of using production.”⁽⁸⁾ They have described the following reasons in favour of their claim: Firstly, most costs are related to the production rather than to sales. Secondly, anyone can edit and tabulated under various groups and sub-groups as per demand of the study. Avoid the agitating effect of stock fluctuation. And thirdly, the term productivity itself means that it is concerned with production instead of sales. Sales in any particular period can not indicate the true relationship to cost due to fluctuations in stock levels.⁽⁹⁾ With reference to above all opinions, sales value is considered as output for the present study, as production figures are not available.

– **INPUT:**

Inputs can be stored in many ways. As such all the items which are included in profit and loss account become a separate input item. Such types of inputs are neither practicable nor pleasing. So far as the milk Dairy Industry is it is divided into three parts such as material, labour, and overhead. Direct or indirect material it means all the material items have been included under the title of “Material Input”. It includes purchase, Raw-material, consumption, excise, processing & packaging expenses etc. Like the material items, the direct and indirect labour has been covered under the title

of “Labour Input”. In this reference, Krish pannathur says that “The workers” includes manual, skilled and knowledge workers. In the ultimate analysis, everyone in an organization from the chairman to the Gateman, is a worker, for working convenience, we have various level of management supervisory staff and workers”.⁽¹⁰⁾ and the third one is overhead input. Overhead includes depreciation, power and fuel, repairs and maintenance and business service inputs, etc.

- **STATISTICAL TECHNIQUES:**

There are five statistical techniques, which researcher has used for the study. They are as under:

- **CHI-SQUARE TEST:**

Chi-square test is a tool or technique which indicates weather it is possible, (I) to compare a number of frequency distribution, (II) to check the goodness of fit and (III) to check the relationship between attributes with the help of this test. It is possible to decide the significance of the difference between the observed frequency and the frequency assumed. It is calculated with the following formula:

$$\text{Chi square} = \sum \frac{(O - E)^2}{E}$$

Where,

O = Observed Value of productivity indices.

E = Expected Value of productivity indices.

[Critical value of chi-square is achieved from the table of the chi-square distribution]

For the testing of a hypothesis, the comparison is made by calculating a value of chi-square from the above formula. The null hypothesis is accepted weather the calculated value of chi-square is less than the critical value. [Table value] of chi-square at the significance level selected with the appropriate degrees of freedom, otherwise it is rejected.

– **KRUSKAL WALLIS ONE WAY ANALYSIS OF VARIANCE TEST:**

Jerome D. Brawerman observes the rationale of the Kruskal Wallis one way analysis of variance test and in this reference he says that it is one way analysis of variance test that applies rank. James V. Bradley also says that this test is the rank randomization analogue of the observation randomization test. The calculations are completed by converting all observations to a rank. During the ranking process, of the observations, all the values are considered as if they related to one sample. The values are ranked in ascending order. i.e. from a lowest level to the highest level. The lowest no. is ranked as no.1 and the next lowest is ranked as no. 2 and so on until all the observations have been ranked. If any two observations become same, it will be solved by giving them the average value of ranks. The calculation of this test can be done by the following formula:

$$H = \frac{12}{N(N+1)} \sum_{j=1}^K \frac{R_j^2}{n_j} - 3(N+1)$$

Where,

N = Total number of observations

K = Total no. of sample

n_j = the no. of observation in the sample

R_j = the sum of the ranks in the j the sample

If there happens to be the case of large number of ties, it will affect the value of H. so, it will be necessary to adjust the value of H by dividing it by the quantity.

$$H = \frac{(T^3 - t)}{(N^3 - n)}$$

Where,

T = no. of ties in a group of ties.

The H is provided approximately as chi-square with [k - t] degree of freedom. Where K means the no. of sample. Null and alternative hypothesis have been used on the basic of Kruskal Wallis one way analysis of variance test.

– **ARITHMETIC MEAN:**

The arithmetic mean is frequently applied in various types of study. It is computed by doing the sum of all values and divides the total by the number of observations. In the present study it is calculated by doing the sum of the entire productivity index and dividing it by the total no. of years taken for the study. It can be calculated by the following formula:

$$\text{Arithmetic Mean (A)} = \frac{\text{Total Value of all the productivity index value}}{\text{Total no. Of years}}$$

– **STANDARD DEVIATION:**

Standard Deviation is better than the other measures because of its merits in mathematically representing the variability which is very crucial for interpreting and analysis the statistical data. It means as the root of the mean of squares of the deviations of particular items from the arithmetic mean. It can be calculated with the following formula:

$$\text{Standard Deviation} = \sqrt{\frac{\Sigma d^2}{N}}$$

Where,

Σd^2 = Square of deviation of items from arithmetic mean.

N = No. of items.

– **CO-EFFICIENT OF VARIATION:**

Co-efficient of variation is a most important factor of the statistical techniques. It is the best standard of comparing the variability of two series. It indicates weather the items included in a series is steady or not. The series or group, for which the co-efficient of variation is greater, is considered to be more variable. Co-efficient of variation is form of expressing the relative measures of dispersion in percentage. It is computed by dividing the standard Deviation by Arithmetic Mean. Its formula is as under:

$$\text{Co-efficient of variation} = \frac{\text{Standard Deviation}}{\text{Arithmetic Mean}} \times 100$$

8. 'PRODUCTIVITY' MOVEMENT IN INDIA:

With the launching of the First Five Year Plan, the need for improving the efficiency and Productivity of workers was felt by the government and the employers. In 1952, an International Labour Organization's Mission on 'Productivity' visited our country, and after a through study, they reported that there was lack of the workers and employers. The Mission initiated some productivity work in Delhi, Bombay, Calcutta and Ahmedabad which showed encouraging results. At Delhi, the improved productivity enabled the overhauling time of the buses to be cut substantially and it would have been possible to increase the number in service by 50% without purchasing the additional vehicles. As a result of the work of the first I.L.O. Mission, the Government of India decided in December 1953, to request this organization to provide technical assistance in the establishment. In September 1954, another I.L.O. Mission visited India, made a number of visits to certain selected factories and recommended measures for improving Productivity in those establishments.

In October – November, 1956, a 'Productivity Delegation' from our country visited Japan to study the working of the 'Japanese Productivity Centers.' The delegation which was led by Dr. Vikram A. Sarabhai, was required to study the constitution, organization, programme of work and mode of operation of such centers. In this, report which was submitted in 1957, the delegation recommended that an effective movement for 'Productivity' should be started by organizing a central body whose functions should be the creation of appropriate climate for 'productivity', the canalizing of financial aid for such movement and the provision of specialist technical assistance for it. The recommendations of the delegation were discussed at a Seminar on productivity held in November – 1957 under the auspices of the Ministry of Commerce and industry. The seminar laid down, certain guidelines for the organization and establishment of an all – India body to promote industrial productivity.

With the references of productivity movement in India, the NATIONAL PRODUCTIVITY COUNCIL (NPC) was established in February 1958 and was registered under the societies Registration Act sponsored jointly by the Government of India and National Organization of Employees and Labour. The objects of the

Council are to promote productivity consciousness in all sectors of the national economy, disseminate knowledge of the concepts and techniques of 'productivity' and demonstrate their value and validity in practical application. The council has concentrated its attention so far to productivity in manufacturing, industries, public utilities and commercial organization.

- **The principal activities of the National Productivity Council consist of :⁽¹¹⁾**

- Planning, organizing and presenting training programmes directly and through local productivity councils (LPC) and other bodies,
- Organizing local, regional and national seminars and conferences,
- Conducting 'productivity' surveys and assisting the implementation of improvements,
- Sponsoring teams for 'productivity studies abroad,
- Publication of the 'productivity Journals and 'NPC information' (monthly)
- Publication of reports of study teams
- Technical inquiry service,
- Development of local productivity councils and guiding and supporting their activities,
- Preparation of manual training and case examples of the impact of 'productivity' techniques,
- Supporting the activities, of 'Asian productivity organization'

- **NATIONAL PRODUCTIVITY COUNCIL VISION :⁽¹²⁾**
 - NPC aims at combining its promotional mission with a totally professional approach to provide world class services needed by Indian industry to become internationally competitive in a global economy.
 - NPC aims at propagating productivity as an evolving concept, which includes attention to special issues, and concerns relating to quality environment, energy, integrated rural and community development, women workers etc. ‘productivity’ shall increasingly be viewed in this context and not in the conventional sense of mere production increases with constant resources.
 - NPC’s thrust is on providing modern and high quality productivity – related services to sectors not adequately addressed by others, especially the small – scale industry and informal sector.
 - NPC is also a change agent, aiming to assist the central and state governments, local bodies and other organizations in improving the quality, efficiency and productivity of public services.
 - NPC does not seek to supplant the private sector consultancy organizations or specialized bodies, though it would compete with them to the extent that it helps keep its professional skills upgraded and maintain its market credibility.

- **Productivity Awards:**

To encourage the units to perform efficiency with a healthy competitive spirit, Government of India in collaboration with National Productivity Council have instituted National productivity Awards since 1982-83. Keeping in view that an effective nation-wide award scheme provides a basis for every organization to

periodically assess the progress towards improvement, the awards provide a stimulus for 'quality and productivity improvement' in Indian industries and agriculture.

Presently, following sub-sectors are considered for award. "Best Productivity Award" is given in the form of a silver cup along with a citation. Second Best Productivity Award is given in the form of a silver salver along with a citation. A certificate of Merit is given to those units which have shown good performance for sustained productivity effort. Recently, the T.P.M. Excellence award for year 2004 is given to the Tata Iron & Steel Company Ltd. (TISCO)

- **Industry Sector Awards :**

- Automobile industry including Tractors
- Cement Industry
- Fertilizer Industry
- Heavy Engineering Industries
- Leather & Leather Goods Industries
- Light Engineering Industry
- Road Transport (Passenger) city service
- Road Transport (Passenger) Mofussil service
- Road Transport (Passenger) Hill service
- Small Scale Industries

- **Agricultural & Food Processing Sector Awards :**

- Agriculture Extension services
- Horticulture Development in co-operative sector
- Fruit & Vegetable Processing Industries

- Animal Feed Processing
- Marine & Sea Food Processing Industries
- Inland and Marine Fish Production in co-operative sector
- State Agro. Industries Corporation
- Cereal (Flour Milling) Processing Industries
- Bio-Fertilizer Produces
- Marketing & State oil Seed Federation in co-operative sector
- Dairy Processing Industries
- Dairy Development & Production in co-operative & Public Sector
- Poultry Production & Development
- Warehousing Corporations
- Seed Corporations in Public Sector
- Dry Land Farming
- Command Area Development & Irrigation Projects
- Food Processing Training Centers

9. REVIEW OF LITERATURE:

In the present study, the productivity of co-operative Milk Dairy Industry of Gujarat state has been analyzed by considering their financial data. This study is based on secondary data taken from published annual reports of the co-operative milk dairies, various reports of Gujarat co-operative Milk Marketing Federation Ltd. (GCMMF) – Anand, National Dairy Development Board (NDDB) – Anand, unstructured personal interviews of key persons are also used for this study. Most of research of the study was conducted by means of secondary sources through extensive library research based on books, websites, periodicals, new government reports etc.

For the first time the word “Productivity was stated in an article by ‘Quesnay’ in the year 1766.”⁽¹³⁾ In the year [1883] ‘littre’ defined ‘Productivity’ as “faculty to produce” that is desire to produce.⁽¹⁴⁾ The basic classical concept of Productivity was defined by classical economist, Adam Smith, David Ricardo and I.S. Mill in the 18th & 19th centuries in the form of “Law of diminishing returns to all resources”. In the 19th century, Fedrick W. Taylor’s thesis reflects that “Human work can be made infinitely more productive not by ‘working harder’ but by working smarter.”⁽¹⁵⁾ In the year 1900. Productivity is defined as a “Relationship between output and the means employed to produce this output.”⁽¹⁶⁾

In the late 1940’s the U.S. Bureau of Labour Statistics analyzed a series of studies comparing standards and rates of change in labour Productivity among plants in various types of industries. The estimates were utilized to interpret the causes of animating some organizations to measure their own productivity. A number of private researcher also measured productivity of different organizations in some industries.

In the year 1950, Organization European Economic Co-operation (OEEC) offered more formal concept of Productivity. According to them, “Productivity is the quotient obtained by dividing output by one of the factors of production.”⁽¹⁷⁾ In United States, specialized agencies like International Labour Organization [ILO] an affiliated agency of European Productivity Agency [EPA] was established in 1953. Davis [1955] states about the Productivity that, “Change in product obtained for the resources expanded”.⁽¹⁸⁾ The National Productivity Council had been established in 1958 in India. They arrange the “Productivity Programmes” with the help of their experts in their five regional branches. The Asian Productivity Organization {APO} with headquarters in Tokyo, Japan was established in 1961. Fabricant points out [1962] that, “Always a ratio of output to input.”⁽¹⁹⁾ ‘Kendrik’ & ‘Greamer’ [1965] in particular, further encouraged company efforts to measure Total Productivity as well as partial Productivity.”⁽²⁰⁾ Since [1970], Productivity has been measured in U.S. federal government agencies covering more than 50% of all their civilian employees. An increasing number of state and local government are also trying productivity measurement at various administrative and functional levels. E. Oven Smith [1971]

states with clarifying the difference between Productivity and Production that “Productivity is related to ratio and Production is related to total units.”⁽²¹⁾ Another flurry of activity was supported by phase-II of the wage and price control programme in 1971-72 which initially needed company Productivity estimates as a part of the cost determination for applying price increases. According to new cyclopedia part-VII [1974], it is stated that, “Human force Productivity ratio & human force Productivity Index are useful to Productivity and comparison of Productivity.”⁽²²⁾ A major advantage of administrative Productivity management is the Promotion of Productivity-mindedness. To have major effect the periodic results must be circulated within the management circles and attached to company wide Productivity improvement programmes. In the initial period of [1975], the U. S. National Centre for Productivity and Quality of Working Life started publishing the series, ‘Improving Productivity –A description of selected company programmes initiated by upper level management to overcome challenges or to apply continuing cost reduction, involved workers at every stages in programmes featuring work measurement and simplification, special incentive schemes, job redesign, value engineering saving waste, salvage, improved quality and joint labour management Productivity committees. In May, [1976] a white paper about Productivity has been presented by ministry of Iron & Mines in Parliament, which insisted some suggestions to increase the Productivity in Steel Companies.⁽²³⁾ Siegal [1976] defines that, “A family of ratio of output to inputs.”⁽²⁴⁾ K.N.Subramaniam [1977] had given clear opinion about Productivity that clear opinion about Productivity that “Productivity can be understood by available inputs of Production and actual obtained Productivity ratio”.⁽²⁵⁾ In [1979], Robert Dubin states that, “Productivity of goods and services can be measured by dividing output to total inputs”.⁽²⁶⁾

Sumanth [1979] describes, “Total Productivity as a ratio of tangible output to tangible input.”⁽²⁷⁾ Gordan K.C. Chen and Robert E. Mc.Graw [1982] say that “Productivity is the ratio of utilized equipments of production and production units”.⁽²⁸⁾ A.C. Herbert [1983] suggests that “Productivity measurement is a first step of Productivity.”⁽²⁹⁾ G.K.Sari and Jagdishkumar in their book, ‘In Search of Productivity’ say that “Productivity related some important factors such as capital, employees, material, fuel, total sales etc. have been proved as a value added factors in company.”⁽³⁰⁾ The

“U. S. Petroleum Industry had obtained 2387 types of products by refining crude oil in the year 1965”. This information had been given by A.D. Sharma in his research work.⁽³¹⁾ Dr. Shirish P. Shah - Cost accounting [1985] indicates that “Productivity is a ratio of production quantities to production equipments” which had been proven by work study of International Labour Organization in the year 1957.⁽³²⁾ Lawlor [1985] sums up, “Productivity” as comprehensive measures of how efficient and effective an organization or economy satisfies five aims : “Objectives, Efficiency, Effectiveness, Comparability & Progressive Trends”⁽³³⁾ Goldratt & Smith [1987] by describing the Productivity concept say that “Productivity is minimizing the use of resources required to produce and output desired by the customers.”⁽³⁴⁾ David Sumanth [1990] states that “Global Market Principle, study-curve Principle, Product-Mix Principle etc. are used for effective Productivity”.⁽³⁵⁾ Krugman [1990] intended to assert that defining or measuring “Productivity is a Herculean task when he asserted that Productivity is not everything but in the long run it is almost everything.”⁽³⁶⁾ “Though the labour Productivity rate has increased from the year 1950 in India this rate is lower than the developed country’s rate comparative.” – This information has been given in the annual report of labour Ministry.⁽³⁷⁾ (1993) “Analysis of Productivity of co-operative sugar Industry of Gujarat state.” [1993] Dr. Pratapsinh Chauhan, Professor & Head Department of Business Management, Saurashtra University Rajkot has studied and analyzed. “The Material Productivity, Labour Productivity, Overhead Productivity, Capital Productivity and Total Productivity of Co-operative Sugar Mills of Gujarat state.” He has used the “Accounting Model” of Dr. H.S. Davis to find out the Productivity in his research work. This research study has been taken as a reference in the present study. Dr. Hitesh J. Shukla, Associate Professors Department of Business Management – Saurashtra University Rajkot has studied and analyzed “The Productivity of Soda Ash Chemical Industry of India” [2001]. This research concept has been considered as a reference in the present study. ‘The Financial Express’ [2003] published from Mumbai points out that “If any work of the company thinks that he will get 100%. Productivity by their employees, that be considered as a nonsense thought.”⁽³⁸⁾ Dr. Kamlesh Dave, Lecturer in J. H. Bhalodiya women’s college, Rajkot [2005] has studies and analyzed “The Productivity of oil Industry of India”. This research study has been taken as a reference in the present study.

10. LIMITATIONS OF THE STUDY:

This study is based on secondary data taken from annual reports of various dairy, official websites of NATIONAL PRODUCTIVITY COUNCIL OF INDIA (NPC), Annual Reports Of Federation, various published reports and technical news papers, so findings depends entirely on the accuracy of such data. There are different methods to analyze and to measure productivity and other ratio. This study is based on accounting aspects of the productivity. Measurement of productivity is full of practical difficulties. It is very difficult to say that how far the productivity trends are related to specific functions of productivity measurements and partial productivity is only as academic interest.

REFERENCES

1. Hiram S. Davis, “ Productivity Accounting” [Philadelphia : University of Pennsylvania press – 1955] P. No. 109.
2. Hiram S. Davis, “ Productivity Accounting” [Philadelphia : University of Pennsylvania press – 1955] O.P. oit P. No. 109
3. Ibid
4. M.J. Clay and B.H. Walley, ‘Performance and Profitability’ [London : Longmans – 1965] p. 184
5. Ibid
6. N.K. Prasad, cost Accounting [Calcutta : Bank Syndicate Pvt. Ltd. – 1981] p. 20
7. Hiram S. Davis, “ Productivity Accounting” [Philadelphia : University of Pennsylvania press – 1955], Op. oit p.3
8. M.J. Clay and B.H. Walley, ‘Performance and Profitability’ [London : Longmans – 1965] op. eit, p. 185
9. Ibid p. 185
10. Krishan Pannathu, “Trade Unions and productivity” Economic Times, N. Delhi, July 1985 p. 5
11. Website : WWW.npcindia.org
12. Website : WWW.npcindia.org
13. By David J. Sumanth ‘Productivity Engineering & Management’
14. Labousse Etymological Dictionary, [1946 – 49th Edition]
15. By David J. Sumanth ‘Productivity Engineering & Management’
16. By David J. Sumanth ‘Productivity Engineering & Management’

17. Prof. Dr. Uday Salunkhe, Prof. Dr. Srinivas Gondhalekar 'Productivity Techniques' Himalaya Publishing House, Mumbai, 1st edition, 2002. Ch. 1, P.no. 4
18. Prof. Dr. Uday Salunkhe, Prof. Dr. Srinivas Gondhalekar 'Productivity Techniques' Himalaya Publishing House, Mumbai, 1st edition, 2002. Ch. 1, P.no. 4
19. Prof. Dr. Uday Salunkhe, Prof. Dr. Srinivas Gondhalekar 'Productivity Techniques' Himalaya Publishing House, Mumbai, 1st edition, 2002. Ch. 1, P.no. 4
20. Prof. Dr. Uday Salunkhe, Prof. Dr. Srinivas Gondhalekar 'Productivity Techniques' Himalaya Publishing House, Mumbai, 1st edition, 2002. Ch. 1, P.no. 4
21. E. Oven Smith 1971
22. New cyclopedia part – 7. 1974.
23. The report of ministry of Iron & Mines of India.
24. Prof. Dr. Uday Salunkhe, Prof. Dr. Srinivas Gondhalekar 'Productivity Techniques' Himalaya Publishing House, Mumbai, 1st edition, 2002. Ch. 1, P.no. 4
25. K. N. Subramaniam 1977.
26. Robert Dubin – 1979.
27. Prof. Dr. Uday Salunkhe, Prof. Dr. Srinivas Gondhalekar 'Productivity Techniques' Himalaya Publishing House, Mumbai, 1st edition, 2002. Ch. 1, P.no. 4
28. Gordan K. C. Chen & Robert E. Mcgraw 1982.

29. A. C. Hubert, The productivity Pendium in the productivity, New Delhi – NPC.
30. G. K. Sari & Jagdish Kumar, Search of Productivity
31. A.D. Sharma – 1965.
32. Prof. Dr. Uday Salunkhe, Prof. Dr. Srinivas Gondhalekar ‘Productivity Techniques’ Himalaya Publishing House, Mumbai, 1st edition, 2002. Ch. 1, P.no. 4
33. Prof. Dr. Uday Salunkhe, Prof. Dr. Srinivas Gondhalekar ‘Productivity Techniques’ Himalaya Publishing House, Mumbai, 1st edition, 2002. Ch. 1, P.no. 4
34. Prof. Dr. Uday Salunkhe, Prof. Dr. Srinivas Gondhalekar ‘Productivity Techniques’ Himalaya Publishing House, Mumbai, 1st edition, 2002. Ch. 1, P.no. 4
35. Prof. Dr. Uday Salunkhe, Prof. Dr. Srinivas Gondhalekar ‘Productivity Techniques’ Himalaya Publishing House, Mumbai, 1st edition, 2002. Ch. 1, P.no. 4
36. Website :- WWW.ProductivityMeasurement.com Ch. ‘Concept & Measurement of Productivity’ by Gboyega A. Oyeranti Department of Economics University of Ibadan, Ibadan.
37. ILO higher productivity, Ed. Dunlop, J.T. & V.T. P. No. 27.
38. The Financial Express – 2003.

CHAPTER – 4

**AN ANALYSIS OF MATERIAL PRODUCTIVITY OF CO-
OPERATIVE DAIRY AND MILK SUPPLY UNITS OF
GUJARAT STATE**

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AN ANALYSIS OF MATERIAL PRODUCTIVITY OF CO-OPERATIVE DAIRY AND MILK SUPPLY UNITS OF GUJARAT STATE

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REFERENCES

1. INTRODUCTION:

Material is one of the most important assets and the largest single element of cost in almost every industry. Big amount of capital invested is engaged in stock of materials and the cost of maintaining these stocks can amount to round about 25% of the value of total stocks. Moreover, the success or failure of a concern may depend largely upon efficient material purchasing, storage, utilization, controlling and accounting.

The gravity of materials as an element of cost can hardly be over emphasized. Mainly, continuous supply of raw materials of proper quality and in ordered quantity as and when required by the production department is a pre-requisite for carrying out manufacturing process constantly. Because, the non availability of raw-materials will bring the entire production process to a standstill. And if the production stocks, it will create many problems before the management. In a manufacturing organization the cost of raw-materials holds a major part in the cost of production. The percentage is on average 40% to 80% of finished product cost depending upon the nature of industries. The term “materials” refers to such commodities which can be measured and charged directly to the cost of the product. In other words, the “materials” means such commodities which are provided to the manufacturing industry rendering services in their nature of the item is such that it requires further processing before it is put to use. So material productivity is the significant factor in every manufacturing industry. Being a current asset, material not only effects managerial functioning. It is the first pace in productivity, which can affect all other productivities. So, controlling over material productivity is essential for different reasons. Material productivity is affected by regular supply of materials, proper planning, quality of raw materials, its’ efficient utilization and control.

Material productivity is affected by effective control, regular supply of materials, quality of raw materials and proper planning. A further article (Beman – 1981) gave credit to material control for decreasing the impact of the recent time (January 1981 – July 1981)⁽¹⁾ In the conference, Board said, “Better material management and improved economic policy – making may be moderating the inventory fluctuations and possibly, introducing a long term down trend in inventory ratios.”⁽²⁾ Cost of

material, represents a big part of the total cost of each product. It is reasonable to analyze material productivity comprehensively.”

2. MEANING & CONCEPT OF MATERIAL PRODUCTIVITY:

Before clarifying the meaning of material Productivity, it should be necessary to know about the material cost. Materials are of two types viz. (1) Direct Materials & (2) Indirect Materials.

- **DIRECT MATERIALS:**

The direct materials are those which can be identified simply and without any objection with a unit or operation or costing unit or cost centre. It can be directly distributed and charged to cost centers or cost units. For Example, wood used in production of tables and chairs, steel bars used in steel factory, lather used in manufacturing the shoes, cotton yarn used in making the cotton cloth etc. are the direct material cost that becomes the part of the finished product.

- **INDIRECT MATERIALS:**

“Materials which are utilized as a ancillary to production and which can not be conveniently considered to one unit of production are termed as indirect materials.” In other words, it can be said that the manufacturing cost incurred on materials used to further manufacturing process which can not be traced into the finished product and the material needed in the manufacturing process but not necessarily built into the product are called indirect materials. Now, the concept of material would be cleared.

Simply, Material productivity is the ratio of material used with the production for the manufacturing industries. Here, the output means the actual production is divided by the inputs means i.e., material and the result is material productivity. If the output is more than that of the previous output with the same inputs or a unit gets the same output with the lower input of material, is called higher material productivity. But in the concept of cost Accounting, if one get more output than before at the same cost of

material or get the same output with a lower cost, is known as the material productivity. It can be calculated with under written formula:

$$\text{Material Productivity} = \text{Output (the actual production)} / \text{Material input.}$$

Under this study, any growth in material productivity shows efficiency and effectiveness. The productivity has increased if,

- The output is increased at the same level of input.
- The output is the same and the input is decreased.
- The output and input both are increasing but comparatively the output has a greater increase than that of input.
- The input and output both are decreasing but comparatively the input has a greater decrease than that of output.

3. MATERIAL PRODUCTIVITY RATIO:

According Adolph Matz, Othel & Curry and George W. Frank, “Since a Significant factor in profitable functions is the ability to keep Material Costs at a minimum level in each unit of a finished product, the importance of material control through proper planning, purchasing, handling and accounting can not be over emphasized.”⁽³⁾

According to Louis Petro’s opinion, “Material costs constitute a significant part of the total costs of manufacturing companies. Proper accounting for and control over material purchase and inventory are important for effective management of a business and for reporting to various parties with an interest in firm, such as banks and shareholders, Creditors and Government.”⁽⁴⁾

When output is divided by material input, there is a problem of price which changes continuously. Actual productivity can not be found out, because of changes in price level. There is an option to take only the quantity of material. But Material refers to many components. We have also to consider the wastages, by products etc. at the time

of Valuation of productivity, because they also affect the efficient use of material, so only output/input ratio of material is not the actual measurement of productivity. As the cost of raw material represents a major part of the total cost of every product, decisions regarding material call for residual management and upto the minute data.⁽⁵⁾

In a manufacturing industry, we can achieve higher material productivity with the help of related factors which are best quality of raw material, regular & needed flows of raw material, efficient purchase, and effective utilization of raw material, latest technology and skilled and qualitative workers. R. Gopal Krishna and M. Sudarson defined the ratio which can be used to count. The utilization of materials. Some of them are as under:⁽⁶⁾

- **Inventory Index:**
- **Inventory or Material Turn-over Ratio:**
[Raw Material Turn-over Ratio]

This ratio indicates the speed of moment of a particular item of material. A high inventory turn over ratio indicates that a particular item of material or store is moving fast and such investment in such inventory is minimum, while a low inventory turnover ratio points out that an item is not consumed quickly and it leads to overstocking. In case of non-moving or obsolete item, the rate of inventory turnover ratio is extremely less or zero.

$$\text{Inventory or Material Turn-over Ratio} = \frac{\text{Material consumption during the particular period}}{\text{Average stock during the particular period}}$$

- **Weekly Inventory Ratio:**

This ratio shows any risk of interruption in production due to lack of raw materials in stock.

$$\text{Weekly Inventory Ratio} = \frac{\text{Material in stock}}{\text{Weekly Consumption}}$$

- **Efficiency Index:**
- **Order Cost Ratio:**

This ratio states the cost per order in a particular period in purchase department. In this ratio, decrease is possible by purchasing material in a proper quantity. This will also save additional cost.

$$\text{Order Cost Ratio} = \frac{\text{Total cost of Purchase Department}}{\text{Total number of orders placed}}$$

- **Rush Order Cost Ratio:**

This ratio indicates the comparison of prices which are paid for rush order and for normal order. Decrease in this ratio is possible by purchasing material at proper price and proper time. This will also save the additional cost.

$$\text{Rush Order Cost Ratio} = \frac{\text{Price paid for rush order material}}{\text{Price normally paid for these materials}}$$

- **Purchase Efficiency Ratio:**

This ratio points out purchase efficiency in purchase department. In this ratio, decrease is possible by purchasing material at a proper time. This will also save the additional cost of rush time.

$$\text{Purchase Efficiency Ratio} = \frac{\text{Total purchase value}}{\text{Total expenses of purchase department}}$$

- **Stores Index:**
- **Handling Cost ratio:**

This ratio presents the comparison between the total handling cost and the total value of material received and issued from stores department. This ratio can be decreased by purchasing and issuing the material in a big and economic quantity.

$$\text{Handling Cost Ratio} = \frac{\text{Total handling cost}}{\text{Total value of material received \& issued}}$$

- **Handling loss ratio :-**

This ratio clarifies the total value of losses against the total value of material received and issued from stores department. By purchasing and issuing the material at a proper price, this ratio can be decreased.

$$\text{Handling Loss Ratio} = \frac{\text{Total value of losses due to handling}}{\text{Total value of material received \& issued}}$$

- **Storage loss ratio :**

This ratio indicates the total value of inventory loss against the average value of inventory. Increase in this ratio shows decline in material productivity and decrease in this ratio shows the improvement in material productivity.

$$\text{Storage Loss Ratio} = \frac{\text{Total value of inventory loss due to deterioration, obsolescence etc.}}{\text{Average value of inventory}}$$

- **Vendor Rating Index:**
- **Quality Ratio:**

This ratio states the comparison between the no. of orders rejected and no. of orders received.

$$\text{Quality Ratio} = \frac{\text{No. of orders rejected}}{\text{No. of orders received}}$$

- **Delivery ratio:**

This ratio points out the no. of delivery which have been done on schedule against the total no. of deliveries.

$$\text{Delivery Ratio} = \frac{\text{No. of deliveries on schedule}}{\text{Total No. of deliveries}}$$

- **Price ratio:**

This ratio shows the comparison between the lowest price bid and the price bid by vendor.

$$\text{Price Ratio} = \frac{\text{Lowest price bid}}{\text{Price bid by vendor}}$$

These ratios, the vendor who is most comfortable may be selected. It will increase material productivity as the material is purchased at the right and at a reasonable price.

• **Scrap Index:**

- **Scrap Disposal Ratio:**

This ratio shows the comparison between the value of scrap disposed and the total value of scrap. It shows how effectively scrap is being used without causing much loss.

$$\text{Scrap Disposal Ratio} = \frac{\text{Value of scrap disposed}}{\text{Total value of scrap}}$$

- **Scrap loss ratio:**

This ratio presents the value of scrap against the value of material used. If this ratio is high, then improvement in quality or controlling of material is needful to increase material productivity.

$$\text{Scrap Loss Ratio} = \frac{\text{Value of scrap}}{\text{Value of material used}}$$

- **Quality Control effectiveness ratio:**

This ratio expresses the comparison between total value of items rejected on inspection and total value of defective material. By improving this ratio defective items are checked out which in turn increases material productivity.

$$\text{Quality Control Effectiveness Ratio} = \frac{\text{Total value of items rejected on inspection}}{\text{Total value of defective material}}$$

All the above ratio may be changed into indices. To fix, these indices, we have taken base year's index as 100 to find out the trends of material productivity.

4. IMPROVEMENT OF MATERIAL PRODUCTIVITY:

In manufacturing industry, the cost of raw-materials contributes a major part to the total cost of production. As Wheldon said that, "Large amount of capital invested is locked up in stock of material".⁽⁷⁾ It indicates adequate proof of the importance of material in manufacturing unit. Lack of control over material would lead to wastage and even pilferage.

Hence, to control the cost and to achieve the maximum utilization of material is only possible through higher material productivity. It can be the possible help of proper control over purchase, quality, utilization, accounting and wastage. For a complete

system of material control and accounting, it is necessary to devise a number of subsidiary records which will contain detailed material costs and to maintain controlling accounts in the general ledger. Material productivity is important because of its following benefits:

- The maximum utilization of machinery. (technology)
- Saving the consumption of materials.
- The production with higher quality becomes possible.
- Increasing the production with the same cost.
- The unit gets low cost of production by increasing it and gets more profit per unit.
- Efficient and needful use of working capital can be possible.

5. MATERIAL PRODUCTIVITY RELATIONSHIP WITH OTHER MEASUREMENT AND ACTIVITIES:

- With the support of material productivity, the organization can obtain the data of production, wastage and planning about future.
- Employees can get more salaries by decreasing the material losses and their individual efficiency is also increased.
- Value added is more with higher material productivity.
- Income per capita, standard of living, national income and national wealth will be increased by the higher material productivity.

6. IMPORTANT ASPECTS OF MATERIAL CONTROL:

“Material Productivity is dependent on material [inventory] control.”⁽⁸⁾ Material control is a term that means to control of all factors that affect the material. It begins with achieving materials and ends with their consumption. Material control is a systematic check over purchase utilization and storage so as to aim minimum wastage, constant flow of materials and lower investment in inventories.

In this present scenario, Material control is the basic and essential factors of cost Accounting. The need and significance of material control converts in direct proportion or the idle time. Cost of labour and machinery. As the material cost is a controllable to a large extent, Acceptance of a proper technique of material control is very needful. The demands of modern era are so quick and immediate that they can not stop for the convenience of the supplier. The solution lies in the maximum utilization of men and machines for which a planned and proper technique of inventory control is important. The success of otherwise of any industrial firm depends to a greater extent upon the proper management and inventory control. Moreover, it gives a number of a venues and wide opportunity for improvement of overall performance of the firm. Hence, inventory control aims at ensuring the availability of required quality material in required quantity, at proper time and place with minimum cost. In this reference, a comprehensive policy and programmes relating to inventory should be come out. If there is no proper technique of material control, the firm will suffer a loss.

Normally, the following tools or techniques are used to control the inventory.⁽⁹⁾

- Coding of Materials
- Determination of Inventory Levels
- Bin Card system
- A.B.C. method of analysis
- Physical verification of Inventory

- Material Turn-over Ratio
- Review of slow and non-moving materials.

- **CODING OF MATERIALS:**

A good and proper control of store keeping needs proper classification and codification of different items of materials. For this intense, firstly they are classified according to their nature of use.

After doing the classification of materials, it is comfortable to codify them by a proper method i.e. alphabetically, numerically, decimal system etc. the benefits of codification of the materials are (i) long and detailed information are replaced by simple codes, (ii) Accounting control of store becomes easy and normal by giving the code and (iii) The secrecy of description can be maintained.

- **DETERMINATION OF INVENTORY LEVELS:**

Inventory levels help the store-keeper to maintain the materials at the desirable high percentage of stores loss etc. while the lower level of stock may direct to stock-out position resulting in stoppage of production. So, inventory levels help to maintain the right balance between the excess material situation and no stock position.

Economic Order Quantity [EOQ] is another significant tool or technique of material control. As order quantity is increased, the average amount of inventory on hand also increasing and so that handling cost and carrying cost also increase. On the other hand, as order quantity is increased, number of orders will be needed very few to fulfill the total requirements and so that ordering cost decreases. So, one cost is increasing and other cost is decreasing as a point of view of order quantity. There is an ideal order quantity at which the cost of ordering and carrying are at a lowest level. And this ideal order quantity is known as a “Economic Order Quantity” [EOQ]

It helps the store-keeper to requisition the most economical quantity of material which will support to maintain the carrying cost and ordering cost at the lowest level.

- **BIN CARD:**

Generally, materials are stored in racks with partition in the stores room. Each such enclosure is called as a Bin. In this method, a card is fastened with the Bin on which detail information of each separate material is noted. Every item of receipt and issue is posted separately in the Bin card and after each posting the balance of stock on hand is come out. So, Bin Card draws the clear picture about materials received, materials issued and materials in balance. It enables the store-keeper to determine the quantity of materials received, issued and in balance at a glance.

- **KARDEX CARD:**

This method of record of material has taken the place of Bin card. Most of the units apply this method. The arrangement of Kardex cards in many racks is kept in such a way that so many kardex cards can be seen at a glance. These cards are arranged near the seat of kardex Assistant who deals with this process. It helps him to find out the position of a individual material in store without moving from his seat.

- **STORES LEDGER:**

This method is also used in place of Bin card and Kardex card. A stores Ledger is a record of movement of inventory in both the quantity terms as well as value terms. It is kept in and maintained by the store accounting section. Store Ledger is a combination of store issued and store received registers. The essential feature of store Ledger is that it keeps not only the records of Physical movement nut also their monetary value.

- **A, B, C SYSTEM:**

A modern system of material control is the A-B-C system. It is believed that the full form of A-B-C is Always Better Control. It is also known as control according to their values. The inventory consists of many items. And it has been noted that all the items of materials do not need equal control. A few items in the inventory represent a large portion of the total value of inventory. In the same way, a large number of items constitute a small portion of the total value of inventory. So, it is needful to pay serious control to a few items because they contribute large part in the total value of inventory. While the same control is not necessary to large number of items because they contribute a small value in the total value of inventory. So, this system is only to stress the point that more valuable items and less control is to be kept for the less valuable items. The actual picture of inventories may be like this:

Table 4.1

Category	No. of items (%) of inventory	Value (% of total inventory)
A	10 %	75 %
B	25 %	20 %
C	65 %	5 %

(**Source:** Adolph Matz, Authel J. Carry & George W. Frank, 'Cost accounting' New York South Western Publishing company – 1932. P.No. 110.)

All the items in inventory, are parted into the under mentioned three categories.

In category 'A' are included those few items which consist scarcely 5 to 10 % of the total number of items included in the inventories but contribute 70% to 75% of the total value of inventories. There should be strict control over such items. Items are included in category 'B' constitute 20% to 25% of the total number of items in the inventories but contribute 15% to 20% of the total value of inventories control over such items should not be as strict as category 'A'.

The remaining items of inventories constitute 60% to 65% of the total number of items, contributing 5% of the total value in inventories. There should be light control over such items.

- **PHYSICAL VERIFICATION OF INVENTORY:**

There are different types of materials in the store of a big scale industry. The receipts and issues records are kept by the store keeper and the balance of stock of materials is also displayed in their records. Physical verification of stock is another technique for controlling the material. The verification of actual stock of material and the registered stock should be done properly for a good store control so that the discrepancy between the recorded balance and actual balance of material may be found out and needful actions can be taken at the right time. There are two methods of physical verification of materials.

- (1) A periodical checking of material.
- (2) A perpetual checking of material.

- **INVENTORY TURN-OVER RATIO:**

To determine the speed of movement of a specific item of material, the inventory turn-over ratio is calculated. In a store, how much of a particular material is received, how much of that material is issued and what is the rate of turn-over of receipt and issue of material is determined which is called as inventory (material) turn-over ratio. It is also known as 'stock turn-over ratio' or 'stock velocity'. It indicates the relationship between the cost of raw materials used during the particular period of time and the average stock of raw materials. It points out the speed of raw-materials which have been utilized for manufacturing.

A high inventory turn-over ratio shows that a specific item of material or store is being used fast and as such investment in such inventory is minimum. On the other hand, a low inventory turn-over ratio states that a specific item of material or store is not used quickly and it takes it towards the overstocking. If inventory turn-over ratio comes out to less or zero, it interprets that a specific item of material is non-moving or

obsolete item. This ratio helps the top management to avoid more capital being engaged unnecessarily. It also reveals the efficiency of stock keeping to the top management.

- **REVIEW OF SLOW AND NON-MOVING MATERIALS:**

The cash engaged in stock is money loss to the business. If more capital is engaged in slow and non-moving materials, there would not be any chance of availability of capital to invest in other important requirements. So, it can be pointed out that it also affects the liquid position of the organization. So, slow and non-moving materials should be reviewed regularly. It is also suggested that slow and non-moving materials should be identified and quickly disposed off.

- Actual process in dealing with shortages & discrepancies.
- Proper internal checks
- Standardization of materials.
- Selection of supplies keeping in view the quality, price and services.
- Materials purchased should be of proper quality, quantity and design specification.
- Proper planning of purchase work & centralized purchase work.
- Material is purchased with authority.
- Materials should be received and checked in a proper manner.
- Well-planned storage of all materials in stores.
- Direct materials should be calculated to production on a proper and stable pricing basis.
- Indirect materials used in production and service departments should be properly allocated and absorbed into product cost.
- Material issues only with proper authority.

- Classification and coding of materials should be in a proper manner.
- Preparing the Bin cards and stores ledger and regular reconciliation of both the records.
- Actual documentation and accounting of material receipts and issues.
- Adoption of perpetual inventory system and continuous stock calculating.
- Determination of inventory levels.

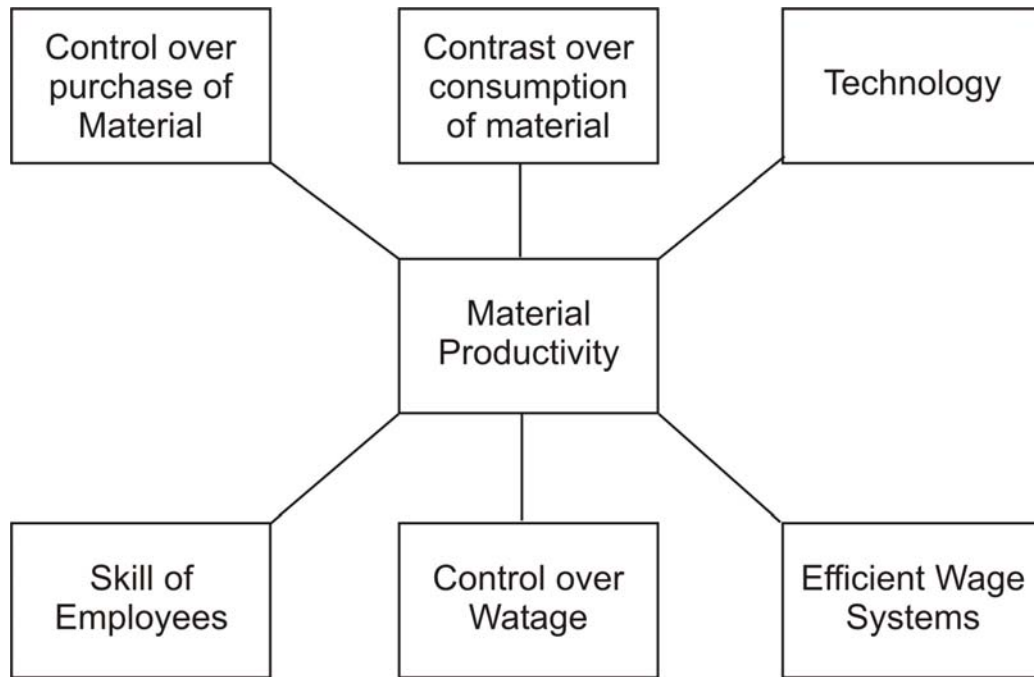
7. FACTORS AFFECTING TO MATERIAL PRODUCTIVITY:

Many factors can affect the material productivity. These are :⁽¹⁰⁾

- Control over purchase of material.
- Contrast over consumption of material.
- Technology
- Skill of employees.
- Control over wastage.
- Efficient wage systems.

These factors can be expressed by the following figure:

Fig. 4.1



(**Source:** Adolph Matz, Authel J. Carry & George W. Frank,
'Cost accounting' New York South Western Publishing company – 1932.
P.No. 110.)

The manufacturing unit will obtain the qualitative material at the right time and get the benefit of capital employed by controlling the purchase of material. Then, it will decrease losses during transit, evaporation, wastage and make the efficient use of consumed material. With the latest technology and skilled employees, the manufacturing organization can achieve more output with the same input. The employees can get more remuneration and incentives with higher material productivity.

8. TECHNIQUES TO IMPROVE MATERIAL PRODUCTIVITY:

Material is the first and important element in manufacturing industry. It is the first step for getting better utilization of resources. It is very essential for and manufacturing unit, to have control and management over material. In this reference,

J.P. Shrivastav says, “Material productivity is the first step for getting higher overall productivity of a manufacturing unit”.⁽¹¹⁾ Following techniques may be helpful to improve material productivity of a unit.

- Better management of material, purchase at the proper time, at the proper price, at the proper quantity and from the proper source.
- Material should be of proper quality.
- Efficient handling of material.
- Efficient storage of material.
- Proper skilled employees can avoid wastage and defective work.
- Value analysis
- Work study aspects should be kept in view while installing material.
- Avoid any wasteful activities.
- Variance test are useful for needful control.
- Proper co-ordination through judicious selection of machineries and training of workmen.

9. STEPS IN ACCOUNTING FOR MATERIAL PRODUCTIVITY:

• HYPOTHESIS:

Productivity ratios and indices are based on total output and material input is calculated for the purpose of interpreting and analyzing the material productivity. Two hypothesis based on chi-square test and another is based on Kruskal Wallis one-way analysis of variance test. The hypothesis has been tested to overcome the difficulty of interpreting and analyzing the result.

- **NULL HYPOTHESIS:**

“Materials productivity indices can be represented by the straight line trend based on least square method.”

- **ALTERNATIVE HYPOTHESIS:**

“Material productivity indices can not be described by the line of the best fit.”

- **LEVEL OF SIGNIFICANCE:**

5 percent

- **STATISTICAL TEST USED:**

Chi-square test

- **CRITICAL VALUE:**

2.17

Another null hypothesis has been tested to see if there is any significant difference between the material productivity ratios of the dairy industry of Gujarat state. This hypothesis is based on Kruskal Wallis one-way analysis of variance test. The acceptance of the following null hypothesis would disclose that material productivity of the various Co-operative Dairy and Milk supply Unit is approximately equal. However, discard of this null hypothesis would also state that some of the Co-operative dairies and milk supply units applied their material effectively in comparison with other dairies and units, so individual attempts are became necessary. The null and alternative hypothesis are given as under:

The Second One,

- **Null Hypothesis:**

“There is no significant difference between the material productivity of the Co-operative milk dairy plants.”

- **Alternative Hypothesis :**

“There is significant difference between the material productivity of the Co-operative milk dairy units.”

- **Level of significance :**

5 percent

- **Statistical Test used :**

Kruskal Wallis One-way variance test

- **Critical Value :**

2.17

• **CALCULATION OF MATERIAL PRODUCTIVITY:**

Material productivity ratio is calculated by dividing output value to input value of material. This ratio is normally known as material productivity. Here, total output is a result of combination of all inputs such as material, labour, overhead, capital etc. Therefore, co-efficient of factorial productivity is multiplied with the O/I ratio and net partial productivity/co-efficient factorial productivity is also calculated. Material Productivity can be calculated as under:

$$\text{Material Productivity} = \frac{\text{Output}}{\text{Material Input}}$$

Material productivity indices are assumed 100 for the base year and the base year is 1996-97 for the study. Material productivity indices below 100, states that there is decrease in productivity and above 100 states that there is improvement in productivity, in comparison to the productivity of the base year. Input – output ratio shows about input used for a rupee of output. This ratio also helps in estimating possible savings.

- **Calculation of possible savings in Material Input:**

The possible saving in material input is computed on the basis of the following formula:

$$\text{POSSIBLE SAVING} = \text{Actual Input} - \text{Standard Input}$$

Here, the term Actual Inputs means the product of minimum requirement per rupee of output during the period of the study.

10. MATERIAL PRODUCTIVITY ACCOUNTING IN THE CO-OPERATIVE DAIRY AND MILK SUPPLY UNITS OF GUJARAT:

Production is nothing but the process of raw-material to finished goods with the help of manpower, money power and some other or element of for production. Louis or states “proper accounting and control over material purchases, uses and inventory are important for effective management basic factor to increase total productivity of manufacturing unit. As the cost of raw-material covers the major part of the total cost in co-operative dairy plants in Gujarat, measurement of material productivity is very crucial to check the efficiency of raw-material in process. By this calculation, one can decide their standards for the total requirements of input raw-material to output. The material productivity accounting for the co-operative dairy plant units are calculated as under:

Table 4.1
Material Productivity of " Amul Dairy" - Anand

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	4,001,021,578	3,428,633,761	1.167	100.00	102.18	0.8569	3,338,065,659	90,568,102
1997-98	4,173,534,355	3,510,745,830	1.189	101.89	101.83	0.8412	3,481,993,647	28,752,183
1998-99	4,623,462,516	3,857,370,216	1.199	102.74	101.48	0.8343	3,857,370,216	0
1999-00	4,871,408,788	4,095,212,886	1.190	101.97	101.13	0.8407	4,064,232,617	30,980,269
2000-01	5,091,912,736	4,293,260,905	1.186	101.63	100.78	0.8432	4,248,199,795	45,061,110
2001-02	4,687,806,783	3,964,102,187	1.183	101.37	100.43	0.8456	3,911,052,851	53049336
2002-03	4,883,366,669	4,177,329,016	1.169	100.17	100.08	0.8554	4,074,209,115	103,119,901
2003-04	5,459,302,648	4,745,362,649	1.150	98.54	99.73	0.8692	4,554,714,429	190,648,220
2004-05	6,004,696,000	5,211,995,000	1.152	98.71	99.38	0.8680	5,009,737,924	202,257,076
Total	43,796,512,073	37,284,012,450	10.585	907.02	907.02	7.6545	36,539,576,253	744,436,197
Average	4,866,279,119	4,142,668,050	1.176	100.78	100.78	0.8505	4,059,952,917	82,715,133

Standard Deviation : 1.9826
Co-efficient of variation : 1.9673

Chi-Square : 0.01

MATERIAL PRODUCTIVITY IN AMUL DAIRY – ANAND:

The table 4.1 indicates the numerical data regarding input is material, output, output, output-Input ratio, productivity indices, trend value, Input-output ratio and possible savings. It also creates some statistical data like standard deviation, co-efficient of Variation, chi-square and growth rate of Amul Dairy from the year 1996-'97 to 2004-'05.

So far the output of Amul Dairy is concern, it is clear from the table that it increases from the table that it increases from 400.10 crores in 1996-'97 to 509.19 crores in 2001-'02. The fluctuation expansion of output works out to be 27.27% input of material, it increases from 342.86 crores in 1996-'97 to 429.33 crores in 2001-'02. The fluctuation expansion of input works out to be 25.22%. Here out-put increases more than the input. It shows good material productivity of Amul Dairy during this period. Then, in the year 2001-02 suddenly both the output and input decrease. Then, output increases from 468.78 crores in the 2001-02 to 600.47 crores in the year 2004-05. The fluctuation expansion of output comes out to be 28.09%. While in case of input of material, it increases from 396.41 crores in the year 2001-02 to 521.20 crores in the year 2004-05. The fluctuation expansion of input works out to be 31.48%. So, during this period, input increases more than the output. It indicates the negative trend of material Productivity during this period. Productivity ratio with the help of co-efficient of factorial productivity moves in mixed trend during the research period.

Material productivity ratio (O-I ratio) Works out 1.167 for the base yeas 1996-'97. The average productivity ratio Works out 1.176 for the research period. The O-I ratio of 1997-'98 (1.189), 1998-'99 (1.199), 1999-'00 (1.190), 2000-'01 (1.183) are recorded higher than the average ratio, While the O-I ratio of 2002-'03 (1.169), 2003-'04 (1.150), and 2004-'05 (1.152 are recorded lower than the average ratio. By viewing this result, we can say it could be man-power and latest machinery of the dairy.

The factorial material productivity, in the base year was 0.0273 and it reaches to a high factors 0.0306 in the year 1998-'99. Then, it declines to 0.0280 in the year in

2000-'01. Then after it increases in very next year and then again it decreases. So, it constantly fluctuates upward. The average factorial productivity ratio is 0.0277 which is higher than the base year ratio. It states overall bullish trend of materials productivity during the research period. It can be said that productivity of any individual element is not dependent only on an individual input but it is very much sensitive with respect to other factors also such as labour and overheads.

The productivity index which is 100 for the base year-1996-'97, and increased in initial years to 102.74, but from the year 1999-'00 it started decreasing and reaches to a minimum level i.e. 98.54 in the year 2003-'04. Then, very next year it gained but not so significantly. So far the analytical point of view is concern; productivity index draws an idea about the variation in output-input ratio for the years under the study. The table interprets that the productivity index comes on an average to 100.78 which is more by 0.78% from the base year. It indicates an overall increasing trend and supports the view that material management has improved slightly in Amul Dairy which helps to reduce some losses of material itself.

The overall result of material productivity is considered in reference to the value of standard deviation, co-efficient of variation of the Amul Dairy is 1.98, and co-efficient of variation is 1.97; it makes clear that there is no much variation in the productive indices. The calculated value of chi-square is 0.01 while the table value of chi-square is 2.17 so, the calculated value is less than the table value, and it allows the acceptance of null hypothesis, "Material productivity indices can trend based on least square method." It means "There is no significant difference between the material productivity of the co-operative milk dairy plants." The calculated value of productivity index. The average requirement of material per rupee off output for Amul Dairy is 0.85 Input-output ratio is the lowest during the year 1998-'99. It makes clear that the unit got its maximum efficiency in material during this year. The table moreover indicates clear that the possible savings in material input comes out at 8.27 crores per year for the dairy.

Material Productivity of Amul Dairy - Anand.

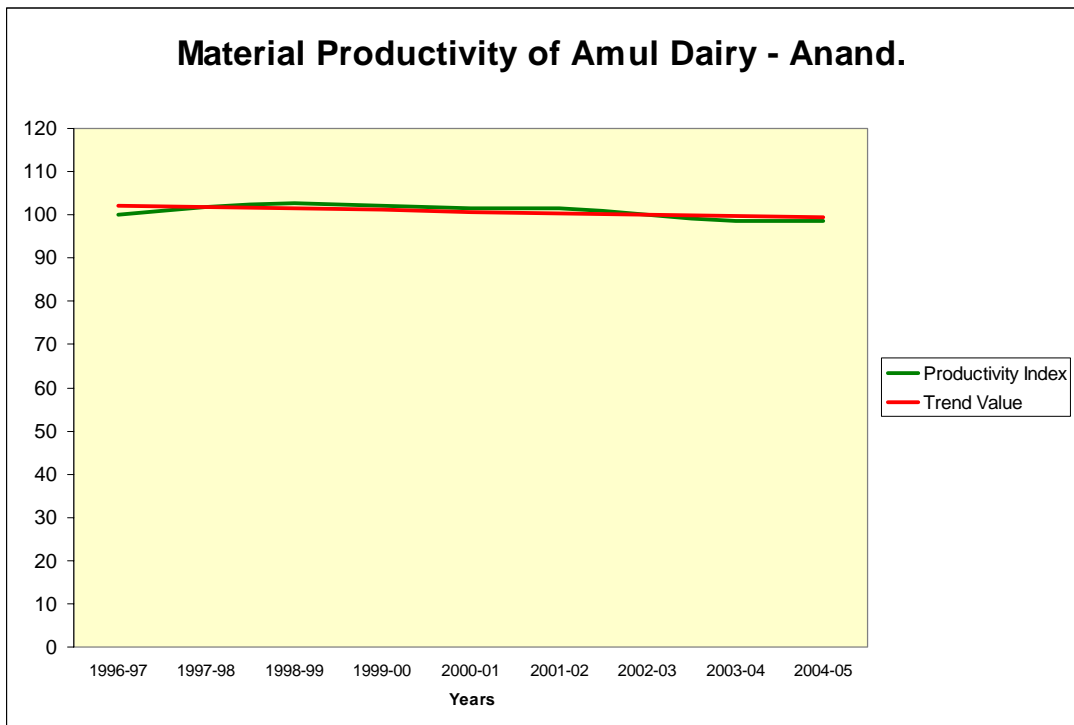


Table 4.2

Material Productivity of "Gopal Dairy" - Rajkot

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	174,685,012	130,263,102	1.341	100.00	98.08	0.7457	130,263,102	0
1997-98	216,556,153	166,992,655	1.297	96.72	95.95	0.7711	161,486,529	5,506,126
1998-99	268,575,714	216,554,789	1.240	92.47	93.82	0.8063	200,277,661	16,277,128
1999-00	372,833,832	305,064,074	1.222	91.13	91.68	0.8183	278,023,231	27,070,843
2000-01	458,274,780	390,854,286	1.172	87.40	89.55	0.8529	341,736,785	49,117,501
2001-02	506,238,891	430,993,337	1.175	87.62	87.42	0.8514	377,503,757	53,489,580
2002-03	678,063,418	602,696,262	1.125	83.89	85.29	0.8888	505,633,787	97,062,475
2003-04	665,709,864	590,741,811	1.127	84.04	83.16	0.8874	496,421,707	94,320,104
2004-05	871,822,330	785,996,969	1.109	82.70	81.02	0.9016	650,120,350	135,876,619
Total	4,212,759,994	3,620,157,285	10.808	805.97	805.97	7.5235	3,141,466,909	478,720,376
Average	468,084,444	402,239,698	1.201	89.55	89.55	0.8359	349,051,879	53,191,153

Standard Deviation : 32.14
 Co-efficient of variation : 35.89

Chi-Square : 0.02

MATERIAL PRODUCTIVITY IN GOPAL DAIRY – RAJKOT:

The table 4.2 provides the figures regarding material productivity of Gopal Dairy of Rajkot and generates research statistical data of the research period.

In reference to Gopal Dairy's output, it is appearance from the table that it increases from 17.47 crores in 1996-'97 to 67.81 crores in 2002-'03. The fluctuations spread of output Works out to be 288.15% Moreover, the input of material increases from 13.03 crores in 1996-'97 to 60.27 crores in 2002-'03. The fluctuations spread of material input Works out to be 362.55%. Here, it respectfully states that input of material is more increased than output during the research period of Gopal Dairy. It shows that there is no good material Productivity of the Gopal dairy during this particular period. The productivity ratio, which is generated with the help of co-efficient of factorial productivity, moves in upward and downward ways but mostly it seems in downward ways during the period of the study.

Material productivity ratio (O-I ratio) Works out 1.341 for the base year 1996-'97. The average productivity ratio of the unit Works out 1.202 for the research period O-I ratio of 1997-'98 (1.297), 1998-'99 (1.240), 1999-'00 (1.222) are recorded higher than the average of the period of study While the O-I ratio of 2000-'01 (1.172), 2001-'02 (1.175), 2002-'03 (1.125), 2003-'04 (1.127), 2004-'05 (1.109) are recorded lower than the average of the of the period of should be medium qualitative manpower and not utilization of latest technology in the dairy.

Factorial productivity is calculated on the basis of co-efficient of productivity. The factorial productivity. The factorial productivity ratio of the base yeas is 0.0712 Which is the highest value during the research period and it continuously declines till 2002-'03 to 0.0281, then it is increased to 0.0296 in the year 2003-'04 then again it is decreased in 2004-'05 to 0.0262. The average productivity ratio is 0.0416. In this reference, the table indicates that the average factorial productivity ratio is lower than the base years ratio so, overall it seems the negative trend of material productivity during the period of the study.

The productivity index, which is assumed 100 for the base year i.e. 1996-1997 and it continuously decreasing, and reaches to 87.40 in 2000-'01. Then it goes to 87.62 in 2001-'02 and then it decreases to 82.70 in 2004-'05. From the interpreting view, productivity index gives an idea about the Variation in output-input ratio for the years under the study. The table shows the average productivity index is 89.55 which are below than the base year is an improper material management in Gopal Dairy, Which increases the material cost and also losses of material automatically.

The overall result of material productivity is depend on the value of standard deviation, co-efficient of Variation and chi-square. Standard deviation of the Gopal Dairy is 32.14 and co-efficient of variation is 35.89, it makes clear that there is 35.89, it makes clear in that there is no much Variation in the productive indices. The calculated value of chi-square is 0.02 while the table value of chi-square is less than the table value and it allows the acceptance of null hypothesis, "Material productivity indices can be represented by the straight line trend based on least square method". It means "There is no significant difference between the material productivity of the co-operative milk dairy plants." The calculated value of productivity index. The average requirement of material per rupee of output for Gopal Dairy is 0.84. Input-output ratio is the lowest in the year 1996-'97 It states clear that the unit gets its maximum efficiency in material during this year. Moreover, the table makes clear that the possible savings in material input comes out at 5.32 crores per year for the dairy.

Material Productivity of Gopal Dairy - Rajkot.

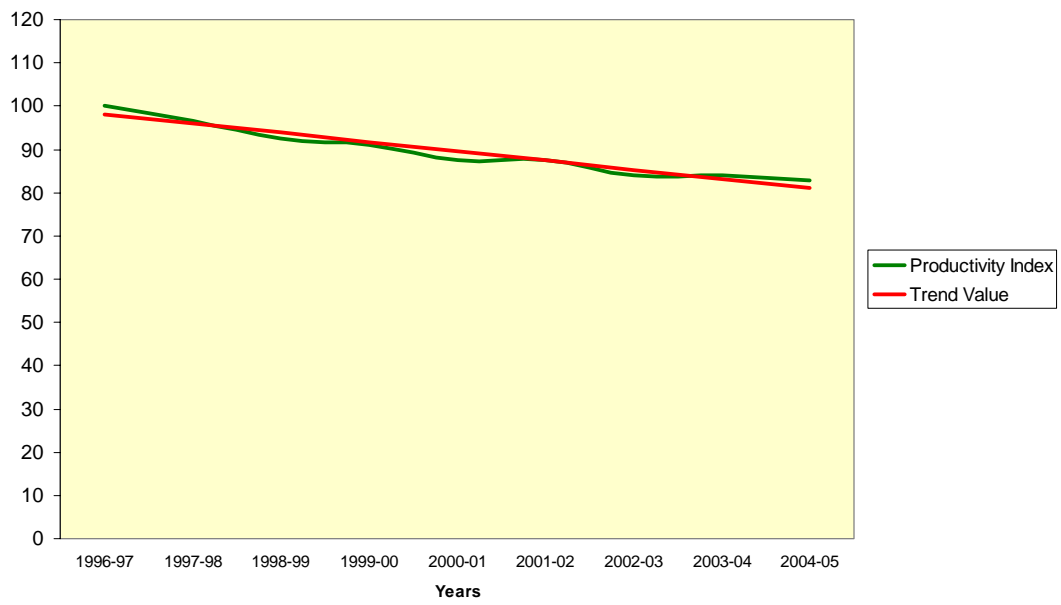


Table 4.3

Material Productivity of "Uttam Dairy" - Ahmedabad

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	511,784,952	436,374,068	1.173	100.00	101.38	0.8527	419,362,129	17,011,939
1997-98	573,701,471	481,019,638	1.193	101.71	101.56	0.8384	470,097,195	10,922,443
1998-99	689,645,318	580,371,280	1.188	101.28	101.74	0.8416	565,102,838	15,268,442
1999-00	687,372,508	568,130,801	1.210	103.15	101.93	0.8265	563,240,473	4,890,328
2000-01	734,114,121	662,485,012	1.199	102.22	102.11	0.8342	650,705,706	11,779,306
2001-02	808,915,447	662,834,073	1.220	104.01	102.30	0.8194	662,834,073	0
2002-03	850,566,046	708,484,582	1.201	102.38	102.48	0.8330	696,963,025	11,521,557
2003-04	906,794,648	743,990,052	1.219	103.92	102.66	0.8205	743,037,350	952,702
2004-05	1,064,493,178	904,658,703	1.177	100.34	102.85	0.8498	872,257,232	32,401,471
Total	6,827,387,689	5,748,348,209	10.780	919.01	919.01	7.5161	5,643,600,021	104,748,188
Average	758,598,632	638,705,357	1.198	102.11	102.11	0.8351	627,066,669	11,638,688

Standard Deviation : 1.83

Co-efficient of variation : 1.79

Chi-Square : 0.02

MATERIAL PRODUCTIVITY IN UTTAM DAIRY – AHMEDABAD:

The table-4.3 provides the data regarding input of material and output. It reveals the material productivity ratio and also calculates co-efficient of variation, standard deviation value of chi-square, growth rate of the Uttam Dairy of Ahmedabad from the year 1996-'97 to 2004-'05.

Regarding to Uttam Dairy's output, it is evident from the table that it increases from 51.18 crores 1996-'97 to 68.96 crores in 1998-'99. Then it decreases and after it continuously increases. The Fluctuation spread of output Works out to be 34.74%. Moreover in case of input of material it fluctuates from 43.64 crores in 1996-'97 to 58.04 crores in 1998-'99. The fluctuation spread of input works out to be 33% mere, the output increases more than the input. It indicates good material productivity of Uttam dairy during this particular period. After declining both the output and input of material in the year 1999-00, Output increases from 68.74 crores in 1999-00 to 106.45 crores in the year 2004-05. The expansion spread of output comes out to be 54.86%. While input of material increases from 56.81 crores in the year 1999-00 to 90.47 crores in the year 2004-05. The fluctuation spread of input of material comes out to be 59.25%. So, here input of material is increasing more than the output. It interprets that there is a negative trend of material productivity of Uttam dairy during this period. The productivity ratio with the help of co-efficient of factorial productivity moves in upward and downward ways during the study period.

Material productivity ratio [O-I ratio] , Which is 1.173 for the base year 1996-'97. The average productivity ratio of the unit is 1.198 for the period. O-I ratio of 1999-'00 [1.210], 2000-'01 [1.199], 2001-'02 [1.220], 2002-'03 [1.201], 2003-'04 [1.219] are recorded higher than the average of the period while, during the years 1997-'98 [1.193], 1998-'99 [1.188], 2004-'05 [1.177], it was recorded below the average ratio of the time. By seeing these figures, we can say that it should be complete utilization of qualitative man-power and latest technology in the dairy.

The factorial productivity ratio in the base year was 0.0350. In the first year it increases then it decreases and then it moves in fluctuating ways continuously the

table indicates that it fluctuates period. The average factorial productivity ratio is 0.0392, which is ratio. It interprets the positives trend of material productivity during the period of the study.

The productivity index, which is 100 for the base year 1996-'97 It increased to 101.71 in year 1997-'98 Then it decreased to 101.28 in 1998-'99. It improved to 103.15 in 1999-'00 and then it decreased to 102.22 in 2000-'01 It increased to 104.01 in 2001-'02 then It decreased to 102.38 in 2002-'03 and then increased to 103.92 in 2003-'04. It decreased to 100.34 in 2004-'05. The average productivity index is 102.11 which are more by 2.11% from the base year. It shows an overall increasing trend and supports the view that material management has improved gradually in Uttam Dairy which automatically helps to reduce losses of material.

The overall result of material productivity is kept in view in reference to the value of standard deviation, co-efficient of variation and chi-square. Standard deviation of Uttam Dairy is 1.83 and co-efficient of variation is 1.79. So, it clears that there is no much variation in the productive indices. The calculated value of chi-square is 0.02 while the table value of chi-square is 2.17. So, the table value is more than the calculated value and it indicates the acceptance of null hypothesis, "Material productivity indices can be represented by the straight line trend based on least square method." It means, "There is no significant difference between the material productivity plants." The calculated value of productivity index. The average requirement of material per rupee of output for Uttam Dairy is 0.84. Input-output ratio is lowest in the year 2001-'02. It clears that the unit gets its maximum efficiency in material daring this year. In material daring this year. In reference to the possible savings in material input, the table makes clear that it comes out at 1.16 crores per year for the dairy.

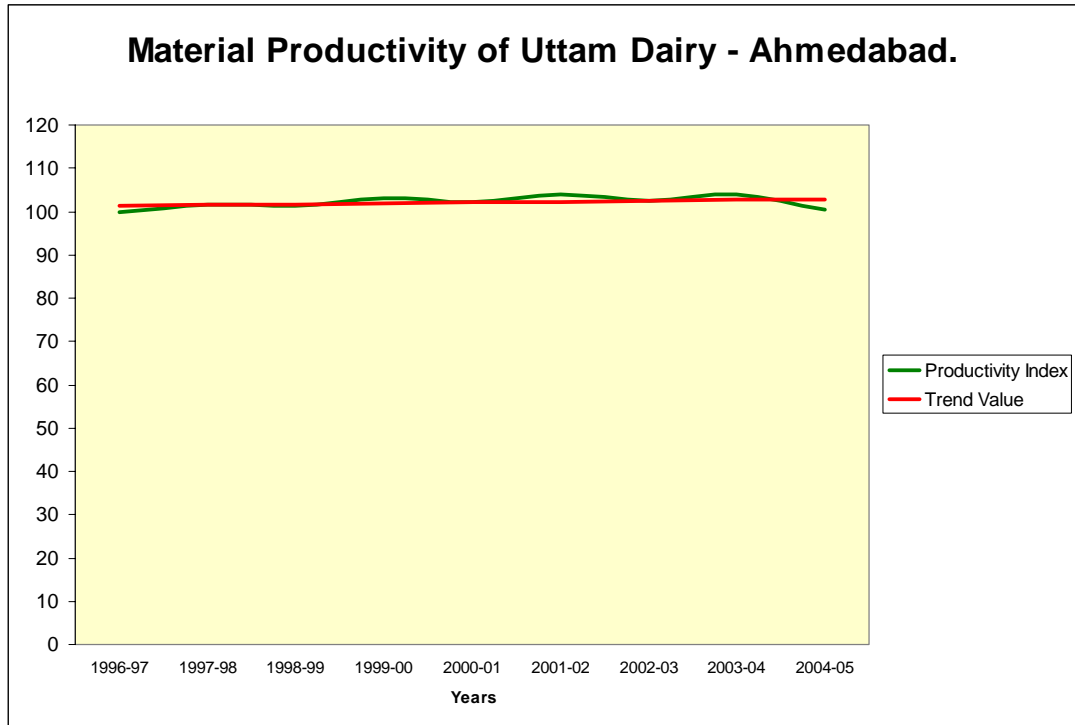


Table 4.4
Material Productivity of "Madhur Dairy" - Gandhinagar

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	290,221,515	271,972,468	1.067	100.00	99.64	0.9371	260,912,102	11,060,366
1997-98	360,325,063	333,247,584	1.081	101.31	99.99	0.9249	323,935,906	9,311,678
1998-99	410,278,514	377,615,203	1.086	101.78	100.34	0.9204	368,844,568	8,770,635
1999-00	489,815,303	463,732,270	1.056	98.97	100.68	0.9467	440,348,952	23,383,318
2000-01	552,144,201	520,378,355	1.061	99.44	101.03	0.9425	496,383,267	23,995,088
2001-02	606,154,453	566,611,993	1.070	100.28	101.38	0.9348	544,939,035	21,672,958
2002-03	649,934,804	604,313,794	1.075	100.75	101.73	0.9298	584,298,017	20,015,777
2003-04	666,809,710	615,764,295	1.083	101.50	102.07	0.9234	599,468,729	16,295,566
2004-05	738,683,878	664,084,339	1.123	105.25	102.42	0.8990	664,084,339	0
Total	4,764,367,441	4,417,720,301	9.702	909.28	909.28	8.3586	4,283,214,915	134,505,386
Average	529,374,160	490,857,811	1.078	101.03	101.03	0.9287	475,912,768	14,945,043

Standard Deviation : 3.016
Co-efficient of variation : 2.985

Chi-Square : 0.02

MATERIAL PRODUCTIVITY IN MADHUR DAIRY – GANDHINAGAR:

The table 4.4 provides the data regarding input of material, output material productivity, productivity indices trend value input output ratio, possible savings and some statistics like standard deviation, chi-59 year and co-efficient of variation growth rate of Madhur Dairy of Gandhinagar for the period dairy of the study i.e. 1996-'97 to 2004-'05.

As regard the output of Madhur dairy, it is evident from the table that it continuously increases form 29.02 crores in 1996-'97 to 73.87 crores in 2004-'05. The fluctuations spread of output works out to be 154.55%. Moreover, in case of input of material, it increases from 27.20 crores in 1996-'97 to 66.41 crores in 2004-'05. The fluctuations spread of material input works out to be 144.15%. Here, this picture proves that the output is increasing more than the input of material. It shows good productivity of Madhur dairy productivity of ratio with the support of co-efficient of factorial productivity stays in fluctuating ways during the research period.

Material productivity ratio [O-I ratio] comes out 1.067 for the base year 1996-'97. The average productivity ratio comes out 1.078 for the research period. The O-I ratio of 1999-'00 [1.056], 2000-'01 [1.061], 2001-'02 [1.070] and 2002-'03 [1.075] are registered lower than the average ratio. While the O-I ratio of 1997-'98 [1.081], 1998-'99 [1.086], 2003-'04 [1.083] and 2004-'05 [1.123] are registered higher than the average ratio. By viewing this numerical picture, it can be said that it is overall good performance, of the dairy.

The factorial material productivity for the base year is 0.0141. Then, it increases and reaches to 0.0171 in the year 1998-'99. Then, it slightly declines for one year and then, it increases continuously. It reaches to 0.0226 in the year 2004-'05. The average factorial productivity ratio is 0.0159 which is higher than the base year ratio. It says positive trend of material productivity during the study period.

The productivity index which is 100 for the base year 1996-'97. It increases in initial years and reaches to 1001.78 in the year 1998-'99. Then, it decreases slightly just for one year and then it stays in increasing trend continuously. It reaches to 105.25 in the year 2004-'05. Regarding the analytical point of view of productivity index, it gives an idea about the variation in output –Input ratio for the years under the study. The table analyses that the productivity index comes on an average to 101.03 which is more by 1.03% from the base year. It indicates an overall increasing trend and gives the support that material management has improved in Madhur Dairy which automatically reduces some losses of material.

The overall result of material productivity is taken into consideration with the help of standard deviation value, co-efficient of variation value and chi-square value. Standard deviation of the Madhur dairy is 3.02 while, co-efficient of variation is 2.99; it makes clear that there is no much variation in the productive indices. The calculated value of chi-square is 0.02 while the table value of chi-square is 2.17. So, it clears that the calculated value is less than the table value. It allows the acceptance of null hypothesis, "Material productivity indices can be represented by the straight line trend based on least square method." It means, "There is no significant difference between the material productivity of the co-operative milk dairy plants." The calculated value of productivity index. The average requirement of material per rupee of out for Madhur Dairy is 0.93. Input–output ratio is gone down in the year 2004-'05. It clears that the unit gets its maximum efficiency in material during this year. Moreover, the table states clear that the possible savings in material input work out at 1.49 crores per year for the dairy.

Material Productivity of Madhur Dairy - Gandhinagar.

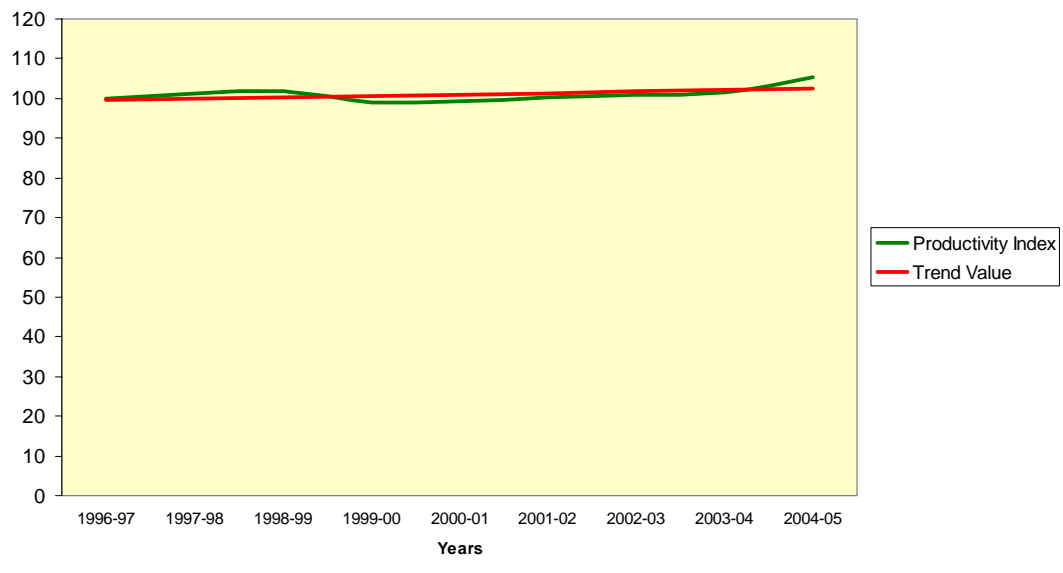


Table 4.5
Material Productivity of "Sugam Dairy" - Baroda

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	1,279,285,046	1,069,840,843	1.196	100.00	101.89	0.8363	1,029,527,160	40,313,683
1997-98	1,368,463,465	1,126,727,599	1.215	101.59	101.88	0.8234	1,101,295,063	25,432,536
1998-99	1,559,187,195	1,262,488,939	1.235	103.26	101.86	0.8097	1,254,783,342	7,705,597
1999-00	1,759,366,077	1,434,649,544	1.226	102.51	101.85	0.8154	1,415,880,821	18,768,723
2000-01	1,929,278,983	1,552,621,223	1.243	103.93	101.83	0.8048	1,552,621,223	0
2001-02	2,034,018,057	1,670,479,384	1.218	101.84	101.82	0.8213	1,636,911,837	33,567,547
2002-03	2,300,039,628	1,912,429,585	1.203	100.59	101.80	0.8315	1,850,997,379	61,432,206
2003-04	2,479,889,172	2,050,004,374	1.210	101.17	101.79	0.8267	1,995,734,465	54,269,909
2004-05	2,578,392,763	2,122,014,713	1.215	101.59	101.77	0.8230	2,075,006,964	47,007,749
Total	17,287,920,386	14,201,256,204	10.961	916.48	916.48	7.3921	13,912,758,254	288,497,950
Average	1,920,880,043	1,577,917,356	1.218	101.83	101.83	0.8213	1,545,862,028	32,055,328

Standard Deviation : 1.3727
Co-efficient of variation : 1.3480

Chi-Square : 0.01

MATERIAL PRODUCTIVITY IN SUGAM DAIRY – BARODA:

The table 4.5 gives the numerical picture regarding material productivity of Sugam Dairy of Baroda and finds out necessary statistical data of the research period, i.e. 1996-'97 to 2004-'05.

As the output of Sugam Dairy is concern, it is clear from the table that it increases from 127.93 crores in 1996-'97 to 257.84 crores in 2004-'05. The fluctuations spread of output works out to be 101.55%. while it increases from 106.98 crores in 1996-'97 to 212.20 crores in 2004-'05. The fluctuations spread of input works out to be 98.35%. Here, output increases more than the input of material. These figures say that there is a good material productivity in the Sugam Dairy. Productivity ratio with the backing of co-efficient of factorial productivity moves in fluctuating ways during the research period.

Material productivity ratio [O-I ratio] comes out 1.196 for the base year 1996-'97. The average productivity ratio comes out 1.218 for the study period. The O-I ratio of 1998-'99 [1.235], 1999-'00 [1.226], 2000-'01 [1.243], are recorded higher than the average ratio. While, the O-I ratio of 1997-'98 [1.215], 2002-'03 [1.203], 2003-'04 [1.210], and 2004-'05 [1.215] are recorded lower than the average ratio. These figures indicate that there is a slight lack of qualitative manpower and not completely utilization of latest technology. But, overall, there is a good material productivity.

The factorial material productivity in the base year is 0.0445. It increases to 0.0514 in the year 1998-'99. Then, it declines slightly for one year. Then, after it increases for one year so, it constantly stays in a fluctuating productivity ratio is 0.0486 which is higher than the base year ratio. It clears that there is an overall bullish that of material productivity during the research period. It should be said that productivity of any depend only on an individual input but it is very sensitive with respect to other factors also such as labour and overheads.

The productivity index which is 100 for the base year 1996-'97 productivity index means that it is the reflection of variation in output – input ratio. In the initial years, it increases to in the year 1998-'99. Then, it decreases for one year. After that it

increases for one year, and then decreases. It increases in the last two years but not so significantly. Productivity index comes on an average to 101.83 which are more by 1.83% from the base year. So, overall it states the positive trend and gives support to the view that material management has improved at some level in Sugam Dairy which helps to decrease some losses of material automatically.

The overall result of material productivity is considered in reference to the value of standard deviation, co-efficient of variation and chi square. Standard deviation of the Sugam Dairy is 1.37 and co-efficient of variation is 1.35; it makes clear that there is no much variation in the productive indices. The calculated value of chi-square is 0.01 while the table value is more than the acceptance of null hypothesis, "Material productivity indices can be represented by the straight line trend based on least square method." It means, "There is no significant difference between the material productivity of the co-operative milk dairy plants" The calculated value of productivity index. The average requirement of material per rupee of output for Sugam Dairy is 0.82. Input – Output ratio is the lowest in the year 2000-'01. It indicates that the unit gets its maximum efficiency in material during this year. The table also states that the possible savings in material input comes out at 3.21 crores per year for the dairy.

Material Productivity of Sugam Dairy - Baroda.

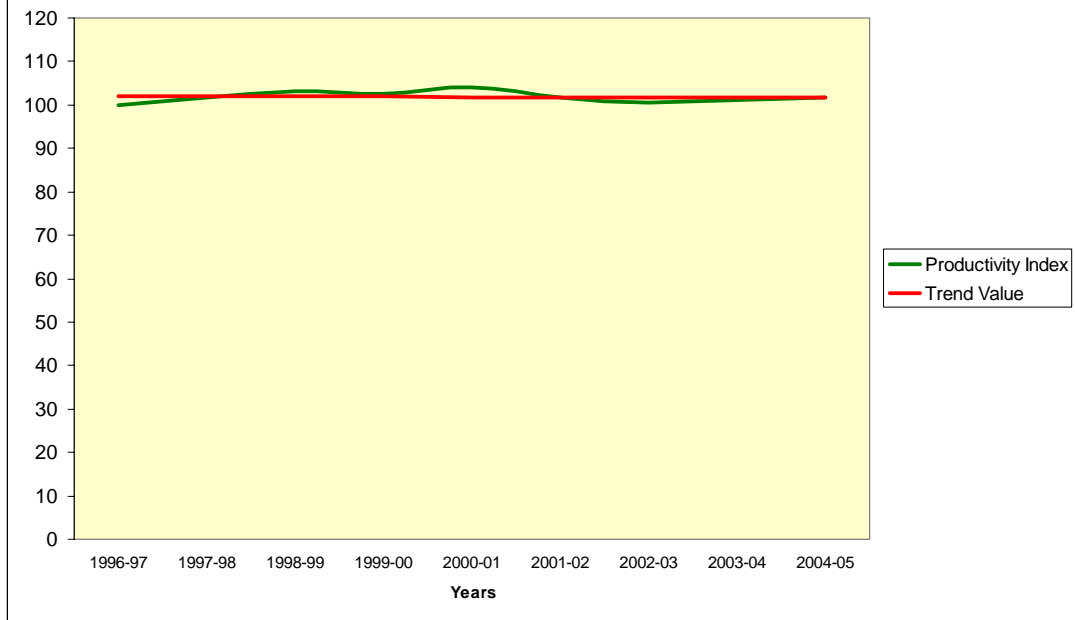


Table 4.6
Material Productivity of "Dudhsagar Dairy" - Mehsana

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	4,554,175,019	4,155,357,494	1.096	100.00	99.88	0.9124	4,105,606,200	49,751,294
1997-98	5,377,438,889	4,911,013,870	1.095	99.91	99.92	0.9133	4,847,511,277	63,502,593
1998-99	6,529,840,740	6,058,882,099	1.078	98.36	99.95	0.9279	5,886,676,404	172,205,695
1999-00	6,867,247,088	6,297,791,174	1.090	99.45	99.99	0.9171	6,190,849,518	206,941,656
2000-01	6,591,432,019	5,942,201,178	1.109	101.19	100.03	0.9015	5,942,201,178	0
2001-02	6,657,700,671	6,010,958,020	1.108	101.09	100.07	0.9029	6,001,942,621	9,015,399
2002-03	7,471,835,291	6,751,458,448	1.107	101.00	100.11	0.9036	6,735,888,095	15,570,353
2003-04	8,791,045,501	8,104,014,385	1.085	98.00	100.14	0.9218	7,925,161,146	178,853,239
2004-05	8,739,200,513	7,953,396,745	1.099	100.27	100.18	0.9101	7,878,422,691	74,974,054
Total	61,579,615,731	56,185,073,413	9.867	900.27	900.27	8.2106	55,514,259,130	670,814,283
Average	6,842,179,526	624,278,157	1.096	100.03	100.03	0.9123	6,168,251,014	74,534,920

Standard Deviation : 1.1921
Co-efficient of variation : 1.1917

Chi-Square : 0.01

MATERIAL PRODUCTIVITY IN DUDHSAGAR DAIRY – MEHSANA:

The table 4.6 gives the figures in reference to input of material, output, output-input ratio, productivity indices, trend value, Input-output ratio and possible savings. It also computes some statistical figures likes standard deviation, co-efficient of variation, chi-square and growth rate of Dudhsagar dairy of Mehasana for the research period i.e. 1996-'97 to 2004-'05.

In reference to the output of Dudhsagar dairy, it is clear from the table that it increases from the 455.42 crores in 1996-'97 to 686.72 crores in 1999-'00. The fluctuation spread of output comes out to be 50.79% while, input of material increases from 415.54 crores in 1996-'97 to 629.78 crores in 1999-'00. So, the fluctuation spread of input comes out to be 51.56%. So, here input of material increases more than the output slightly. These figures do not indicate good material productivity of Dudhsagar dairy during this period. Then, in the year 2000-01, both the output and input of material Output increases from 659.14 crores in the year 2000-01 to 879.10 crores in the year 2003-04. The expansion spread of output comes out to be 33.37%. While input of material increases from 594.22 crores in the year 2000-01 to 810.40 crores in the year 2003-04. The expansion spread of input of material works out to be 36.38%. So, during this period also input of material increases more than the output. It interprets that there is a negative trend of material productivity of Dudhsagar dairy during this period. In the last year i.e. 2004-05, both the output and input of material decrease slightly again. It shows the decreasing trend in the end. Productivity ratio with the help of co-efficient of factorial productivity moves in upward and downward ways during the period of the research.

Material productivity ratio [O-I ratio] comes out 1.096 for the research period. The O-I ratio of 2000-'01 [1.109] and 2004-'05 [1.099] are registered higher than the average ratio. While the O-I ratio of 1997-'98 [1.095], 1998-'99 [1.078], 1999-'00 [1.090] and 2003-'04 [1.085] are registered lower than the average ratio. This figures speak that manpower and latest machinery would not be utilized completely and properly in the dairy. But, overall it is average productivity of the dairy.

The factorial material productivity in the base year is 0.0175. In the initial two years, it declines and reaches to 0.0143 in the year 1998-'99. Then, it increases and touches to 0.0216 in the year 2002-'03. Then, it decreases for only one year and then after it increases. So, it continuously fluctuates but it stays in upward in most of years. The average factorial productivity ratio is 0.0186 which is more than the base year ratio. So, it speaks overall upward trend of material productivity during the period of the study. It can be said that productivity of any one factor does not depend only on an individual input but it is very much affected by other factors also like labour and overheads.

The productivity index which gives an idea about the variation in output – input ratio for the years under the study. Productivity index is 100 for the base year 1996-'97. It decreases in the initial two years to 98.36 in the year Then, it increases and touches to 101.19 Then, it decreases to 99.00 in the year 2000-'01 in the year 2003-'04 . Then after, it increases but not so significantly, in the year 2004-'05 . The table indicates that the productivity index comes on an average to 100.03 which is more by 0.03% from the base year. It says an overall increasing trend and supports the view that material management has slightly improved in Dud saga Dairy Which helps to reduce some material related losses itself.

The overall result of material productivity is calculated in reference to the value of standard deviation, co-efficient of variation and chi-square standard deviation of the Dudhsagar Dairy is 1.192 and co-efficient of variation is also 1.19, it makes clear that there is no variation in the productive indices. The calculated value of chi-square is 0.01 while the table value of chi-square is 2.17. So, the calculated value is less than the table value, and it permits to accept the null hypothesis, "Material productivity indices can be represented by the straight line trend based on least square method". It means, "There is no significant difference between the material productivity of the co-operative milk dairy plants" The calculated value of productivity index. The average requirement of material per rupee of output for Dudhsagar Dairy is 0.91. The input-output ratio was the lowest during the year 2000-'01. It makes clear that the unit got its maximum efficiency in material during this year. Moreover, the table calculates that the possible savings in material input comes out at 7.45 crores per year for the dairy.

Material Productivity of Dudhsagar Dairy - Mehsana.

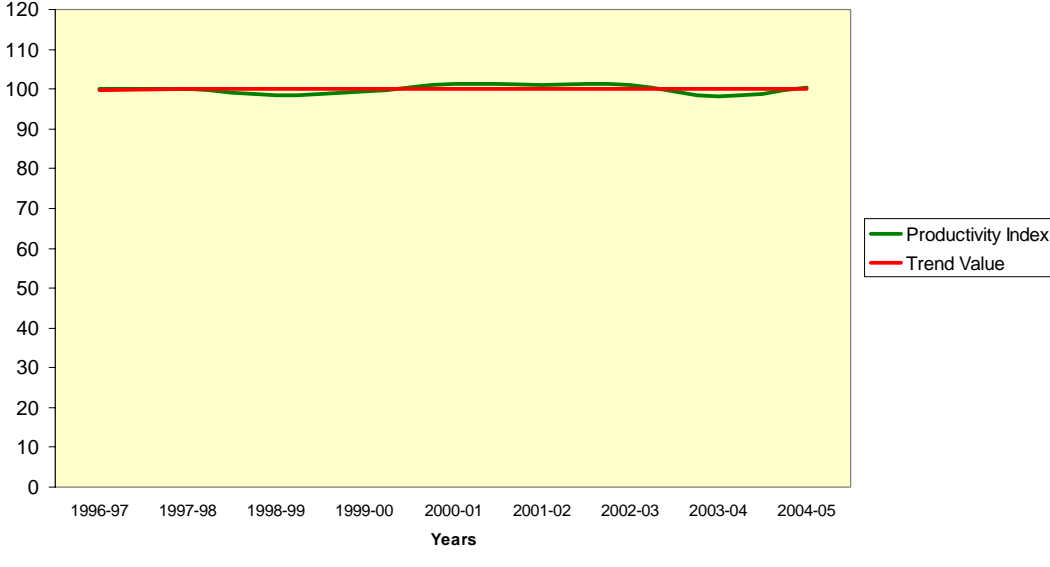


Table 4.7
Material Productivity of "Vasudhara Dairy" - Alipur

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	695,053,623	605,557,830	1.148	100.00	100.87	0.8712	552,033,124	53,524,706
1997-98	772,578,793	682,016,637	1.133	98.69	101.60	0.8828	613,606,016	68,410,621
1998-99	827,345,634	706,446,516	1.171	102.00	102.34	0.8539	657,103,538	49,342,978
1999-00	226,295,942	179,731,249	1.259	109.67	103.08	0.7942	179,731,249	0
2000-01	1,363,097,348	1,172,883,735	1.162	101.22	103.81	0.8605	1,082,614,150	90,269,585
2001-02	1,514,945,909	1,233,730,780	1.228	106.97	104.55	0.8144	1,203,216,982	30,513,798
2002-03	1,759,795,585	1,441,389,371	1.221	106.36	105.29	0.8191	1,397,684,182	43,705,189
2003-04	2,259,975,028	1,903,997,817	1.187	103.40	106.02	0.8425	1,794,942,193	109,055,624
2004-05	2,630,211,146	2,160,342,728	1.217	106.01	106.76	0.8214	2,088,995,190	71,347,538
Total	12,049,299,008	10,086,096,663	10.726	934.32	934.32	7.5600	9,569,926,624	516,170,039
Average	1,338,811,001	1,120,677,407	1.192	103.81	103.81	0.8400	1,063,325,180	57,352,227

Standard Deviation : 11.84
Co-efficient of variation : 11.41

Chi-Square : 0.08

MATERIAL PRODUCTIVITY IN VASUDHARA DAIRY – ALIPUR (CHIKHLI):

The table 4.7 displays the numerical data in reference to input and output of material, Output-Input ratio, and possible savings. It also calculates some other statistical data like standard deviation, co-efficient of variation, chi-square and growth rate of Vasudhara dairy of Alipur (chikhli) from the year 1996-'97 to 2004-2005 i.e. nine years.

The table indicates that the output of Vasudhara dairy increases from 69.51 crores in 1996-1997 to 82.73 crores in 1998-99. The fluctuation expansion of output comes out to be 19.02 % while input of material increases from 60.56 crores in 1996-97. to 70.64 crores in 1998-'99. The fluctuation expansion of input comes out to be 16.64%. Here the output is increasing more than the input. So, it indicates good material productivity of Vasudhara Dairy during this period. Then suddenly both the output and input of material decrease high in the year 1999-00. Then, Output increases from 22.63 crores in the year 1999-00 to 263.02 crores in the year 2004-05. The fluctuation spread of output comes out to be 1062.26%. On the other hand, input of material increases from 17.97 crores in the year 1999-00 to 216.03 crores in the year 2004-05. So, the fluctuation expansion of input of material works out to be 1102.17%. So, here input of material increases more than the output during this particular period. So, it shows the negative trend of material productivity of Vasudhara dairy during this period. Productivity ratio with the support of factorial productivity moves in fluctuating ways during the research period.

Material productivity ratio [O/I ratio] comes out 1.148 for the base year. i.e. 1996-1997. The average productivity ratio comes out 1.192 for the study period. The O-I ratio of 1999-2000 [1.259], 2001-2002 [1.228], 2002-2003 [1.221], and 2004-2005 [1.217] are registered higher than the average ratio. While the O-I ratio of, [1997-1998] [1.133] 1998-1999 [1.171], 2000-2001 [1.162], and 2003-2004 (1.167) are registered lower than the average ratio. These figures say that man-power and latest machinery would not be utilized completely and properly in the dairy but it is average productivity of the dairy.

The factorial material productivity is 0.0304 in 1996-1997 i.e. base year. In the initial one year, it decreases to 0.269, then it increases and touches to 0.0404 in 1999-2000. Then after, it decreases and again it increases in the last year of the research period. So it consistently fluctuates. The average factorial productivity ratio is 0.0352 which is more than base year ratio. So it indicates overall positive trend of material productivity during the study period. It can be said that productivity of any one factor doesn't depend only on an individual input but it is very much affected by other factors also, such as labour and overheads.

Now we move towards productivity index which is 100 for the base year i.e. 1996-1997. In the initial one year it decreases and reaches to a minimum level of 98.69 in 1997-98. Then it increases and touches to 109.67 in 1999-'00. Then after it decreases and again it increases in last year of research period i.e. 2004-05. The table displays that the productivity index comes on an average to 102.81 comes on an average to 103.81 comes on an average to 103.81 which is more by 3.81% from the base year. It interprets an overall increasing trend and supports the view that material management has improved much better in Vasudhara Dairy which reduces some material related losses automatically.

The overall result of material productivity is taken into consideration in respect to the value of standard deviation, co-efficient of variation and chi-square. Standard deviation of Vasudhara dairy comes out to be 11.84 while the co-efficient of variation comes out to be 11.41. These figures clear that there is no much variation in productive indices. The calculated value of chi-square works out to be 0.08 while the critical value works out to be 2.17. So, the calculated value is less than the critical value. It permits to allow the acceptance of null hypothesis, "Material productivity indices can be represented by the straight line trend based on straight line trend based on least square method." It means, "There is no significant difference between the material productivity of the co-operative milk dairy plants of Gujarat State." The calculated value of productivity index. The average requirement of material per rupee of output for Vasudhara Dairy is 0.84. Input output ratio 9005 to the minimum level in the year 1999-00. It clears that the dairy gets it maximum efficiency in material input during this year. The table also makes clear that the possible savings in material input comes out at 5.74 crores per year for the dairy.

Material Productivity of Vasudhara Dairy - Alipur.

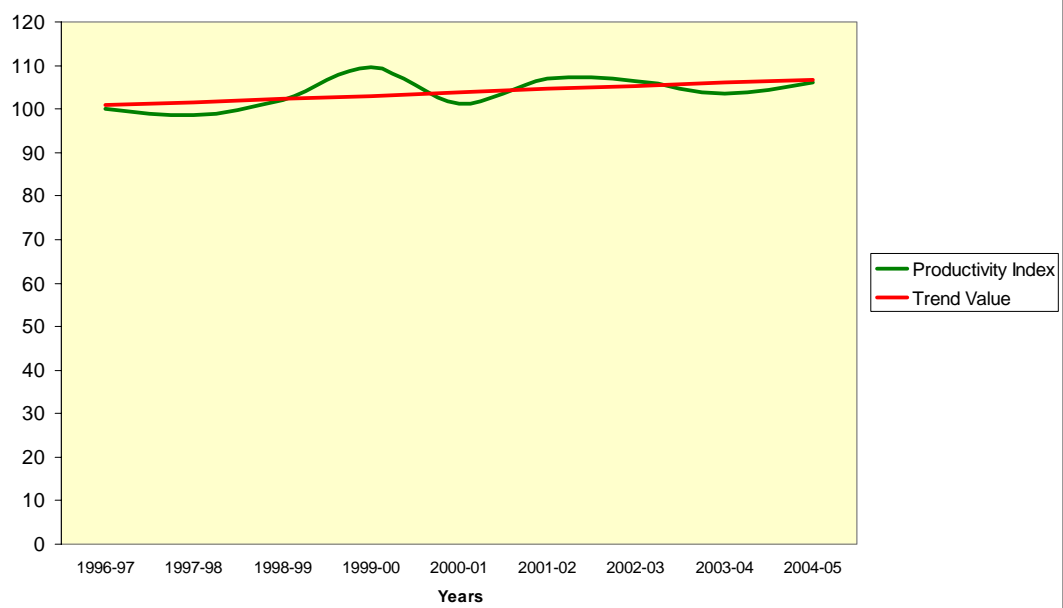


Table 4.8
Material Productivity of "Sumul Dairy" - Surat

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	2,344,676,397	2,111,154,081	1.111	100.00	100.84	0.9004	2,079,618,812	31,535,269
1997-98	2,875,563,460	2,578,765,863	1.115	100.36	100.78	0.8968	2,550,490,922	28,274,941
1998-99	2,900,606,810	2,576,688,632	1.126	101.35	100.72	0.8883	2,572,703,208	3,985,424
1999-00	3,106,651,642	2,755,455,382	1.127	101.44	100.67	0.8870	2,755,455,382	0
2000-01	3,446,899,795	3,075,460,235	1.121	100.90	100.61	0.8922	3,057,239,654	18,220,581
2001-02	3,525,635,053	3,134,942,088	1.125	101.26	100.55	0.8892	3,127,074,163	7,867,925
2002-03	3,818,751,083	3,441,698,071	1.110	99.91	100.50	0.9013	3,387,054,436	54,643,635
2003-04	4,251,273,272	3,812,801,187	1.115	100.36	100.44	0.8969	3,770,681,482	42,119,705
2004-05	4,600,686,233	4,145,232,672	1.110	99.91	100.38	0.9010	4,080,594,512	64,638,160
Total	30,870,743,745	27,632,198,211	10.060	905.49	905.49	8.0531	27,380,912,571	251,285,640
Average	3,430,082,638	3,070,244,246	1.118	100.61	101.61	0.8948	3,042,323,619	27,920,627

Standard Deviation : 0.3577
Co-efficient of variation : 0.3556

Chi-Square : 0.003

MATERIAL PRODUCTIVITY IN SUMUL DAIRY – SURAT:

The table 4.8 draws the numerical picture in reference to material productivity of Sumul Dairy of Surat and finds out some necessary statistical data of the study period, i.e. 1996-97 to 2004-2005.

So far the output of Sumul Dairy is concerned it is clear from the table that it increases from 290.07 crores in 1998-99 to 460.07 crores in 2004-2005. The upward trend in 2004-2005. The upward trend of output works out to be 56.61%. On the other hand in case of input of material, it decreases in the initial year and then it increases constantly. It increases from 257.67 crores in 1998-'99 to 414.52 crores in 2004-05. The upward trend works out to be 60.87%. Here, input increases more than the output. It shows poor material productivity of Sumul dairy. Productivity ratio with the support of co-efficient of factorial productivity moves in mixed trend during the study period.

Material Productivity ratio [O/I Ratio] works out 1.111 for the base year i.e. 1996-1997. The average productivity ratio comes out 1.118 for the research period. The O/I ratio of 1998-1999 [1.126] 1999-2000 [1.127]. 2000-2001 [1.121] and 2001-02 [1.125] are recorded higher than the average ratio while the O-I ratio of 1997-'98 [1.115] and 2004-2005 [1.110] are recorded lower than the average ratio. By seeing this numerical graph, it can be said that it is having good productivity of the dairy. And it can also be said that manpower and latest technology should not be used completely in the Sumul dairy.

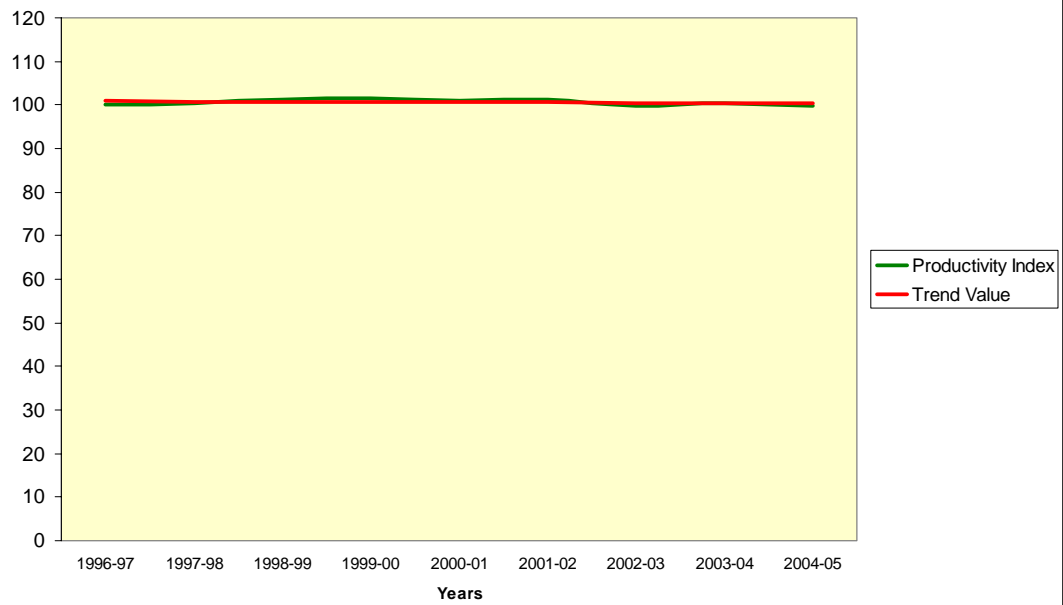
The factorial material productivity for the base year is 0.0231. It decreases in the first initial year but then it increases and reaches to 0.0269 in the year 1999-2000. Thus, it fluctuates constantly till-2004-2005. The average factorial productivity ratio is 0.0243 which is higher than the base year ratio. It states positive trend of material productivity during the research period. It can be said that productivity of any individual element is not dependent only on an individual input but it is very much sensitive with respect to labour and overheads also.

The productivity index which is 100 for the base year-1996-'97. It increases in the initial years of the research period and reaches to 101.44 in the year 1999-'00. Then, it decreases and again it increases. So, it stays in a mixed trend during the research period. As the analytical point of view, productivity index gives an idea about the variation in output- Input ratio, for the study period. The table computes that the average productivity index is 100.61 which is more by 0.61%. From the base year. It indicates an overall positive trend and supports the view that material management has improved slightly in Sumul dairy which decreases some losses of material itself.

The overall result of material productivity is taken into consideration in reference to the value of standard deviation, co-efficient of variation and chi-square. Standard deviation of the Sumul dairy is 0.36 while co-efficient of variation is also 0.36. It clears that there is no variation in the productive indices. The calculated value of chi-square is 0.003 while the table value is 2.17. So, the calculated value is less than the table value. It indicates to accept null hypothesis, "material productivity indices can be represented by the straight line trend based on least square method." It means, "There is no significant difference between the material productivity of the co-operative milk dairy plants of Gujarat State." The calculated value of productivity index.

The average requirement of material per rupee of output for Sumul dairy is 0.89. Input-Output ratio is the lowest in the year 1999-'00. It clears that the unit gets its maximum efficiency in material during this year. The table also indicates that the possible savings in material input comes out at 2.79 crores per year for the dairy.

Material Productivity of Sumul Dairy - Surat.



11. MATERIAL PRODUCTIVITY RATIOS OF THE CO-OPERATIVE DAIRY AND MILK SUPPLY UNITS AND KRUSKAL WALLIS ONE WAY ANALYSIS OF VARIANCE TEST:

The comparative position of material Productivity ratios of co-operative dairy and milk supply units of Gujarat state have been given in table 4.9 along with the application of Kruskal Wallis one way analysis of variance test on this ratio, for the research period.

Table 4.9

COMPARATIVE MATERIAL PRODUCTIVITY RATIO OF CO-OPERATIVE DAIRY & MILK SUPPLY UNITS OF GUJARAT STATE WITH KRUSKAL WALLIS ONE-WAY ANALYSIS OF VARIANCE TEST

Year	AMUL DAIRY RATIO	R1	GOPAL DAIRY RATIO	R2	UTTAM DAIRY RATIO	R3	MADHUR DAIRY RATIO	R4	SUGAM DAIRY RATIO	R5	DUDH- SAGAR DAIRY RATIO	R6	VASU- DHARA DAIRY RATIO	R7	SUMUL DAIRY RATIO	R8
1996-97	1.167	36	1.341	71	1.173	39	1.067	3	1.196	49	1.096	13	1.148	32	1.111	21
1997-98	1.189	46	1.297	70	1.193	48	1.081	7	1.215	56.5	1.095	12	1.133	31	1.115	22.5
1998-99	1.199	50.5	1.240	67	1.188	45	1.086	10	1.235	66	1.078	6	1.171	38	1.126	28
1999-00	1.190	47	1.222	63	1.210	54.5	1.056	1	1.226	64	1.090	11	1.259	69	1.127	29.5
2000-01	1.186	43	1.172	39	1.199	50.5	1.061	2	1.243	68	1.109	17.5	1.162	35	1.121	24
2001-02	1.183	42	1.175	40	1.220	61	1.070	4	1.218	59	1.108	16	1.228	65	1.125	26.5
2002-03	1.169	37	1.125	26.5	1.201	52	1.075	5	1.203	53	1.107	15	1.221	62	1.110	19.5
2003-04	1.150	33	1.127	29.5	1.219	60	1.083	8	1.210	54.5	1.085	9	1.187	44	1.115	22.5
2004-05	1.152	34	1.109	17.5	1.177	41	1.123	25	1.215	56.5	1.099	14	1.217	58	1.110	19.5
Total		369		424		451		65		527		114		434		213

$$\begin{aligned}
H &= \frac{12}{N(N+1) \sum_{j=1}^k n_j} \frac{\sum^k (R_j)^2}{n_j} - 3(N+1) \\
&= \frac{12}{72(72+1)} \left[\frac{(368.5)^2}{9} + \frac{(423.5)^2}{9} + \frac{(451)^2}{9} + \frac{(65)^2}{9} + \frac{(526.5)^2}{9} + \frac{(113.5)^2}{9} + \frac{(434)^2}{9} + \frac{(213)^2}{9} \right] - 3(72+1) \\
&= \frac{12}{5256} \left[15088.03 + 19928.03 + 22600.11 + 469.44 + 30800.25 + 1431.36 + 20928.44 + 5041 \right] - 219 \\
&= 46.49
\end{aligned}$$

The above total i.e. 4.9 interprets that the calculated value of H is 46.49 which is more than the critical value 2.17, so, the null hypothesis based on Kruskal Wallis one-way analysis of variance test, at 5% level of significance is rejected and alternative hypothesis is accepted. It means that there is significance difference between the material Productivity ratios of the co-operative dairy and milk supply units of Gujarat state.

12. COMPARATIVE ANALYSIS OF MATERIAL PRODUCTIVITY IN CO-OPERATIVE DAIRY AND MILK SUPPLY UNITS OF GUJARAT STATE:

The comparative analysis of material Productivity in co-operative dairy and milk supply units of Gujarat state for the period from 1996-97 to 2004-05 is given in table 4.10, which is as under:

TABLE 4.10
COMPARATIVE ANALYSIS OF MATERIAL PRODUCTIVITY IN CO-OPERATIVE DAIRY AND MILK SUPPLY UNITS OF GUJARAT STATE FROM 1996-97 TO 2004-05.

UNIT	PRODUCTIVITY RATIO AVERAGE	RANK	PRODUCTIVITY INDEX AVERAGE	RANK	CO-EFFICIENT OF VARIATION		CHI-SQUARE		INPUT-OUTPUT RATIO	
					VALUE	RANK	VALUE	RANK	AVERAGE	RANK
AMUL DAIRY	1.176	5	100.78	5	1.97	5	0.010	3	0.8505	5
GOPAL DAIRY	1.201	2	89.55	8	35.89	8	0.020	6	0.8359	3
UTTAM DAIRY	1.198	3	102.11	2	1.79	4	0.020	6	0.8351	2
MADHUR DAIRY	1.078	8	101.03	4	2.99	6	0.020	6	0.9287	8
SUGAM DAIRY	1.218	1	101.83	3	1.35	3	0.010	3	0.8213	1
DUDHSAGAR DAIRY	1.096	7	100.03	7	1.19	2	0.010	3	0.9123	7
VASUDHARA DAIRY	1.192	4	103.81	1	11.41	7	0.080	8	0.8400	4
SUMUL DAIRY	1.118	6	100.61	6	0.36	1	0.003	1	0.8948	6
COMBINED AVERAGE	1.160		99.97		7.12		0.022		0.8648	

This table interprets that the combined average of material Productivity ratio for the study period is worked out at 1.160, it clears that for every rupee spent on material, the output ratio comes out to Rs. 1.160. The average productivity ratio of Amul Dairy [1.176], Gopal Dairy [1.201], Uttam Dairy [1.198], Sugam Dairy [1.218] and Vasudhara Dairy [1.192] are registered higher than the combined average productivity ratio for the study period while in case of Madhur Dairy [1.078], Dudhsagar Dairy [1.096] and Sumul Dairy [1.118] are registered less than the combined average productivity ratio. Moreover, the achievement of material productivity is concerned, it is seen from the material productivity indices of various dairies that the progress is made in material productivity during the research period, has been the highest at 103.81 for Vasudhara Dairy, 102.11 for Uttam Dairy, 101.83 for Madhur Dairy, 100.78 for Amul Dairy, 100.61 for Sumul Dairy, 100.03 for Dudhsagar Dairy and 89.55 for Gopal Dairy. The average progress of Vasudhara Dairy, Uttam Dairy, Sugam Dairy, Madhur Dairy, Amul Dairy, Sumul Dairy and Dudhsagar Dairy are better in comparison to the average combined ratio (99.97), while the progress of Gopal Dairy is lower than the combined average in co-operative milk Dairy industry.

Now, the spot light on co-efficient of Variation. It comes out at the highest being 35.89 for Gopal Dairy and 11.41 for Vasudhara Dairy are bigger than the combined average [7.12]. While on the other hand Madhur Dairy – 2.99, Amul Dairy – 1.97, Uttam Dairy – 1.79, Sugam Dairy – 1.35, Dudhsagar Dairy – 0.36 are lower than combined average. This numerical picture proves that there is lowest variability in material productivity in Sumul Dairy.

It is noted from the above table that the average value of chi-square is lower than the critical value. So, it clears that the Productivity indices of co-operative milk dairies seems to be nearer to the straight line based pattern.

As the chi-square value of each dairy is lower than the critical value (2.17), the null hypothesis is accepted for all dairies. The chi-square value of (0.020), Uttam Dairy (0.080), Madhur Dairy (0.020), Amul Dairy (0.010), Sugam Dairy (0.010), Dudhsagar Dairy (0.010) and Sumul Dairy (0.003) is registered lower than the critical value of chi-square.

Therefore, the Productivity indices of all dairies seems to be nearer to straight line trend based on least square method.

REFERENCES

1. The Economic Times of 16th august 1994.
2. D. Garitschi, "Productivity & Efficiency in Distribution System", Edn. 1983.
3. Adolph Matz, Authel J. Carry & George W. Frank, 'Cost accounting', New York South Western Publishing company – 1932, P. No. 110.
4. Louis Petro, 'Material Cost in Accountant's Cost', Handbook Edition, James Bullock, John Wiley & sons, New York – 1983, P. No. 23
5. Brock, Palmer and Archer, op, ct p. no. 26
6. R. Gopalkrishana & M. Sudershan, 'Material Management', Prantic Hill India Pvt. Ltd., New Delhi – 1984, P No. 249
7. Adolph Matz, Authel J. Carry & George W. Frank, 'Cost accounting', New York South Western Publishing company – 1932, P. No. 110.
8. R. J. Tersine, 'Principles of Inventory & Material Management', Elsevien Science Publishers, 1982
9. Adolph Matz, Authel J. Carry & George W. Frank, 'Cost accounting' New York South Western Publishing company – 1932, P. No. 110.
10. J.G.Blocker and W.Keith, Welter, Cost Accounting, Tata Mcgrew Hill – 1978 P. No. 74.
11. J. P. Shrivastav, Material Productivity, Socio Economic Dimension (ND: Oxford & IBH Publishing Company – 1982), P. No. 44-45.

CHAPTER – 5

**ANALYSIS OF LABOUR PRODUCTIVITY OF CO-OPERATIVE
DAIRY AND MILK SUPPLY UNITS OF GUJARAT STATE**

CHAPTER – 5

ANALYSIS OF LABOUR PRODUCTIVITY OF CO-OPERATIVE DAIRY AND MILK SUPPLY UNITS OF GUJARAT STATE

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1. INTRODUCTION:

Labour is the second most significant factor of production cost after the cost of raw materials, even today. It is only labour which converts raw materials into finished products. That's why it requires close attention of the top management. Fixation of wages is a very essential and tough work as it affects Productivity and indirectly profit of the organization. In the present scenario, labour is the only factor which can be a source of almost unlimited Productivity. In many times, employees and workers have got wonders in reference to the value and volume of work completed. It is the very sensitive element in all production activities. The proportion of labour cost is 1/3 part of the total cost in manufacturing industries probably, it is more difficult to control labour cost than even the material cost due to a number of reasons. Material being an inanimate thing can be controlled and even stored when not required. While employees are however human being having their own likes & dislikes. Secondly, labour is a perishable commodity and can not be stored. It has to be utilized as soon as it is available.

Labour cost is an important cost factor requiring continuously measurement, control and analysis. Labour cost is all labour spent in changing the construction, composition, conformation or condition of the product. In the words of J. Batty: "The employment of labour at the right place is normally the responsibility of the personnel department who deal with all formalities and the official in charge of the department requiring the worker being engaged."⁽¹⁾ All wage payments are in the lost analysis, straightly or ultimately based on and limited by the productivity and skill of the employee. Hence, proper motivation, control and accounting for this human cost factor or one of the most essential questions in the management of the industry. "A co-operative and enthusiastic labour. Forever, faithful the company and it's policies can give greatly towards efficient, low cost operation."⁽²⁾

John G. Blocker & W. Keith Welter say, "Proper control and accounting of labour costs constitute one of the most important problems of management in the operations of a business enterprise and in the determination of the cost of manufacture and to sale a goods or services".⁽³⁾

The financial advantages of increased production of lower unit costs, along with wage rates and ever increasing fringe benefits, have expedited the trend towards suitable use of latest equipment to manufacture more goods in fewer labour hours.

So far, the economic development is concerned; the growth of labour productivity must be viewed as a vital and essential for improving the real income and the standard of living of the people. Once, the investment shapes in the form of building, plant etc, now the growth depends on labour productivity and it depends on the objective factors and sincerity to work. Efficient and latest technology increases the capacity of employees. For a long time, it is calculated that the amount of capital per employee was the main deciding factor of the labour productivity in reference to a long time. Thus, it is man or labour who is the living factor, makes the industry or unit productive and profitable with quality.

As the labour holds $\frac{1}{3}$ part of the total cost it is considered as a main factor for achieving higher productivity. It includes the whole effort of labour within a unit of time ascertained jointly by factors dependent or independent employee. In determining the labour productivity, the following factors are important:

- The skill and level of education of employee.
- Enthusiasm of employees towards work.
- Employee's mental and physical energy level.

2. CONCEPT, MEANING AND DEFINITION OF LABOUR PRODUCTIVITY:

There are three factors which are believed as a three aspects of labour productivity. They are as under:

- As one of the basic indicators of economic development.
- As the major determinant of national income.
- As an important tool for the analysis of economic and social problems.

In the Keynesian verdict : “The concept of labour productivity is preferable to regard the labour including the personal services of entrepreneur and his assistants, as the sole factor of production, operating in a given environment of technique, capital equipment, effective demand and national resources. This partly explains way, we have been able to take the unit of labour as the sole physical unit which we require in our economic system, apart from units of money and time”⁽⁴⁾

Sometimes, the concept of productivity is completed with efficiency. But there is a difference between the two. The word efficiency meets to the idea of productivity, but it goes beyond it in the sense that it expresses an attitude or capacity or the quality of the input, the productivity of which is under consideration, while productivity indicates the relationship between output and input factor.⁽⁵⁾

Before the clarifying the meaning of labour productivity, it is needful to clarify the meaning and definition of labour cost. Labour cost is of two types namely (i) direct labour cost and (ii) Indirect labour cost.

- **DIRECT LABOUR COST:**

“The Direct Labour Cost can be defined as; the wages paid to employees and workers who are engaged in the manufacturing process and whose time can be comfortably and economically related to one unit of production.”

In other words, “The labour cost incurred on the employees and workers who are engaged directly in manufacturing the product. I.e. Goods or services, their work can be identified clearly in the procedure of converting the raw materials into finished product is called Direct Labour Cost.” For example, wages paid to the employees and workers engaged in machining department, assembling department, fabrication department etc.

ICMA London defines Direct Labour as, “The cost of remuneration for skills applied directly to a productivity i.e. Goods or saleable services.”⁽⁶⁾

- **INDIRECT LABOUR COST:**

Indirect Labour Cost means, “wages which cannot be allocated to or absorbed by cost centers or cost unit.”

In other words, “The employees or workers who are not directly connected who are not directly connected with the conversion procedure but assist in the process by way of supervision, maintenance, transportation of materials, material handling etc.” Their work benefits all the items being manufactured and cannot be specifically identified with any single product. So, the indirect labour cost should be considered as production overhead.

Moreover ICMA London defines indirect labour as “Indirect labour costs are those costs which are required for production purposes but are not identifiable with a particular unit of production.”⁽⁷⁾

Even if all inputs, [Materials, Manpower, Machines & Money etc.] Are given with the proper lay out work system, the success would depend on the co-ordination of the human factor. In this reference, R.S. Sharma said that “even if all inputs affect the labour productivity it is effected by some social factors as well.”

J.P. Shrivastava says, “Though it is true that the concept of productivity of land and capital is very important for certain purpose, the concept of labour productivity has achieved the lion’s share of attention in recent years. Due to this, the word productivity is frequently used without qualification to refer to this ratio.”⁽⁸⁾ Bronislaw Minc of Polish Academy of Science defines, “Labour productivity is the sum of the use values produced per worker employed in production, it is always calculated with reference to some units of time.” [Hour, day, month or year]⁽⁹⁾ The ILO report says, “ It is necessary to say that to speak of productivity of labour is not to emphasize the efforts to be which are made by labour but the importance of making an efficient use of the service of the labour.”⁽¹⁰⁾

After the above discussion finally. We can define that, “the labour productivity is the ratio of the output to the input of labour.”

3. LABOUR PRODUCTIVITY RATIO :

Labour productivity is calculated with the help of the input of labour within the time limit for turning out a unit of output. For example, a company, manufacturing electronic calculators produced 20,000 calculators by engaging 50 workers at 8 hours/day for 25 days, in this example.

$$\begin{aligned} \text{Productivity of labour} &= \frac{20,000 \text{ calculators (output)}}{50 \text{ workers} \times 8 \text{ hours} \times 25 \text{ days (input)}} \\ &= 2 \text{ Calculator/man hour} \end{aligned}$$

Now assume that, this company increased their production to 35000 calculators by hiring 20 more workers at 8 hours/day for 25 days then in this case.

$$\begin{aligned} \text{Productivity of Labour} &= \frac{35000 \text{ calculators}}{70 \times 8 \times 25 \text{ man hours (input)}} \\ &= 2.143 \text{ calculator/man hour} \end{aligned}$$

The production has gone up by 75% and labour productivity has gone up by 0.143% per employee.

4. LABOUR PRODUCTIVITY IN INDIA :

We all know that India is a laborious country. In India, the productivity of labour is increasing since 1950, in almost every sector. However, when it compared to international standard, it is far below than the developed and newly industrialized countries. According to the report of Ministry of Labour of India, “The output of India

workers is less than the output or workers is less than the output of workers in china, Pakistan, Philippines, south corea and Singapore and other countries.”⁽¹¹⁾

Labour productivity has not been kept in view sufficiently to make Indian product globally since the first plan introduced. In this reference it is necessary to say that, to get more and better productivity per unit of employee and for establishment of wage regimes, the technology should be modernized and productivity oriented.

The National Productivity Council is taking fund from the union Government continued to create an environment and culture of productivity to increase the productivity. Various organizations give special attention to trained workers in promotion of productivity in every sector.

The report states that, the productivity of an Indian worker rose from Rs. 2898 in 1950-51 to Rs. 6169 in 1989-90. At presently Indian labour productivity has also kept up its rising trend.

5. IMPORTANCE OF LABOUR PRODUCTIVITY:

The human force of any organization, as its valuable wealth and backbone, play a marvelous role in its productive and developmental activities. The progress of any organization, to a greater extent, is affected by the systematic and effective use of available human resources. On the other hand, if this resource is not used in a proper manner, its. Manufacturing and marketing functions are retarded. It is the factor which is capable to make even a new organization progressive and productively in initial years or can put the running organization in a much better conditioning the market.

Labour cost is second most essential factor of the total cost of production for any organization. It comes out to 40 to 60% of the total cost. By keeping this labour cost at a lowest level, it makes enable the company to give its product i.e. Goods or services to the customers at a comparatively lower price. As a result the company is in

a position to achieve higher profit while if the labour cost is not controlled properly, it will have an adverse effect on both the cost economies and profit.

In this context, it is also necessary to say that the corporate enterprises must understand the requirement for having scientific and proper policies about the recruitment, training, placement, promotion, remuneration etc. Because if a company is able to appoint the right people, imports proper type of training to them, places them for appropriate work, rewards them appropriately etc, then the company faces no difficulty in managing its human resources and in obtaining higher productivity from them.

It throws back the light on economic objectives. “Labour productivity depends on many other economic objectives such as reduction in the total cost of manufacturing, advantageous location of manufacturing industry, effectiveness of capital investment, work specialization, use of basic funds and so on.”⁽¹²⁾

“Productivity is the combination of all factors of production like Men, Money, Machinery (technology) the 5 M’s which give the highest outputs to the least inputs of efforts & cost Peter F. Drucker says that Money, Machinery, and Materials are inanimate but Men is an animate factor. If we have all other factors except labour (Men), all others are worthless. It means all the factors are directly dependent on labour (Men) factor. This provides the importance of labour in productivity. If manufacturing industry or an organization has skilled and well experienced labour force then the combination of all the inputs gives the best outputs. The utilization of all other inputs depends on labour efficiency. Hence, the labour productivity is the crucial first step to achieve higher productivity.

Today, Labour Force has become an important element in every business. The improvement in labour quality is brought by investment in Labour Force.

In this new scenario, the three major factors, which are related to labour productivity, are training programmes, motivational programmes and incentives schemes. Labour productivity can be improved by giving training to employees. The second major factor is motivation to the employees. An industry can improve their labour productivity by arranging motivational programmes for their employees and workers.

The third major factor is incentives schemes. Every manufacturing industry should provide incentives schemes to their workers. By applying the above factors. Practically the labour productivity improves automatically.

6. CONTROL TECHNIQUES FOR WAGES:

Wages i.e. Labour costs contribute an important part in the total cost of production. Wage rates are the root reason in a most of cases of industrial disputes. Hence, any policy level decision regarding wages must be taken very carefully. The wage system that decreases the labour cost per unit while increasing the output and giving a fair reward to labour will be the most preferable and acceptable. Thus, the wage system should be such which increases the efficient level and gives satisfaction to employees and workers. An ideal wage system should have the under written qualities:

IT SHOULD BE COMMON:

It should be common to adopt it in the same industry or locality.

IT SHOULD BE SPECIFIC AND CERTAIN:

It should not have any element of ambiguity or uncertainly.

IT SHOULD BE ECONOMICAL:

The wage system should be economical in operational functions and should increase the efficiency level of employees and workers.

IT SHOULD BE ENCOURAGABLE:

The wage system should encourage the employees and the workers to increase annuity of output as well as to improve the quality of output.

IT SHOULD HAVE FLEXIBILITY:

It should be flexible to apply any needful changes when it requires.

IT SHOULD GUARANTEE THE MINIMUM WAGES:

It must guarantee to the employees and workers at least minimum wage because it means a lot to them.

IT SHOULD GIVE INCENTIVE TO WORK:

It should give sufficient incentives to employees and worker to work hard and with great care. It should give a chance to them show or to prove their ability and so that they can earn more with their ability and efficiency.

IT SHOULD BE SIMPLE:

It should be simple and easy to adopt it in any industry.

IT SHOULD BE SATISFACTORY:

It should be satisfactory from the point of view of both the employees and employers. The reward to the employees should be fair and must give low cost per unit to the employer.

7. FACTORS AFFECTING TO LABOUR PRODUCTIVITY :

“Mind your men; your men will mind all other things.” This sentence shows the importance of labour in management. There are many factors which affect the labour productivity. They are as under:⁽¹³⁾

Fig. 5.1



(Source: Adolph Matz and Milton F. Usry,
“Cost Accounting, Planning and control”
[Bombay : D.B. Tarpaorevala Sons & Co. 1997]
P.no.397)

- **ABILITY TO WORK:**

Ability to work as personal factors such as skills, training, knowledge physical and mental health, positive attitude affect the labour productivity. If a worker is skilled, knowledgeable, trained, physically and mentally strong and positive attitude performance.

- **WILL TO WORK:**

Will to work is the second factor which affects the employees' performance as well as labour productivity. If a employee is given financial or non-financial motivation, it creates a new interest in him to do the work more efficiently. Today, many multinational companies give the motivational support to their and workers. They invite the big celebrity like a film-star or a cricketer who are believed as a ideal person.

- **COMFORTABLE WORKING ENVIRONMENT:**

Work environment and working condition are also affecting factors to the labour productivity. If the employees or workers have been given favorable work environment and suitable working condition, the employees give their best performance in their work.

- **PARTICIPATION IN DECISION MAKING:**

Generally, the policy level decisions have been taken by the top management. They don't give the chance to their employees and workers in their decision making process. But if the employees and workers have been invited in participation in decision making, they give their suggestions and ideas about the matter. It grows up their confidence level. And they also give better performance because they have become a part of decision making process.

- **WAGE SYSTEMS:**

Productive wage systems, bonus facility and participation in profit also affect the labour productivity. If the company offer productive wage systems, bonus facility and participation in profit. It creates a new enthusiasm in their employees and workers which indirectly increases the labour productivity. Many companies give the protection of their lives by offering insurance schemes which also affects the labour productivity.

Today, productivity is the need of the hour in the country. So wage systems might be proper, if the scheme of linking bonus with productivity should receive acceptance from every corner. In any production system, the human element is the key factor. So the basic requirement of an intensive scheme will be that the contribution of the employee towards productivity should be identifiable and finite.

8. LIMITATIONS OF LABOUR PRODUCTIVITY:

Labour productivity is an uncertain & simply a partial measure of productivity of the industry. It does not count even the specific contribution of labour because of factor substitution. Sometimes, it would be seen that labour force is replaced by new and advanced technology which may increase the productivity ratio because in that case output increases and labour input decreases. This seems to be one of the reasons that the productivity of Indian labour is comparatively much less that that of labourers of developed countries. So that, decisions based on this measure about total factor productivity may sometimes lead to erroneous conclusions. Labour productivity is not only affected by the productive efficiency of the labour but other factors are also responsible for the same.

9. LABOUR PRODUCTIVITY IMPROVEMENT TECHNIQUES:

The techniques for improving productivity have changed powerfully in order to keep pace with the changing form of organization. Productivity techniques play a vital role

in any organization. If you have a technique to improve productivity, then you can get more output from the same or less input. These techniques can be defined as under:⁽¹⁴⁾

- **COMMUNICATION:**

Communication means the adequate and timely flow of information with a feedback mechanism. The object of effective and proper communication is to do mutual understanding between the employees and the top management and to create the social atmosphere that will motivate the employee to improve productivity.

- **EMPLOYEE PROMOTION:**

Promotion policy is one of the most important policy in any organization. It is both financial and non-financial form of motivation to increase the labour productivity. It is a natural way of knowing an employees skill, knowledge, efficiency and efforts of their present job.

- **INDIVIDUAL FINANCIAL INCENTIVES:**

It is certain that, individual incentives can increases the labour productivity in any industry. These are many individual financial incentive plans which are used in organization. Some of them are as under:

- Time work plan,
- Piece work plan,
- Halsey plan,
- Rowan plan,
- Bedaux plan,
- Merrick's multiple piece rate plan,
- Taylor's differential wage plan etc.

- **GROUP FINANCIAL INCENTIVES:**

The second type of financial incentives is Group financial incentives. Some of them are as follows:

- Participation in profit,
- Savings plan,
- Target plan [Attractive wages & bonus]

- **FRINGE BENEFITS:**

Fringe benefits are one of the important techniques. If you give fringe benefits to your employees, it would increase their efficiency in the form of productivity. These benefits are as under:

- Medical Insurance,
- Disability Insurance,
- Entertainment, Allowance,
- Free education,
- Home Rent Allowance, etc.

- **JOB ENRICHMENT:**

Job enrichment is a non-financial motivational technique which provides feedback of different efficiency in given tasks.

- **JOB ROTATION:**

Job Rotation means rotation of workers into different work for short period of time. It is the technique which provides an opportunity to workers to learn and perform tasks

for which they were not originally hired. This concept gives “All Rounder” in the long run.

- **RECRUITMENT & INTENSIVE TRAINING:**

The recruitment and training is the first step in the employment of labour. If the labour is not recruited properly, it may prove to be unit and inefficient for the job and the production will suffer.

Intensive training must be an on-going factor, if total productivity is to be improved on a consistent basis. Training maintains the previous skill and experience, adds new knowledge and skill, brings flexibility in manning and keeps employees updated and trim. It minimizes the labour turnover rate and acts as a motivator by adding in the growth of man.

- **TIME MANAGEMENT:**

Time factor is a crucial factor for any productivity. Time management always affects the labour productivity. It concentrates on wasteful elements and improves it very well.

- **WORKER PARTICIPATION:**

Worker participation in decision making process is one of the techniques to increase the labour productivity. It is the emotional and mental element to encourage the person to give their opinion and suggestion in decision making policy and to share their responsibilities in them. Worker participation is a concept to overcome resistance through employees' involvement.

- **INDUSTRIAL DEMOCRACY:**

Industrial Democracy is another employee based labour productivity improvement technique to stimulate the labour productivity. Industrial democracy can only be

fruitful. When there is mutual understandings, trust and co-operation among the employees. If employees are given industrial democracy with special reference to good working condition then it will definitely improve their efficiency in the form of labour productivity.

- **CAN DO APPROACH:**

Can do approach is a new attitude which encourage the employees. It creates self-confidence and willpower in them. Every organization should follow this attitude to increase the labour productivity with this attitude we can say, “ Employees are nothing but they can do everything”.

10. STEPS IN ACCOUNTING FOR LABOUR PRODUCTIVITY:

- **HYPOTHESIS:**

Productivity ratios and indices are based on total output and labour input. Labour productivity is computed for the aim of interpreting and analyzing the labour productivity of co-operative Dairy and Milk Supply Units of Gujarat State. Two hypothesis based on statistical methods are used. One hypothesis is based on chi-square test and another is based on kruskal Wallis one was analysis of variance test. The hypothesis has been tested to overcome the difficulty of interpreting and analyzing the result.

- **NULL HYPOTHESIS:**

“Labour productivity indices can be represented by the straight line trend based on least square method.”

- **ALTERNATIVE HYPOTHESIS:**

“Labour productivity indices can be represented by the straight line of best fit.”

- **LEVEL OF SIGNIFICANCE:**

5 percent.

- **STATISTICAL TEST USED:**

Chi-square test.

- **CRITICAL VALUE:**

2.17

Another null hypothesis has been used to see if there is any significant difference between the labor productivity ratios of the Dairy Industry of Gujarat State. This hypothesis is based on Kruskal Wallis one way analysis of Variance test. For the acceptance of null hypothesis, the critical value of chi-square test remains more than the calculated value. If critical value is less than the calculated value, the alternative hypothesis will be considered. The acceptance of the indices based on least square, straight line trend may truly represent the style and growth of Labour productivity.

Second test,

- **NULL HYPOTHESIS:**

“There is no significant difference between the labor productivity of the co-operative Milk dairy plants of Gujarat State.”

- **ALTERNATIVE HYPOTHESIS:**

“There is no significant difference between the labor productivity of the co-operative Milk dairy units of Gujarat State.”

- **LEVEL OF SIGNIFICANCE:**

5 Percent

- **STATISTICAL TEST USED:**

Kruskal Wallis one-way Variance test.

- **CRITICAL VALUE:**

2.17

- **CALCULATION OF LABOUR PRODUCTIVITY:**

Labour productivity ratio is calculated by dividing output value to input value of Labour. This ratio is generally known as Labour productivity. Here, total output is a result of combination of all inputs such as material, labour, overhead, capital etc. There fore, co-efficient of factorial productivity is multiplied with the O/I ratio and net productivity/co-efficient factorial productivity is also calculated.

Labour productivity indices is assumed 100 for the base year and the base year is 1996-'97 for the research period. Labour productivity indices below 100 states that there is decrease in productivity and above 100 state that there is an improvement in productivity of the base year. Input –output ratio shows about input used for a rupee of output. This ratio also helps in estimating possible savings.

- **CALCULATION OF POSSIBLE SAVINGS IN LABOUR INPUT:**

The possible saving in Labour is calculated on the basis of the following formula:

$$\text{POSSIBLE SAVING} = \text{Actual Input} - \text{Standard Input.}$$

Here, the term Actual Input means the actual amount of Labour input and the product of minimum requirement per rupee of output during the research period.

11. LABOUR PRODUTIVITY ACCOUNTING IN THE CO-OPERATIVE DAIRY INDUSTRY OF GUJARAT STATE:

Productivity process is nothing but the process of raw material to the finished goods with the help of man-power, money power and some other factors. Labour productivity is one of the basic and crucial factors of any economic development. Because it is related to Hyman being factor which gives contribution in increasing production and productivity directly or indirectly. According to M.Dillon,

“Productivity, expressed as a numerical relationship between output and input depends to a significant extent on the way in which financial and material resources are developed, but the greatest single influence on productivity performance is the degree to which the inherent potential of the human resource is realized. Labour productivity is a concept of production and measures its success. It indicates how efficiently and effectively the manpower can be utilized by the co-operation dairy and milk supply units of Gujarat state. By this calculation one can check the efficiency of man-power in the process and can decide this stands for the total requirements of input Labour to output. The Labour productivity accounting for the co-operative dairy and milk supply units are calculated as under:

Table 5.1
Labour Productivity of " Amul Dairy" - Anand

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	4,001,021,578	128,000,304	31.258	100.00	98.02	0.0320	113,220,892	14,779,412
1997-98	4,173,534,355	127,691,511	32.685	104.57	99.11	0.0306	118,102,657	9,588,854
1998-99	4,623,462,516	156,533,425	29.537	94.49	100.21	0.0339	130,834,723	25,698,702
1999-00	4,871,408,788	154,106,626	31.611	101.13	101.31	0.0316	137,851,105	16,255,521
2000-01	5,091,912,736	156,464,511	32.544	104.11	102.40	0.0307	144,090,925	12,373,586
2001-02	4,687,806,783	159,497,195	29.391	94.03	103.50	0.0340	132,655,536	26,841,659
2002-03	4,883,366,669	152,768,815	31.966	102.27	104.59	0.0313	138,189,489	14,579,326
2003-04	5,459,302,648	154,487,323	35.338	113.05	105.69	0.0283	154,487,323	0
2004-05	6,004,696,000	177,938,000	33.746	107.96	106.78	0.0296	169,920,862	8,017,138
Total	43,796,512,073	1,367,487,710	288.076	921.61	921.61	0.2820	1,239,353,512	128,134,198
Average	4,866,279,119	151,943,079	32.008	102.40	102.40	0.0313	137,705,946	14,237,133

Standard Deviation : 32.4427
Co-efficient of variation : 31.6819

Chi-Square : 0.24

LABOUR PRODUCTIVITY IN AMUL DAIRY – ANAND:

The table 5.1 indicates the mathematics data regarding input of Labour, output, Output-Input ratio, productivity indices, Trend value, Input-output ratio, Co-efficient factor and possible savings. It also creates some statistical data of variation, Chi-square and growth rate of Amul dairy from the year 1996-'97 to 2004-'05.

So for the output of Amul Dairy is concern, it is clear from the table that it increases from 400.10 crores in 1996-'97 to 509.19 crores in 2000-'01. The fluctuation expansions of output works out to be 27.27%. While in case of input of Labour, it increases from 12.80 crores in 1996-'97 to 15.65 crores in 2000-'01. The fluctuation expansions of input of material work out to be 22.27%. Here, output increases more than the input of Labour during this particular period. It shows positive trend of labour Productivity of Amul Dairy. Then after, in the year 2001-'02 output decreases high. And input of labour decreases in the year 2002-'03. Then, output increases from 488.34 crores in the year 2002-'03 to 600.47 crores in the year 2004-'05. So, the fluctuation expansion comes out to be 22.96%. On the other hand, input of labour increases from 15.28 crores in the year 2002-'03 to 17.79 crores in the year 2004-'05. The fluctuation spread of input of labour comes out to be 16.43%. So, during this period output is increasing more than the input of labour. From these figures, it can be said that there is good labour Productivity of Amul Dairy. Productivity ratio with the help of co-efficient of factorial productivity moves in mixed trend during the research period.

Labour productivity ratio [O-I ratio] comes out 31.258 for the base year i.e. 1996-'97. The average productivity ratio comes out 32.008 pr the research period. The O-I ratio of 1997-'98 [32.685], 2000-'01 [32.544], 2003-'04 [35.338] and 2004-'05 [33.746] are registered higher than the average ratio while the O-I ratio of 1998-'99 [29.537], 1999-'00 [31.611] 2001-'02 [29.391] and 2002-'03 [31.366] are registered lower than the average ratio. By viewing this mathematical picture, it can be said that it is overall good performance and average productivity of the dairy.

The factorial Labour productivity in the base year is 0.7324. It increases in the first initial year and reaches to 0.7780. Then it decreases in the year 1998-'99. Then after it increases and reaches to 0.7688 in the year 2000-'01. So, it continuously fluctuates upward and downward ways. The average factorial Labour productivity ratio is 0.7523 which is higher than the base year's ratio. It shows overall positive trend of Labour productivity during the study period. It can be said that productivity of any individual factor is not dependent only on an individual input but it will be affected much by other factors also like material and overheads.

The productivity index which is 100 for the base year 1996-'97. It increases in initial first year to 104.57 in the year 1997-'98. Then it decreases and reaches to 94.49 in the year 1998-'99. Then it increases and reaches to 104.11 in the year 2000-'01. Then again it decreases to 94.03 in 2001-'02 which is the minimum level during the research period. Then again it increases and reaches to 113.05 in the year 2003-'04. So for the analytical point of view is concerned, productivity index draws an idea about the variation in output-Input ratio for the study period. The table indicates that the average productivity index comes out to 102.40 which are more by 2.40% from the base year. It indicates an overall increasing trend and supports the view that manpower management or labour productivity has improved in Amul Dairy which helps to reduce some losses of labour automatically.

The overall result of labour productivity is considered in reference to value of standard deviation, co-efficient variation and chi-square. Standard deviation of the Amul Dairy is 32.44 and the co-efficient of variation is 31.68. It clears that there is no much variation in the productivity indices. The calculated value of chi-square is 0.24 while the critical value of chi-square 2.17. So the calculated value is less than the critical value and it allows the acceptance of null hypothesis, "Labour productivity indices can be represented by the straight line trend based on least square method." It means "There is no significant difference between the labour productivity of the cooperative milk dairy plants. "The calculated value of the productivity index. The average requirement of labour per rupee of output for Amul Dairy is 0.03. Input-output ratio is the lowest during the year 2003-'04. It clears that the unit gets its maximum efficiency in labour during this year. Moreover, the table also indicates that the possible savings in labour input comes out at 1.42 crores per year for the dairy.

Labour Productivity of Amul Dairy - Anand.

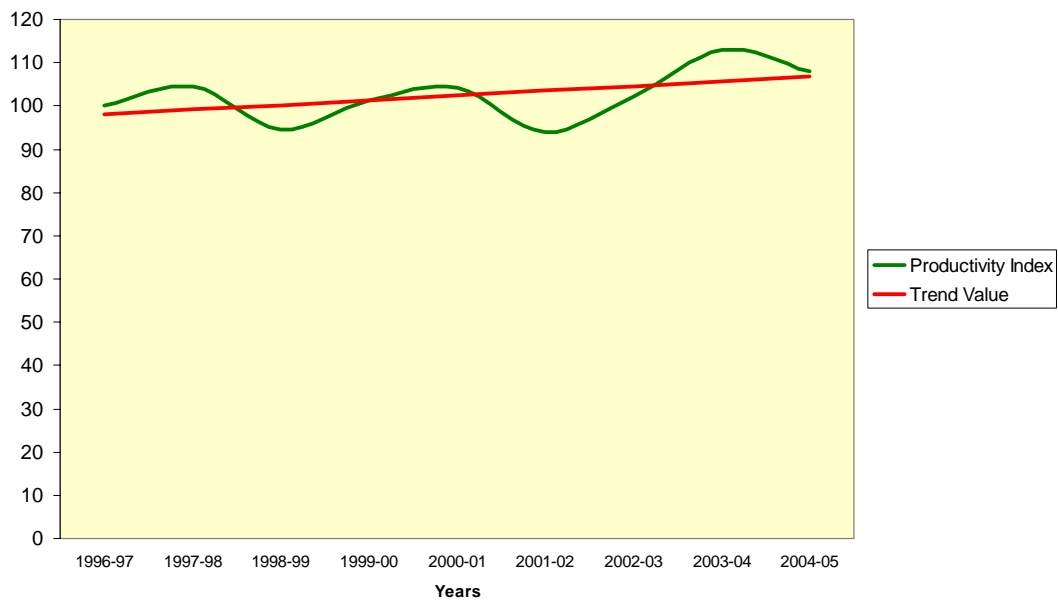


Table 5.2
Labour Productivity of "Gopal Dairy" - Rajkot

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	174,685,012	21,063,291	8.293	100.00	85.32	0.1206	8,766,720	12,296,571
1997-98	216,556,153	24,308,887	8.909	107.43	102.87	0.1123	10,868,060	13,440,827
1998-99	268,575,714	29,073,730	9.238	111.40	120.43	0.1083	13,478,707	15,595,023
1999-00	372,833,832	35,570,587	10.482	126.40	137.98	0.0954	18,710,991	16,859,596
2000-01	458,274,780	37,606,273	12.186	146.94	155.54	0.0821	22,998,920	14,607,353
2001-02	506,238,891	37,904,796	13.356	161.05	173.09	0.0749	25,406,041	12,498,755
2002-03	678,063,418	37,797,992	17.939	216.31	190.65	0.0557	64,029,205	3,768,787
2003-04	665,709,864	42,244,729	15.758	190.02	208.20	0.0635	33,409,231	8,835,498
2004-05	871,822,330	43,753,165	19.926	240.27	225.76	0.0502	43,753,165	0
Total	4,212,759,994	309,323,450	116.087	1399.82	1399.82	0.7630	241,421,040	97,902,410
Average	468,084,444	34,369,272	12.899	155.54	155.54	0.0848	26,824,560	10,878,046

Standard Deviation : 2262.46
Co-efficient of variation : 1454.62

Chi-Square : 1.30

LABOUR PRODUCTIVITY IN GOPAL DAIRY – RAJKOT:

The table 5.2 provides the number regarding labour productivity of Gopal Dairy of Rajkot and generates necessary statistical data of the research statistical data of the research period.

In reference to Gopal Dairy's output, it is appraised from the table that it increases from 17.47 crores in 1996-'97 to 50.62 crores in 2001-'02. The fluctuation spread of output works out to be 189.75%. Moreover, the input of labour increases from 2.11 crores in 1996-'97 to 3.97 crores in 2001-'02. The fluctuation spread of labour input works out to be 79.62%. Here it respectfully states that output is more increases than input during the research period of Gopal Dairy. It indicates positive trend of labour productivity in the dairy. The productivity ratio, which is generated with the help of co-efficient of factorial productivity, moves in upward and downward ways but mostly it seems in upward ways during the research period.

Labour productivity ratio [O-I ratio] works out 8.293 for the base year 1996-'97. The average productivity ratio of the unit works out 12.899 for the period of the study. O-I ratio of 2001-2002 [13.356], 2002-2003 [17.939], 2003-'04 [15.758], 2004-'05 [19.926] are recorded higher than the average of the research period while the O-I ratio of 1997-'98 [8.909], 1998-'99 [9.238], 1999-'00 [10.482], 2000-'01 [12.186] are recorded lower than the average of the research period. This clears that its overall good performance and average productivity of the dairy.

Factorial labour productivity is computed on the basis of co-efficient of productivity. The factorial productivity ratio of the base year 0.4405. Then it decreases in the first three initial years and reaches to 0.3630. Then after it increases continuously for three years and reaches to 0.4483. Then it decreased to 0.4142 and again it increases and reaches to 0.4707. The average factorial labour productivity ratio is 0.4057. In this reference, the table states that the average productivity ratio is lower than the base year's ratio. So, overall it seems the negative trend of labour productivity during the research period.

The productivity index, which is 100 for the base year 1996-'97 then it continuously increases and touches to 216.31 in the year 2002-'03. The it decreases to 190.02 in 2003-'04 and again it increased and reaches to 240.27 in the year 2004-'05. From the interpreting view, productivity index gives an idea about the variation in output-input ratio for the years under the study. The table indicates the average productivity index is 155.54, which is more by 55.54% from the be year. It states an overall positive trend and supports the view that labour productivity has improved substantially in Gopal Dairy which decreases some losses of labour automatically.

The overall result of labour productivity is considered in reference to the value of standard deviation, co-efficient of variation and chi-square. Standard deviation of Gopal Dairy is 2262.46 and co-efficient of variation is 1454.58. It clears that there is some variation in the productive indices. The calculated value of chi-square is 1.30 while the critical value of chi-square is 2017. So, the calculated value is less than the critical value and it allows the acceptance of null hypothesis' Labour productivity indices can be represented by the straight line trend based on least square method." It means" There is no significant difference between the labour productivity of the co-operative milk dairy plants." The calculated value of the productivity index. The average requirement of labour per rupee of output for Gopal Dairy is 0.08. Input-output ratio is the lowest in the year 2004-'05. It evident that the unit gets its maximum efficiency in labour during this year moreover, the table clears that the possible savings in labour input comes out at 1.09 crores per year for the dairy.

Labour Productivity of Gopal Dairy - Rajkot.

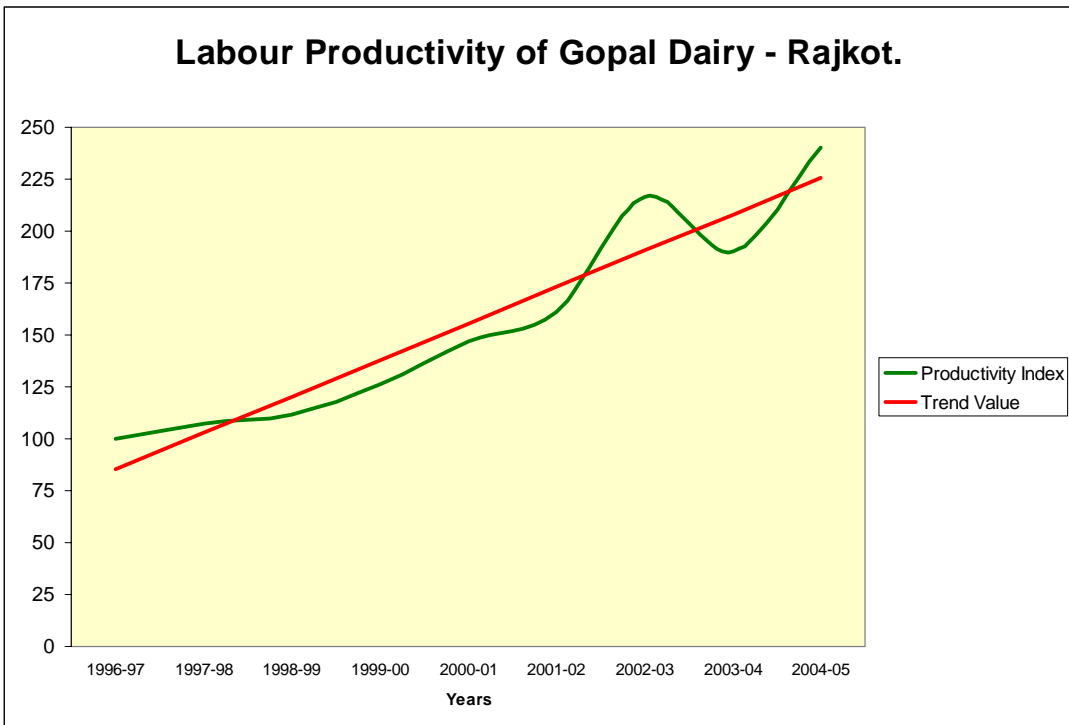


Table 5.3
Labour Productivity of "Uttam Dairy" - Ahmedabad

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	511,784,952	29,327,902	17.450	100.00	97.36	0.0573	28,985,733	342,169
1997-98	573,701,471	33,661,355	17.043	97.67	96.11	0.0587	32,492,471	1,168,884
1998-99	689,645,318	39,405,997	17.501	100.29	94.86	0.0571	39,059,131	346,866
1999-00	687,372,508	43,882,014	15.664	89.77	93.62	0.0638	38,930,407	4,951,607
2000-01	734,114,121	49,664,524	15.990	91.63	92.37	0.0625	44,975,883	4,688,641
2001-02	808,915,447	54,888,170	14.738	84.46	91.12	0.0679	45,814,179	9,073,991
2002-03	850,566,046	61,218,826	13.894	79.62	89.87	0.0720	48,173,126	13,045,700
2003-04	906,794,648	59,939,286	15.129	86.70	88.63	0.0661	51,357,719	8,581,567
2004-05	1,064,493,178	60,289,220	17.656	101.18	87.38	0.0566	60,289,220	0
Total	6,827,387,689	432,277,294	145.065	831.32	831.32	0.5620	390,077,869	42,199,425
Average	758,598,632	48,030,810	16.118	92.37	92.37	0.0624	43,341,985	4,688,825

Standard Deviation : 54.5818
Co-efficient of variation : 59.0911

Chi-Square : 0.49

LABOUR PRODUCTIVITY IN UTTAM DAIRY – AHMEDABAD:

The table 5.3 provides the data regarding input of labour and output. It reveals the labour productivity ratio and also calculates co-efficient of variation, standard deviation, value of chi-square, growth rate of the Uttam Dairy from the year 1996-'97 to 2004-'05.

Regarding to Uttam Dairy's output, it is evident from the table that it is incur from crores in 1996-'97 to 68.96 crores in 1998-'99. Then it decreases and after it continuously increases. The fluctuation spread of output work out to be 34.74%. Moreover, in case of input of labour, it increases from 2.93 crores in 1996-'97 to 3.94 crores in 2002-'03. The fluctuation Spread of input works out to be 34.47%. Here, the output increases more than the input. It indicates positive trend of labour productivity of Uttam Dairy. Then after, in the year 1999-'00 output decreases and then it increases continuously till the year 2004-'05. Then, till the year 2002-'03 input of labour increases constantly. It decreases in the year 2003-'04. And then, in the last year i.e. 2004-'05 it again increase. The productivity ratio with the help of the co-efficient of factorial productivity moves in upward and downward ways during the research period.

Labour productivity ratio [O-I ratio], which is 17.450 for the base year I.e. 1996-'97. The average productivity ratio of the unit is 16.118 for the period of study. O-I ratio of 1997-'98 [17.043], 1998-'99 [17.501], 2004-'05 [17.656] are recorded higher than the average of the period. While during the years 1999-'00 [15.664], 2000-'01 [15.990], 2001-'02 [14.738], 2002-'03 [13.894], 2003-'04 [15.129], it was recorded below the average ratio of the time by seeing this figures. It can be said that it should be medium qualitative manpower and not utilization of latest technology in the dairy.

Factorial productivity is computed on the basis of co-efficient of productivity. The factorial productivity ratio of the base year is 0.5206. Then it continuously increases till 1999-'00 to 0.5388. Then it decreased till 2002-'03 to 0.4825. Then again it increased to 0.5361 in the year 2003-'04 and again it decreased to 0.5255 in 2004-'05. The average productivity ratio is 0.5243 which is higher than the base year's ratio. It

shows overall positive trend of labour productivity during the period of the study. It can be said that productivity of any individual factor is not dependent only on an individual input but it will be effected much by other factors also like material and overheads.

The productivity index, which is 100 for the base year [1996-'97]. It decreases in the first initial year but then it increases and reaches to 100.29 in the year 1998-'99. Then, again it decreases and touches to 89.77 in the year 1999-'00. Then, after it stays in continuous increasing-decreasing trend. In the year 2004-'05, it reaches to 101.18. The productivity index reflects an idea about the variation in output-input ratio for the research period. The average productivity index is 92.37 which is less by 7.63% from the base year. It indicates the negative trend and clears that there should not be used qualitative manpower properly and fully, in the dairy.

The overall result of labour productivity is considered in reference to the value of standard deviation, co-efficient of variation and Labor chi-square standard deviation of Uttam Dairy is 54.58 and co-efficient of variation and is 59.09 so there is no much variation in the productivity in diets. The calculated value of chi-spear is 0.49 while the critical value of 2.17. so the clause of chi-square is less than the critical vale and it allows the acceptance of null hypothesis. 'Labour productivity in dices can be represented by the straight line trend based on least square method' It means 'there is no significant difference between the labour productivity of the co-operative milk dairy plants' productivity index. The average requiring of labour rupee of output for Uttam Dairy is 0.06 input-output ratio is the lowest in the year 2004-'05. It proves the unit gets its maximum effetely in labour during this year .that the possible savings in labour input comes out at 46.89 lass per year for the dairy.

Labour Productivity of Uttam Dairy - Ahmedabad.

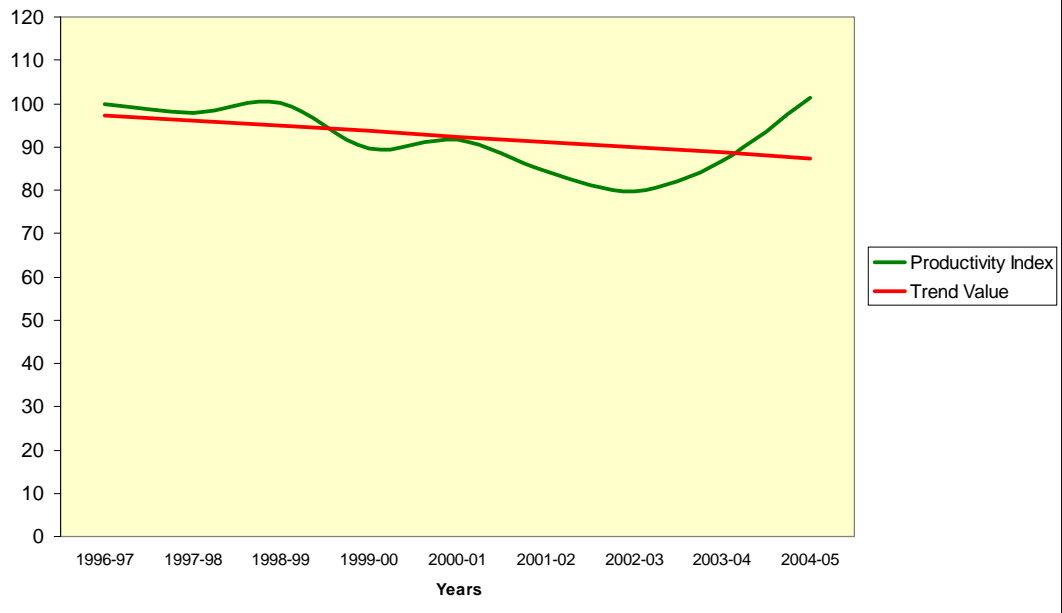


Table 5.4
Labour Productivity of "Madhur Dairy" - Gandhinagar

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	290,221,515	6,083,658	47.705	100.00	103.18	0.0210	6,047,505	36,153
1997-98	360,325,063	7,508,291	47.990	100.60	98.08	0.0208	7,508,291	0
1998-99	410,278,514	9,836,433	41.710	87.43	92.97	0.0240	8,549,198	1,287,235
1999-00	489,815,303	11,569,246	42.338	88.75	87.87	0.0236	10,206,550	1,362,696
2000-01	552,144,201	12,230,412	45.145	94.63	82.77	0.0222	11,505,332	725,080
2001-02	606,154,453	16,182,436	37.458	78.52	77.66	0.0267	12,630,773	3,551,663
2002-03	649,934,804	19,531,821	33.276	69.75	72.56	0.0301	13,543,048	5,988,773
2003-04	666,809,710	23,425,196	28.465	59.67	67.45	0.0351	13,894,680	9,530,516
2004-05	738,683,878	23,624,075	31.268	65.54	62.35	0.0320	15,392,361	8,231,714
Total	4,764,367,441	129,991,568	355.355	744.89	744.89	0.2355	99,277,738	30,713,830
Average	529,374,160	14,443,508	39.484	82.77	82.77	0.0262	11,030,860	3,412,648

Standard Deviation : 203.44
Co-efficient of variation : 245.79

Chi-Square : 0.38

LABOUR PRODUCTIVITY IN MADHUR DAIRY – GANDHINAGAR:

The table 5.4 provides the data regarding input of labour, output, and labour productivity ratio, productivity indices, trend value, input-output ratio, co-efficient factor and possible saving. It also calculates some statistical data such as standard deviation, chi-square, co-efficient of variation and growth rate of Madhur Dairy for the year from 1996-'97 to 2004-'05.

As regard the output of Madhur Dairy, it is evident from the table that it increases from 29.02 crores in 1996-'97 to 73.87 crores in 2004-'05. The fluctuation Spread of output comes out to be 154.55%. While in case of input of labour it increases from 60.84 lacs in 1996-'97 to 2.36 crores in 2004-'05. The fluctuation spread of labour input comes out to be 288.30%. Here, this mathematical figures show that the input of labour is increasing more than the output. It indicates the negative trend of labour productivity of Madhur Dairy productivity ratio with the help of co-efficient of factorial productivity stays in mixed trend during the study period.

Labour productivity ratio [O-I ratio] comes out 47.705 for the base year i.e. 1996-'97. The average productivity ratio comes out 39.484 for the period of the study. The O-I ratio of 1997-'98 [42.338], 2000-'01 [45.145] are recorded higher than the average ratio. While the O-I ratio of 2001-'02 [37.458], 2002-'03 [33.276], 2003-'04 [28.465], 2004-'05 [31.268] are recorded lower than the average ratio. By seeing this numerical result, it can be said that it is overall good performance of the dairy.

The factorial labour productivity for the base year is 0.8246. Then it decreases and reaches to 0.5056 in the year 1999-'00. Then it increases for one year and again it decreases in the rest years. In the year 2004-'05, it increases and touches 0.6293. The average factorial labour productivity ratio is 0.5930 which is lower than the base year ratio. It indicates negative trend of labour productivity during the period of the research work.

The productivity index is 100 for the base year 1996-'97. It increases in the first initial year but then it decreases. Then after it increases and reaches to 94.63 in the year 2000-'01. But again it decreases and loaches to 59.67 in the year 2003-'04. In the year 2004-'05 it increases to 65.54. So for the analytical point of view is concerned, productivity index draws an idea about the fluctuation in output-input ratio for the research period. The average productivity index works out to be 82.77 which is less than by 17.23% from the base year. It clears the negative trend and gives the support that there should not be used qualitative manpower fully and properly.

The overall result of labour productivity is taken in to consideration with the help of standard deviation value, co-efficient of variation value and chi-square value. Standard deviation of the Madhur Dairy is 203.44 while co-efficient of variation is 245.79, it makes clear that there is some variation in the productive indices. The calculated value of chi-square is 0.38 while the critical value of chi-square is 2.17. So, it clears that the calculated value is less than the critical value. It allows the acceptance of null hypothesis, "Labour productivity indices can be represented by the straight line trend based on least square method." It means, "There is no significant difference between the labour productivity of the co-operative milk dairy plants." The calculated value of productivity index. The average requirement of labour per rupee of output for Madhur Dairy is gone down in the year 1997-'98. It is an evident that the unit gets its maximum efficiency in labour during this year. Moreover, the table states clear that the possible savings in labour input comes out at 34.13 lacs per year for dairy.

Labour Productivity of Madhur Dairy - Gandhinagar.

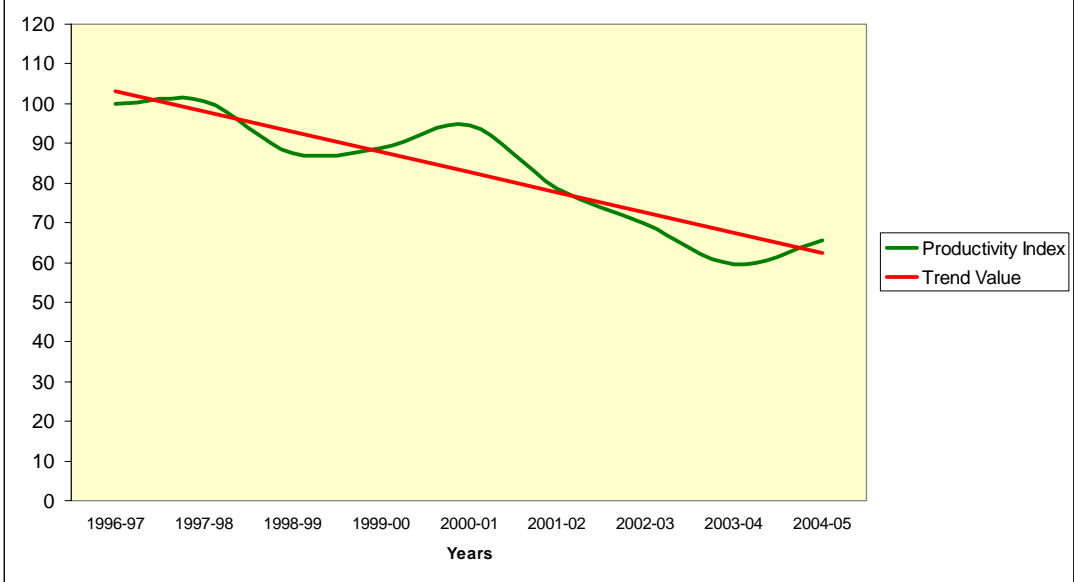


Table 5.5
Labour Productivity of "Sugam Dairy" - Baroda

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	1,279,285,046	88,877,490	14.394	100.00	98.15	0.0695	88,877,490	0
1997-98	1,368,463,465	101,318,375	13.507	93.84	95.33	0.0740	95,073,102	6,245,273
1998-99	1,559,187,195	118,207,069	13.190	91.64	92.50	0.0758	108,323,508	9,883,561
1999-00	1,759,366,077	132,549,713	13.273	92.21	89.67	0.0753	122,230,805	10,318,908
2000-01	1,929,278,983	161,848,841	11.920	82.81	86.85	0.0839	134,035,393	27,813,448
2001-02	2,034,018,057	167,780,963	12.123	84.22	84.02	0.0825	141,312,071	26,468,892
2002-03	2,300,039,628	190,484,800	12.075	83.89	81.19	0.0828	159,793,746	30,691,054
2003-04	2,479,889,172	224,890,718	11.027	76.61	78.36	0.0907	172,288,675	52,602,043
2004-05	2,578,392,763	234,498,738	10.995	76.39	75.54	0.0909	179,132,147	55,366,591
Total	17,287,920,386	1,420,456,707	112.504	781.61	781.61	0.7254	1,201,066,937	219,389,770
Average	1,920,880,043	157,828,523	12.500	86.85	86.85	0.0806	133,451,882	24,376,641

Standard Deviation : 282.28
Co-efficient of variation : 325.02

Chi-Square : 0.05

LABOUR PRODUCTIVITY IN SUGAM DAIRY – BARODA:

The table 5.5 gives the numerical picture regarding labour productivity of Sugam Dairy of Baroda and finds out necessary period, i.e. 1996-'97 to 2004-'05.

As the output of Sugam Dairy is concerned, it is clear from the table that it increases from 127.93 crores in 1996-'97 to 257.84 crores in 2004-'05. The fluctuation spread of output works out to be 101.55%. While in case of labour input, it increases from 8.89 crores in 1996-'97 to 23.45 crores in 2004-'05. The fluctuation spread of input works out to be 163.78%. Here, input of labour is increasing more than the output. These figures say that there is a negative trend of labour productivity in Sugam Dairy. Productivity ratio with the backing of co-efficient of factorial productivity moves in mixed trend during the study period.

Labour productivity ratio [O/I ratio] comes out 14.394 for the base year 1996-'97. The average productivity ratio comes out 12.500 for the study period. The O-I ratio of 1997-'98 [13.507], 1998-'99 [13.190] and 1999-'00 [13.273] are recorded higher than the average ratio while, the O-I ratio of 2000-'01 [11.920], 2001-'02 [12.123], 2002-'03 [12.075], 2003-'04 [11.027] and 2004-'05 [10.995] are recorded lower than the average ratio. These figures indicate that it should be medium qualitative manpower and not utilization of latest technology in the dairy.

The factorial labour productivity in the base year is 0.5353. It decreases in the first initial year. Then it increases and reaches to 0.5487 in the year 1998-'99. Then it continuously decreases for five years and touches to 0.4353 in the year 2003-'04. In the year 2004-'05, it increases but not so significantly. So, overall, it can be said that, it continuously moves in downward ways. The average factorial productivity ratio is 0.4982 which is lower than the base year's ratio. It makes clear that there is an overall negative trend of labour productivity during the research period. It should be said that productivity of any individual element does not depend only on a individual input but it is very sensitive with respect to other factors also like material and overheads.

The productivity index which is 100 for the base year 1996-'97. Productivity index means that it is the reflection of variation in output –input ratio. In the first initial two years, it decreases and reaches to 91.64 in the year 1998-'99. Then, it increases and reaches to 92.21 in the year 1999-'00. Then after, it decreases and increases for one year each. Then, from the year 2001-'02, it constantly decreases and touches to 76.39 in the year 2004-'05. Productivity index comes on an 13.15% from the base year. So, overall, it indicates the negative trend. It makes also clear that there should not be used qualitative manpower properly and fully in the dairy.

The overall result of labour productivity is considered in reference to the value of standard deviation, co-efficient of variation and chi-square value. Standard deviation of the Sugam Dairy is 282.28 and co-efficient of variation is 325.02. It indicates that there is some variation in the productive indices. The calculated value of chi-square is 0.05 while the critical value is 2.17. So, the calculated value is less than the critical value. It supports to accept null hypothesis, "Labour productivity indices can be represented by the straight line trend based on least square method." It means, "There is no significant difference between the labour productivity of the co-operative milk dairy plants." The calculated value of productivity index. The average requirement of the labour per rupee of output for Sugam Dairy is 0.08. Input-output ratio is the lowest in the year 1996-'97 i.e. Base year. It is an evident that the unit gets its maximum efficiency in labour during this year. The table also says that the possible savings in labour input comes out at 2.44 crores per year the sugam Dairy.

Labour Productivity of Sugam Dairy - Baroda.

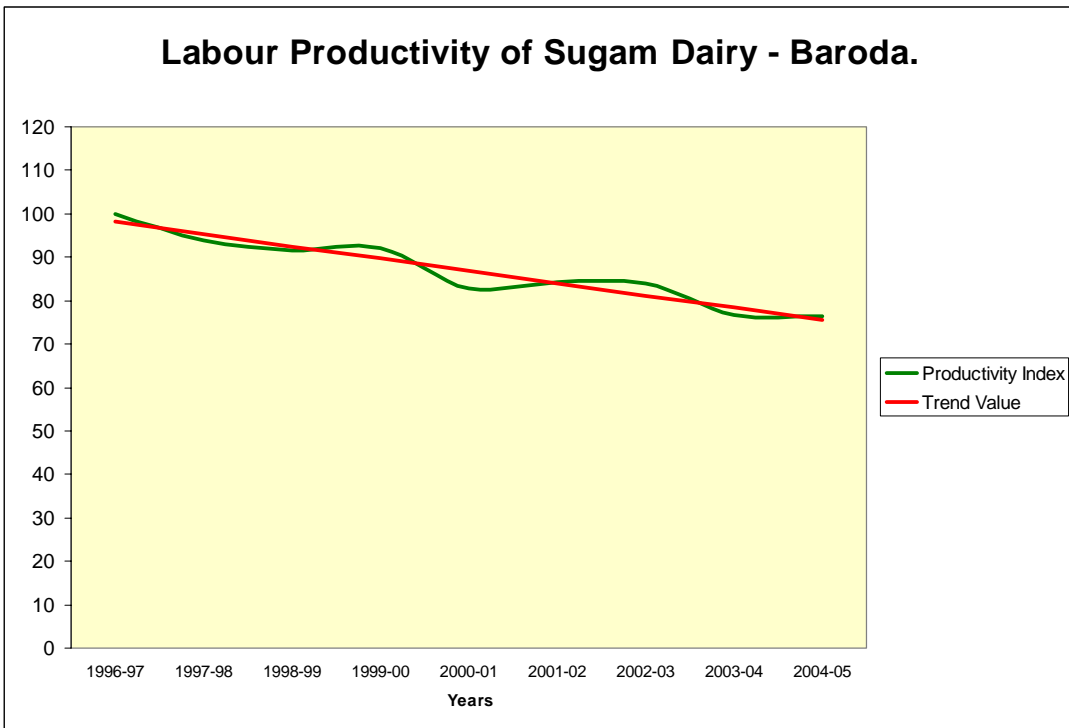


Table 5.6
Labour Productivity of "Dudhsagar Dairy" - Mehsana

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	4,554,175,019	106,161,810	42.898	100.00	113.03	0.0233	87,062,267	19,099,543
1997-98	5,377,138,889	106,344,135	50.564	117.87	107.26	0.0198	102,794,887	3,549,248
1998-99	6,529,840,740	124,831,114	52.309	121.94	101.50	0.0191	124,831,114	0
1999-00	6,591,432,019	179,151,456	38.332	89.36	95.73	0.0261	131,281,319	47,870,137
2000-01	6,657,700,671	184,333,643	35.758	83.36	89.97	0.0280	126,008,556	58,325,087
2001-02	6,867,247,088	200,744,462	33.165	77.31	84.20	0.0302	127,275,415	73,469,047
2002-03	7,471,835,291	251,153,521	29.750	69.35	78.43	0.0336	142,839,245	108,314,276
2003-04	8,739,200,513	265,882,682	33.064	77.08	72.67	0.0302	168,058,617	97,824,065
2004-05	8,791,045,501	277,460,661	31.497	73.42	66.90	0.0317	167,067,495	110,393,166
Total	61,579,615,731	1,696,063,484	347.337	809.69	809.69	0.2420	1,177,218,915	518,844,569
Average	6,842,179,526	188,451,498	38.593	89.97	89.97	0.0269	130,802,102	57,649,397

Standard Deviation : 330.08
Co-efficient of variation : 366.88

Chi-Square : 1.12

LABOUR PRODUCTIVITY IN DUDHSAGAR DAIRY – MEHSANA:

The table 5.6 gives the figures in reference to input of labour, output-input ratio, productivity indices, trend value, input-output ratio, co-efficient factor and possible saving. It also computes some statistical figures like standard deviation, co-efficient of variation, chi-square value and growth rate of Dudhsagar Dairy Mehsana for the research period i.e. 1996-'97 to 2004-'05.

In reference to the output of Dudhsagar Dairy, it make clear from the table that it increases from the 455.42 crores in the year 1996-'97 to 686.72 crores in the year 1999-'00. The fluctuation spread of output comes out to be 50.79%. While input of labour increases from 10.62 crores in the year 1996-'97 to 17.92 crores in the year 1999-'00. The fluctuation spread of labour input comes out to be 68.74%. Here, the input of labour increases more than the output. These figures do not indicate good labour productivity of Dudhsagar Dairy. Then, in the year 2000-'01 output suddenly decreases while input of labour increases constantly till the year 2004-'05. Output increases from 659.14 crores in the year 2000-'01 to 873.92 crores in the year 2004-'05. The fluctuation spread of output works out to be 32.58%. On the other hand, input of labour increases from 18.43 crores in the year 2000-'01 to 27.75 crores in the year 2004-'05. The fluctuation expansion works out to be 50.57%. So, input of labour is increasing more than the output during this period. It shows negative trend of labour productivity. Productivity ratio with the help of co-efficient of factorial productivity moves in mixed during the study period.

Labour productivity ratio [O-I ratio] works out 38.593 for the research period. The O-I ratio of 1997-'98 [50.564] and 1998-'99 [52.309] are registered higher than the average ratio while the O-I ratio of 1999-'00 [38.332], 2000-'01 [35.758], 2001-'02 [33.165], 2002-'03 [29.750], 2003-'04 [33.064] and 2004-'05 [31.497] are registered lower than the average ratio. These figures speak that there should not be utilized qualitative and efficient manpower and latest machinery completely and properly in the dairy. Overall it indicates the negation trend of labour productivity in the dairy.

The factorial labour productivity in the base year is 0.6838. In the first initial year it increases to 0.7140 in 1997-'98. Then it decreases for two years and touches to 0.6355 in 1999-'00. Then again it increases and again it decreases till the year 2003-'04. In the year 2004-'05, it increases and reaches to 0.5921. So, it constantly fluctuates in upward-downward ways. The average factorial labour productivity ratio is 0.6390, which is less than the base year ratio. It indicates an overall negative trend of labour productivity during the period of the study. It should be said that productivity of any individual factor does not depend only on an individual input but it is very much affected by other factors also like material and overheads.

The productivity index which gives an idea about the fluctuation in output-input ratio for the years under the study. Productivity index is 100 for the base year 1996-'97. It increases in the first initial years significantly and reaches to 121.94 in 1998-'99. But then it constantly decreases for four years and comes out to 69.35 in 2002-'03. Then it increases and again in the year 2004-'05 it decreases to 73.42. The average of productivity index comes out to be 89.97, which is less by 10.03% from the base year. It indicates the negative trend and also makes clear that there should not be used qualitative and efficient manpower properly and completely in the dairy.

The overall result of labour productivity is calculated in reference to the value of standard deviation, co-efficient of variation and chi-square. Standard deviation of the Dudhsagar Dairy is 330.08 and co-efficient of variation is 366.88. It makes clear that there is some variation in the productivity indices. The calculated value of chi-square is 1.12 while the table value is 2.17. So, the calculated value is less than the table value. It permits to accept the null hypothesis, "Labour productivity in dices can be represented by the straight line trend based on least square method" It means "there is no significant difference between the labour productivity of the co-operative milk dairy plants" The calculated value of productivity index. The average requirement of labour bar rupee of output for Dudhsagar Dairy is 0.03. The Input- output ratio the lowest during the year 1998-'99. It clears that the unit gets its maximum efficiency in labour during this year. Moreover, the table calculates that the possible saving in labour input comes out at 5.76 crores per year for the dairy.

Labour Productivity of Dudhsagar Dairy - Mehsana.

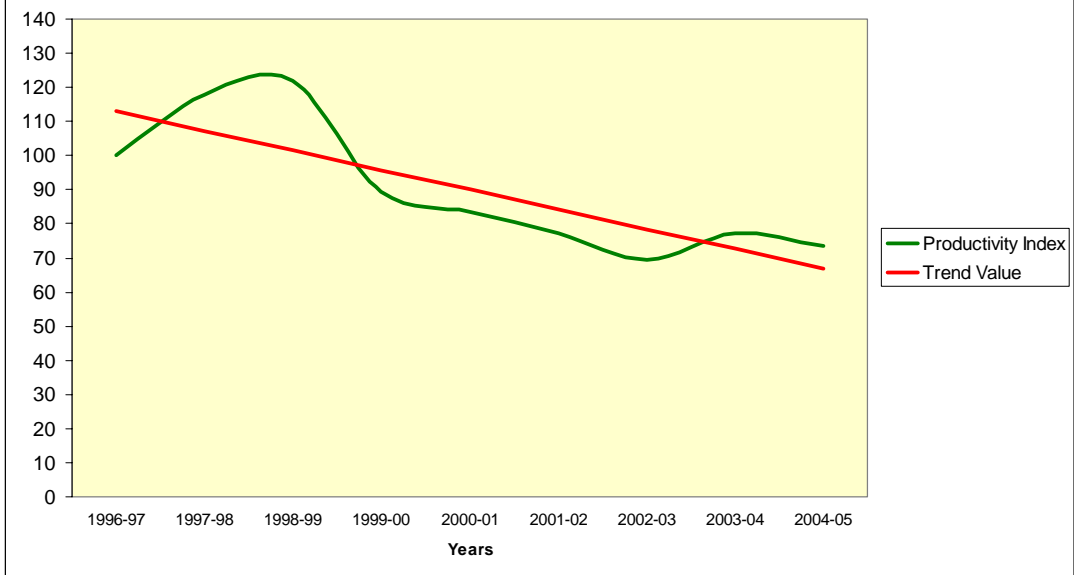


Table 5.7
Labour Productivity of "Vasudhara Dairy" - Alipur

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	695,053,623	32,341,893	21.491	100.00	100.60	0.0465	28,498,945	3,842,948
1997-98	772,578,793	31,677,672	24.389	113.48	101.90	0.0410	31,677,672	0
1998-99	827,345,634	40,996,241	20.181	93.90	103.19	0.0496	33,923,250	7,072,991
1999-00	226,295,942	9,891,897	22.877	106.45	104.48	0.0437	9,278,702	613,195
2000-01	1,363,097,348	63,614,035	21.428	99.71	105.77	0.0467	55,890,417	7,723,618
2001-02	1,514,945,909	68,541,947	22.102	102.84	107.06	0.0452	62,116,589	6,425,358
2002-03	1,759,795,585	74,437,498	23.641	110.00	108.35	0.0423	72,156,041	2,281,457
2003-04	2,259,975,028	93,244,380	24.237	112.78	109.64	0.0413	92,664,655	579,725
2004-05	2,630,211,146	108,563,718	24.227	112.73	110.93	0.0413	107,845,267	718,451
Total	12,049,299,008	523,309,281	204.573	951.89	951.89	0.3976	494,051,538	29,257,743
Average	1,338,811,001	58,145,476	22.730	105.77	105.77	0.0442	54,894,615	3,250,861

Standard Deviation : 43.88
Co-efficient of variation : 41.49

Chi-Square : 0.32

LABOUR PRODUCTIVITY IN VASUDHARA DAIRY – ALIPUR(CHIKHLI):

The table 5.7 displays the numerical data in reference to input and output of labour, input and output ratio, productivity index, trend value, Input-output ratio co-efficient factor and possible savings. It also computes some other mathematical data like standard deviation, co-efficient of variation, chi-square and growth rate of Vasudhara Dairy –Alipur [chikhli] from the year 1996-1997 to 2004-2005 i.e. Nine years.

The table 5.7 indicates that the output of Vasudhara Dairy in ceases from 69.51 crores in 1996-97 82.73 crores in 1998-99 the fluctuation expansion of out put works out to be 19.02% while input of labour in creases form 3.23 crores in 1996-97 to 4.10 crores in 1998-99. The fluctuation expansion of input of labour works out to be 26.93%. Here, the labour input increases more than the output during this particular period input decrease suddenly in the year 1999 -2000. Then, they increase more and more year by year. The output increases from 136.31 crores in 2000-2001 to 263.02 crores in 2004-2005 the flirtation spread of output comes out to be 92.96%. While in case of input of labour, it increases from 6.36 crores in 2000-2001 to 10.86 crores in 2000-2005. The fluctuation crores in 2004-2005.The fluctuation spread of input of labour comes out to be 70.75% in this period .Here, Output increases more than the labour input .So; it shows good labour productivity during this period. Productivity ratio with the help of co-efficient factor stays in mixed trend during the study period.

Labour productivity ratio [O-I-Ratio] comes out 21.491 for the base year, i.e.1996-1997. The average productivity ratio comes out 22.73 for the research period. The O-I-ratio of 1997-1998 [24.389], 1999-2000 [22.877], 2002-2003 [23.641], 2003-2004 [24.237] and2004-2005 [24.227] are recorded higher than the average ratio. While the O-I-ratio of 1998-1999 [20.181], 2000-2001 [21.428] and 2001-2002 [22.102] are recorded lover then the average ratio. By viewing these forges. We can say it could be only possible bye to the compete utilization of efficient manpower and latest machinery in the dairy.

The factorial labour productivity is 0.5692 in 1996-1997, i.e. Base year. In the first initial year; it increases and reaches to 0.6365 in 1997-1998. Then, it 1998-1999. Then, touches to 0.5860 in 1998-1999. Then, in the year 1999-2000, it decreases to 0.7341 and again it decreases to 0.6136 in 2000-2001. Then again it decreases to 0.6136 in 2000-2001. Then after, it increases and decreases. Then, in 2004-2005, it increases to 0.7307. The average factorial productivity ratio is 0.6705 year ratio. So, it indicates overall passivity trend of labour productivity during the research any on an individual input but it is very much affected by other factors also like material and overheads.

Now, the productivity index which is 100 for the base year, 1996-1997. In the first initial year, it increases and goes to 113.48 in 1997-'98. Then, it decreases to 93.90 in 1998-1999. Then, again it decreases and increases. Then after it increases for three years constantly and touches to 112.78 in 2003-2004. The table shows that the productivity index comes on an average to 105.77 which is more by 5.77% from the base year. It displays an overall increasing trend and supports that labour management has improved much better in Vasudhara dairy which decreases some labour related losses itself.

The overall result of labour productivity is considered in repeat to the value of standard deviation, co-efficient of variation and chi-square. Standard deviation of Vasudhara dairy comes out 43.88 while co-efficient of variation works out 41.49. It clarifies that there is no much variation in the productivity indices. The calculated value of chi-square is 2.17. So, the critical value is more than the calculated value. It allows to acceptance the null hypothesis, "Labour productivity indices can be represented by the straight line trend based on least square method". It means, "There is no significant difference between the labour productivity of the co-operative milk dairy plants of Gujarat state." The calculated value of productivity index. The average requirement of labour per rupee of output for Vasudhara dairy is 0.04. Input-output ratio is the lowest during the year 1997-1998. It indicates that the dairy gets its maximum efficiency in labour during this year. Moreover, the table indicates that the possible savings in labour input year for the dairy.

Labour Productivity of Vasudhara Dairy - Alipur.

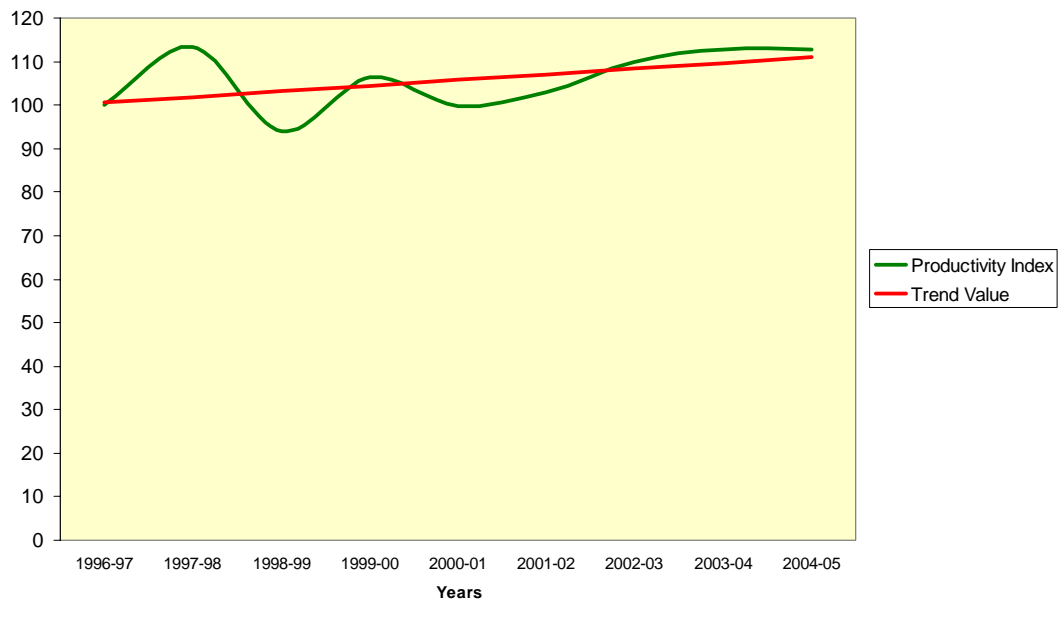


Table 5.8
Labour Productivity of "Sumul Dairy" - Surat

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	2,344,676,397	76,348,909	30.710	100.00	98.75	0.0326	68,151,586	8,197,323
1997-98	2,875,563,460	83,582,626	34.404	112.03	99.14	0.0291	83,582,626	0
1998-99	2,900,606,810	108,162,318	26.817	87.32	99.53	0.0373	84,310,549	23,851,769
1999-00	3,106,651,642	114,265,653	27.188	88.53	99.92	0.0368	90,299,556	23,966,097
2000-01	3,446,899,795	108,528,923	31.760	103.42	100.30	0.0315	100,189,386	8,339,537
2001-02	3,525,635,053	104,947,717	33.594	109.39	100.69	0.0298	102,477,946	2,469,771
2002-03	3,818,751,083	125,578,158	30.409	99.02	101.08	0.0329	110,997,809	14,580,349
2003-04	4,251,273,272	142,656,229	29.801	97.04	101.47	0.0336	123,569,724	19,086,505
2004-05	4,600,686,233	141,352,954	32.548	105.99	101.85	0.0307	133,725,944	7,627,010
Total	30,870,743,745	1,005,423,487	277.231	902.74	902.74	0.2943	897,305,126	108,118,361
Average	3,430,082,638	111,713,721	30.803	100.30	100.30	0.0327	99,700,570	12,013,151

Standard Deviation : 64.63
Co-efficient of variation : 64.44

Chi-Square : 0.64

LABOUR PRODUCTIVITY IN SUMUL DAIRY – SURAT:

The table 5.8 draws the numerical picture in reference to labour productivity of Sumul dairy, Surat and finds out some necessary statistical data of the research period, i.e. 1996-1997 to 2004-2005.

So for the output of Sumul dairy is concerned, it make clear from the table that it increases from 234.47 crores in the year 1996-'97 to 310.67 crores in the year 1999-'2000. So, the upward trend comes out to be 32.50%. While in case of input, it increases from 7.63 crores in 1996-1997 to 11.43 crores in 1999- 2000. So, the upward trend comes out to be 49.80%. Here, the labour input increases more than the output. It shows the negative trend of labour productivity of Sumul dairy. But, after the year 1999-2000, the output is increasing more and more year by year. While the labour input moves in mixed trend after the year 1999-2000. Productivity ratio with the support of co-efficient of factorial productivity moves in mixed trend during the study period.

Labour productivity ratio [O-I ratio] comes out 30.710 for the base year, i.e. 1996-1997. The average productivity ratio comes out 30.803 for the study period. The o-I ratio of 1997-1998 [34.404], 2001-2001 [31.760], 2001-2002 [33.594] and 2004-2005 [32.548] are recorded higher then the average ratio. While the o-I ratio of 1998-1999 [26.817], 1999-2000[27.188], 2002-2003[30.409], and 2003-2004 [29.801] are recorded lower then the average ratio. By viewing these figures, it can be said that it shows operas good productivity of the dairy. And it can be also said that manpower and latest technology should not be used complexly and productivity in the dairy.

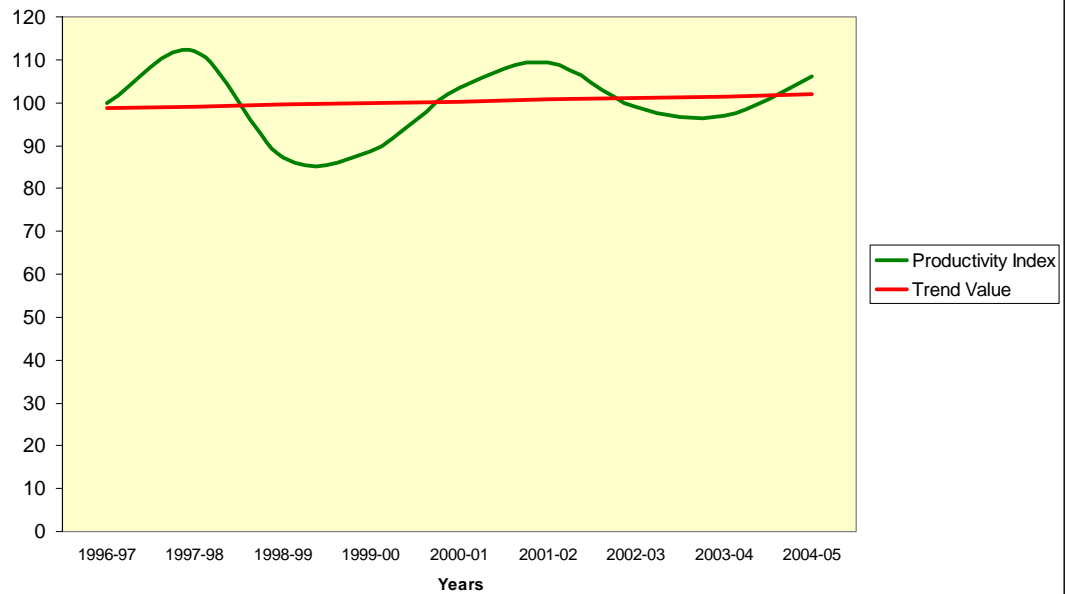
The factorial labour productivity for the base year is 0.6378. It increases in the first finial year and then, it decreases. After 1998-1999. It initial year and then. It increases constantly for three years constantly for three years and reaches to 0.7120 in 2001-2002. Then, it decreases to 0.6543 in 2002-2003. Then after, it increaser and touches to 0.6807 in 2004-2005. The touch to 0.6807 in 2004-2005. The average factorial labour productivity ratio is 0.6671 which is higher than the base year ratio. It shows positive trend of labour. It shows positive trend of labour productivity during hype

period of the research. It can be said that productivity of any individual element is not dependent only on an individual input but it is very much sensitive with respect to material and over heads, also.

The productivity index which is 100 for the base year 1996-1997. It increases year. Then it decreases and goes to 87.32 in 1998-1999. After that it increases constantly for three years and reaches 109.39 in 2001-2002. Again it decreases and then it increases in last year and reaches to 105.99 in 2004-2005. So, it stays in admixed trend during the study in a As the analytical point of view, productivity index gives the mathematical picture about ratio for the research period. About the fluctuation in output-input ratio for the research average productivity index comes out 100.30 which is more by 0.30% from the base year. It indicates an overall positive trend and supports the view that manpower management [labour productivity] has improved slightly in Sumul Dairy, Which reduces some labour losses automatically.

The overall result of labour productivity is determined in repeat to the value of standard and chi –square. Standard deviation of Sumul Dairy Works out to be 64.63. While the co-efficient of variation works out to be 64.44. These figures clears that there is no variation in the productive in dices. The calculated value of chi-square is 0.64 while the critical value is 2.17. So, the critical value is more then the calculated value. It permits to acceptance the null “Labour productivity indices can be represented by the straight line trend based on least square method”. It means, “There is no significant difference between the labour productivity of the co-operative milk dairy plants.” The calculated value of productivity index. The average requirement of labour per rupee of output for Sumul Dairy is 0.03. Input-output ratio goes to its minimum level during the year 1997-‘98. It shows that the dairy gets its maximum efficiency in labour input during this year. Moreover, the table indicates clear that the possible savings in slab our input comes out at 1.20 crores per year for the dairy.

Labour Productivity of Sumul Dairy - Surat.



12. LABOUR PRODUCTIVITY RATIOS OF THE CO-OPERATIVE DAIRY AND MILK SUPPLY UNITS AND KRUSKAL WALLIS ONE WAY ANALYSIS OF VARIANCE TEST:

The comparative position of labour productivity ratios of co-operative dairy and milk supply units of Gujarat state have been given in table 5.9 along with the application of Kruskal Wallis one-way analysis of Variance test on this ratio for the study period.

Table 5.9

COMPARATIVE LABOUR PRODUCTIVITY RATIO OF CO-OPERATIVE DAIRY & MILK SUPPLY UNITS OF GUJARAT STATE WITH KRUSKAL WALLIS ONE-WAY ANALYSIS OF VARIANCE TEST

Year	AMUL DAIRY RATIO	R1	GOPAL DAIRY RATIO	R2	UTTAM DAIRY RATIO	R3	MADHUR DAIRY RATIO	R4	SUGAM DAIRY RATIO	R5	DUDH- SAGAR DAIRY RATIO	R6	VASU- DHARA DAIRY RATIO	R7	SUMUL DAIRY RATIO	R8
1996-97	31.258	46	8.293	1	17.450	24	47.705	69	14.394	14	42.898	67	21.491	30	30.710	45
1997-98	32.685	54	8.909	2	17.043	23	47.990	70	13.507	15	50.564	71	24.389	36	34.404	60
1998-99	29.537	41	9.238	3	17.501	19	41.710	65	13.190	11	52.309	72	20.181	28	26.817	37
1999-00	31.611	50	10.482	4	15.664	20	42.338	66	13.273	12	38.332	64	22.877	32	27.188	38
2000-01	32.544	52	12.186	10	15.990	22	45.145	68	11.920	7	35.758	62	21.428	29	31.760	51
2001-02	29.391	40	13.356	13	14.738	17	37.458	63	12.123	9	33.165	56	22.102	31	33.594	58
2002-03	31.966	48	17.939	26	13.894	16	33.276	57	12.075	8	29.750	42	23.641	33	30.409	44
2003-04	35.338	61	15.758	21	15.129	18	28.465	39	11.027	6	33.064	55	24.237	35	29.801	43
2004-05	33.746	59	19.926	27	17.656	25	31.268	47	10.995	5	31.497	49	24.227	34	32.548	53
Total		451		107		184		544		87		538		288		429

$$\begin{aligned}
H &= \frac{12}{N(N+1) \sum_{j=1}^k n_j} \frac{\sum^k (R_j)^2}{n_j} - 3(N+1) \\
&= \frac{12}{72(72+1)} \left[\frac{(451)^2}{9} + \frac{(107)^2}{9} + \frac{(184)^2}{9} + \frac{(544)^2}{9} + \frac{(87)^2}{9} + \frac{(538)^2}{9} + \frac{(288)^2}{9} + \frac{(429)^2}{9} \right] - 3(72+1) \\
&= \frac{12}{5256} \left[22600.11 + 1272.11 + 3761.78 + 32881.78 + 841 + 32160.44 + 9216 + 20449 \right] - 219 \\
&= 62.24
\end{aligned}$$

The above table, i.e., 5.9 indicates that the collated value of H is 62.24, which is more than the critical value 2.17, So the null hypothesis based on Kruskal Wallis one-way analysis of Variance test, at 5% level of significance is rejected and alternative hypothesis is accepted. It means that there is significance difference between the labour productivity ratios of the co-operative dairy and milk supply units of Gujarat state.

TABLE 5.10
COMPARATIVE ANALYSIS OF LABOUR PRODUCTIVITY IN CO-OPERATIVE DAIRY AND MILK SUPPLY UNITS OF
GUJARAT STATE FROM 1996-97 TO 2004-05.

UNIT	PRODUCTIVITY RATIO AVERAGE	RANK	PRODUCTIVITY INDEX AVERAGE	RANK	CO-EFFICIENT OF VARIATION		CHI-SQUARE		INPUT-OUTPUT RATIO	
					VALUE	RANK	VALUE	RANK	AVERAGE	RANK
AMUL DAIRY	32.008	3	102.4	3	31.68	1	0.240	2	0.0313	3
GOPAL DAIRY	12.899	7	155.54	1	1454.58	8	1.300	8	0.0848	8
UTTAM DAIRY	16.118	6	92.37	5	59.09	2	0.490	5	0.0624	6
MADHUR DAIRY	39.484	1	82.77	8	245.79	5	0.380	4	0.0262	1
SUGAM DAIRY	12.5	8	86.85	7	325.02	6	0.050	1	0.0806	7
DUDHSAGAR DAIRY	38.593	2	89.97	6	366.88	7	1.120	7	0.0269	2
VASUDHARA DAIRY	22.73	5	105.77	2	41.49	2	0.320	3	0.0442	5
SUMUL DAIRY	30.803	4	100.3	4	64.44	4	0.640	5	0.0327	4
COMBINED AVERAGE	25.642		102.00		323.62		0.568		0.0486	

13. COMPARATIVE ANALYSIS OF LABOUR PRODUCTIVITY IN CO-OPERATIVE DAIRY AND MILK SUPPLY UNITS OF GUJARAT STATE:

The comparative analysis of labour productivity ratios of co-operative dairy and milk supply units of Gujarat state for the period from 1996-'97 to 2004-'05 is given in table 5.10, which is as under:

This table analyses that the combined average of labour productivity ratio for the research period comes out at 25.642, it makes clear that for every rupee spent on labour the output ratio works out to 25.642 in milk dairy industry. The average productivity ratio of Amul Dairy [32.008], Madhur Dairy [39.484], Dudhsagar Dairy [38.593] and Sumul Dairy [30.803] are registered higher than the combined average productivity ratio for the study period. While in case of Gopal Dairy [12.899], Uttam Dairy [16.118], Sugam Dairy [12.500] and Vasudhara Dairy [22.730] are registered lower than the combined average productivity ratio. Moreover, the achievement of labour productivity is concerned; it is seen from the labour productivity indices of various dairies that the progress is made in labour productivity during the research period, has been the highest at 155.54 for Gopal Dairy, 105.77 for Vasudhara Dairy, 102.40 for Amul Dairy, 100.30 for Sumul Dairy, 92.37 for Uttam Dairy, 89.97 for Dudhsagar Dairy, 86.85 for Sugam Dairy and 82.77 for Madhur Dairy. The average progress of Gopal Dairy, Vasudhara Dairy and Amul Dairy are better in comparison to the average combined ratio (102.00), while the progress of Sumul Dairy, Uttam Dairy, Dudhsagar Dairy, Sugam Dairy and Madhur Dairy are lower than the combined average in co-operative milk dairy industry.

Now, look on the co-efficient of variation. It works out at the highest being 1454.58 for Gopal Dairy, 366.88 for Dudhsagar Dairy and 325.02 for Sugam Dairy are higher than the combined average i.e. 323.62. While 245.79 for Madhur Dairy, 64.44 for Sumul Dairy, 59.09 for Uttam Dairy, 41.49 for Vasudhara Dairy are lower than the combined average. These figures clarify that there is lowest variability in labour productivity in Amul Dairy.

It is observed from the above table that the average value of chi-square is lower than the critical value i.e. 2.17. So, it clarifies that the productivity indices of co-operative milk dairies seems to be nearer to the straight line based pattern. The chi-square value of Gopal Dairy (1.30), Dudhsagar Dairy (1.12), Sumul Dairy (0.64), Uttam Dairy (0.24) and Sumul Dairy (0.05) is registered lower than the critical value of chi-square. So, as the chi-square value of each dairy is lower than the critical value, the null hypothesis is accepted for all dairies. And therefore, the productivity indices of all dairies seem to be nearer to straight line trend based on least square method.

Labour input requirement shown by the Input-Output ratio (I/O Ratio) of Madhur Dairy is the lowest among the others. For an average output of one rupee, Rs. 0.0486 is spent on labour input. In case of Madhur Dairy, it is 0.0262, the lowest input is registered in the study, Dudhsagar Dairy, it is 0.0269, Amul Dairy, it is 0.0313, Sumul Dairy, it is .0327, Vasudhara Dairy, it is 0.0442, while in case of Uttam Dairy, it is 0.0624, Sumul Dairy, it is 0.0806 and Gopal Dairy, it is 0.0848 are recorded higher than the combined average during the period of the study.

REFERENCES

1. J.Batty, Standard Costing , [London : Macdonald & Evans Ltd. 1970], P.no. 182
2. Adolph Matz and Milton F. Usry, “Cost Accounting, Planning and control” , [Bombay : D.B. Tarporevala Sons & Co. 1997], P.no. 397
3. J.G.Blocker and W.Keith, Welter, Cost Accounting, Tata Mcgrew Hill – 1978 P. No. 74.
4. J.K. Keynes, Quoted by J.P. Shrivastava, General Theory of Employment, Interest & Money – 1936, P.no.. 213-214
5. Productivity Measurement, vol. I OEEC 1955, P. No. 26
6. Adolph Matz and Milton F. Usry, “Cost Accounting, Planning and control” [Bombay : D.B. Tarporevala Sons & Co. 1997], P.no. 397
7. Adolph Matz and Milton F. Usry, “Cost Accounting, Planning and control” [Bombay : D.B. Tarporevala Sons & Co. 1997], P.no. 397
8. J.P. Shrivastava, Op. Cit., P. 45
9. Bronislaw Minc, Eds, Dunlop J. P. And V.P. Diatchenko, In Labour productivity, Op. Cit. P. No. 27
10. The Annual Reports of Labour Ministry of India – 1993.
11. ILO Higher Productivity, Edn. Dunlop, J. T. & V. T. P No. 27
12. G. A. Prudensky, Eds., Dunlop, J.P. and V.P. Diatchenko, “Labour Productivity’ Concept, factors and growth reserves in Labour productivity” [mcgraw Hill Book Co., New York, 1964], P. NO. 4
13. Adolph Matz and Milton F. Usry, “Cost Accounting, Planning and control” [Bombay : D.B. Tarporevala Sons & Co. 1997], P.no. 397
14. Solman Fabricant, A Primer on Productivity, Prantice Hill Publishing Ltd. – 1973.

CHPATER – 6

**OVERHEAD PRODUCTIVITY OF CO-OPERATIVE DAIRY &
MILK SUPPLY UNITS OF GUJARAT STATE**

CHPATER – 6

OVERHEAD PRODUCTIVITY OF CO-OPERATIVE DAIRY & MILK SUPPLY UNITS OF GUJARAT STATE

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REFERENCES

1. INTRODUCTION:

And, Last but not the least important element of cost is overhead cost. Today, in the comparative scenario overhead expenses have a special importance in the total cost of a product. It consist 33% part of the total cost. It means it covers 1/3 part of the total cost of a product.

Overhead costs are operating costs of a business enterprise which can not be 'traced directly to a particular unit of output. It is generally defined as the cost of indirect expenses that can not be identified directly to a specific jobs or products.

It consists of all manufacturing expenses incurred in running a business other than direct expenditure. So on, the basis of the identifiability of cost items with the cost centers or units. Costs are classified into two costs. i.e. Direct costs and Indirect costs. Directs costs which are also known as Prime costs indicate the cost which can directly and undoubtly be identified with the particular cost centre. These indirect costs are called overhead expenses or overhead costs. All the expenses which are incurred over and above prime cost are overhead.

Thus, Overhead is a family of all the expenses except direct costs which straightly affects the total cost of a product and efficiency of the manufacturing industry. Therefore overhead productivity is one of the important measurements of a manufacturing organization.

2. MEANING & DEFINITION OF OVERHEAD:

Overhead cost means all indirect manufacturing expenses and general expenses that can not be specified with particular units of production it covers all input values that are common and result in overall production.

Basically and essentially, Overhead expenses are indirect by nature. It means, these costs can not easily be identified with any cost centre or cost unit. Because, Overhead expenses are general in nature. These costs are incurred for the benefit of more than one cost unit. These are incurred note for a particular work order but for the output generally as a entire manufacturing industry.

So, it can be said that, “ Overhead expenses include indirect material cost, indirect labour cost, and indirect expenses including services as can not be charged directly and comfortably to specific cost unit.” Alternatively, “Overheads are all expenses other than direct expenses.”

Many authors have given different definitions of overhead cost in their words. Some of them are as under:

According to L.W.J. Oowler and J.L. Brown : ‘Overhead’ is defined in the terminology of cost Accountancy as, “the aggregate of indirect material cost, indirect wages and indirect expenses, and by the word ‘indirect’ means that which can not be allocated but which can be apportioned to or absorbed by cost centers or cost units.”⁽¹⁾

ICMA London has described Overhead expenses as “The aggregate of indirect material costs, indirect wages and indirect expenses.”⁽²⁾

In the words of Rober N. Anthony and James S. Hekimian : “Some costs are classified as overhead because it is impossible to allocate them directly with product and other costs are classified as overhead because it is not suitable to trace them directly with product even though it would be possible to do so.”⁽³⁾

Horngren also observes that, “The terms overhead is peculiar but its origin unclear. Some accountants have wondered why such costs are not called ‘underfoot’ rather than overhead costs. The answer probably lies on organization chart. Lower departments ultimately bear all costs, including those coming from overhead.”⁽⁴⁾

3. GENERAL PRINCIPLES FOR OVERHEADS:

For Determining, if an expense is to be considered as overhead or not, the following basic principles should be referred:

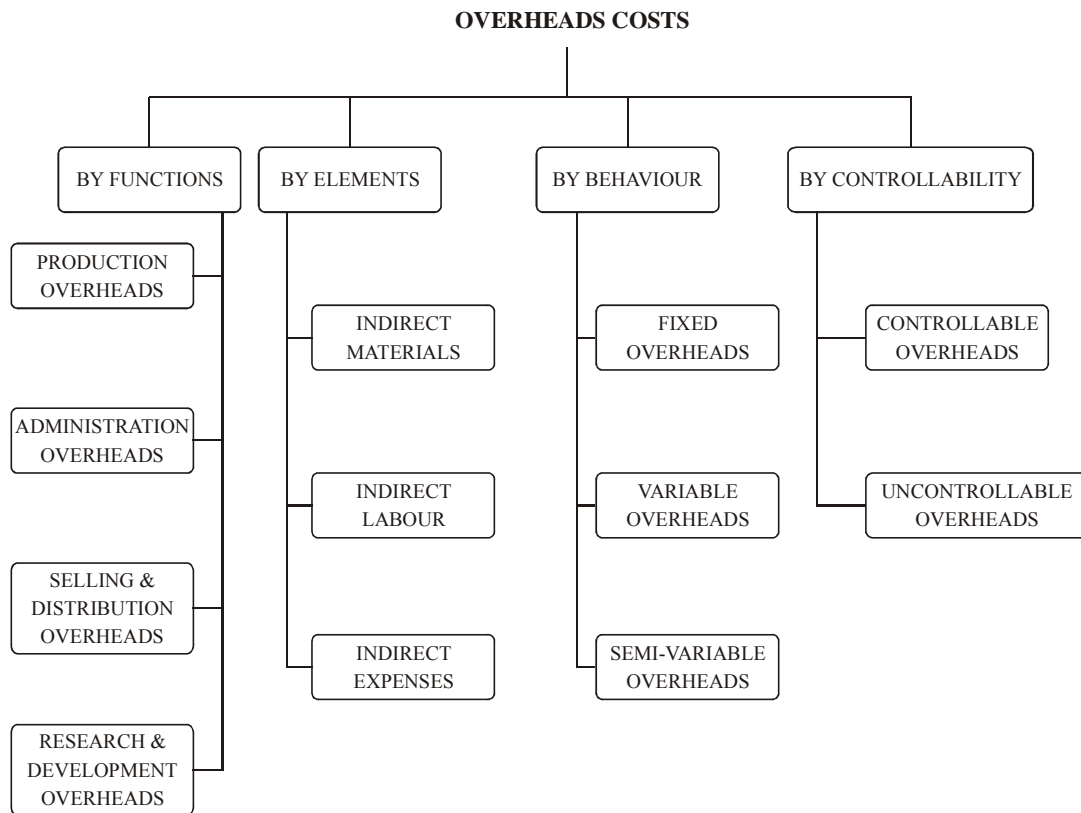
- Overhead expenses can not be charged to any particular or individual job or process or product or cost unit and has to be apportioned.

- Expenses of capital nature are excluded from costs accounts and should not, therefore be included in overheads.
- Sometimes, it occurs that direct expenses e.g. the cost of bolts, screws, nut etc. purchased for a specific job may be so small as not to treat it as direct expense and so it is included in overheads.
- Those expenses which are not connected to the cost of production like income tax, donations, interest on loan etc. must be excluded from overheads.
- Wherever cash is paid for any indirect expenses or liability is incurred or a loss is incurred in capital values, they should be considered as overheads. e.g. depreciation on assets.
- Overhead are to be allocated over cost centers on the basis of the principles of benefit and responsibilities.

4. CLASSIFICATION OF OVERHEADS:

The classification of direct cost is easier than the classification of overheads. It depends upon a number of factors, such as the type and size of the business, the nature of the product or the service rendered and managerial policies. Overheads include all indirect costs and their classification is a more complicated process. Overheads are broadly and principally classified into four groups which are as follows:

Fig. 6.1



- (Source: L.W.J. Owler and J.L. Brown
‘Wheldon’s Cost Accounting and Costing Methods’
Vikas Publication, Delhi – 1970.
P. No. 153)

- **BY FUNCTION OR DEPARTMENT:**

As the above chart, displays the classification of overheads, the first group is by Functions or Departments. Under these groups there are four types of overhead costs which are based on the major business functions. These are production overheads, Administration or office overheads, selling & Distribution overheads and Research & Development overheads.

- **FACTORY OVERHEADS:**

These are the direct expenses that arise in connection with production operations within the factory from the receipt of raw material till the production. The factory overheads are included to determine cost of goods produced because such expenses will have to be incurred irrespective of it goods produced are finished or not. The factory or production overhead is inclusive of all indirect materials, indirect labour and indirect expenses related with manufacturing operation which starts with supply of materials and ends with primary packing of the product. Factory overheads are also known as manufacturing overheads or works overheads or production overheads. Factory overheads include the following expenses:

- Power and Fuel
- Consumable stores like grease, oil etc.
- Repairs to plant and machinery.
- Depreciations of plant and machinery.
- Factory rent and rates.
- Work manager's salary.
- Supervisor's salary.
- Factory canteen and welfare expenses.
- Factory building and plant insurance.
- Factory lighting and heating.
- Cost of stationary used in factory.
- Cost of training to new workers
- Store keeping and time keeping expenses
- Normal waste and idle time.
- Material handling charges.

- **OFFICE OVERHEADS:**

Indirect expenses that arise in relation with management and administration of an enterprise are called as Office overheads. All the indirect costs incurred for formulating the policies, directing the organizations, controlling the operations and motivating the human resources for completing the corporate purposes are known as Office Overheads. Office overheads are also known as Administrative overheads or Establishment overheads. In this reference, it can be also said that Office overheads are incurred in the general administration of a concern. Office overheads may include the following expenses:

- Office rent, rates and taxes
- Depreciation of office buildings, furniture, equipments and fittings
- Office lighting, heating and cleaning
- Insurance of office buildings, furniture, equipments and fittings
- Repairs and maintenance of office buildings, furniture, equipments and fittings
- Salaries of office staff
- Printing and stationary, postage and telegrams, telephones etc.
- Audit fees
- Legal charges
- Director's remuneration and sitting fees
- Bank charges

- **SELLING AND DISTRIBUTION OVEHEADS:**

Selling and Distribution overheads are the expenses which are related with marketing and selling of a product. These mean the expenses incurred by the Marketing department from the time the production process is completed till the product is issued to the customer. The indirect expenses incurred for seeking to generate and to push-up the demand, to prome the total sales and to retain customers are known as Selling overheads. While the expenses incurred for handling the products from the period between they are put in the warehouse and they are delivered to the customers called as Distribution overheads. In this context, it can be noted that Selling overheads are related with generating demand and achieving orders while Distribution overheads are concerned with dispatching and issuing the products to the customers. The following expenses are included in Selling and Distribution overheads:

- Advertisement costs
- Catalogue, price list etc.
- Sales office rent and rates
- Sales office insurance and lighting
- Salaries, commission and traveling expenses of salesmen and agents.
- Showroom expenses
- Bed debts
- Cash discount
- Carriage outward, expenses for participating in industrial fair
- Warehouse rent etc.

- **RESEARCH AND DEVELOPMENT OVEHEADS:**

Research overheads are the costs of searching for new products, new production processes or machinery. While the Development overheads are the costs of putting

research result on professional basis. Such Research and Development overheads are given below:

- Cost of raw-materials used in research
- Subscriptions to books and journals
- Costs of tests considered and trial runs.
- Salaries and wages to Research and Development employees
- Depreciation of assets

- **BY ELEMENTS:**

Then, the second group is by elements. On the basis of elements of overhead expenses can be parted into three types. i.e. indirect material cost, indirect labour cost and other indirect expenses. These are as under:

- **INDIRECT MATERIAL COST:**

It is the expenses of material used not for a particular cost unit or cost centre but the entire production. It comprises the material which is not part of the product but is utilized for the object ancillary to production. It is the material needed for operating and maintaining plant and machineries known as consumable stores like cotton waste, oil and grease, belts etc. It consists of stores used by service department like power house, canteen etc. Sometimes, it might be occur that materials are not considered as direct material because of their cost being small. E.g. thread used in stitching shoes.

- **INDIRECT LABOUR COST:**

Wages and salaries paid to different persons who are nor directly related to production as well as service departments are known as Indirect labour cost. In other words, it can be also said that labour costs or wages which can not easily be identified with specific cost unit or cost centre are called as Indirect labour cost. Salary of

supervisory staff, repairs and maintenance staff, salary of store keeper, gate keeper, sweeper, foremen etc. are the examples of Indirect labour cost.

- **OTHER INDIRECT COST:**

Other expenses other than Indirect material cost and Indirect labour cost which can not be identified with individual cost centers or cost units are known as Indirect overhead cost. It means that these are the expenses which are incurred for benefit of entire production process. It gives the advantage of it to the whole organization also. Depreciation, insurance, rent, coal, gas, electricity, water expenses, various factory expenses, lighting, rates, taxes, heating etc. are the examples of Indirect overhead costs.

• **BY BEHAVIOUR:**

The third group is by behaviour. On the basis of how Overhead expenses behave with respect to the levels of activity, they can be divided into three types i.e. Fixed expenses, Variable expenses and Semi-Variable expenses. These are as follows:

- **FIXED EXPENSES:**

These are the expenses which do not change with the level of production volume. These expenses remain same constantly for all volumes of production. Such expenses are considered as Fixed expenses. It can be also said that these expenses have no any relation with the production volume. If the production increases or decreases or remains zero, such expenses have to be incurred in the organization. Factory rent, rates, insurance, taxes, manager's salary, interest on capital etc. are the examples of Fixed expenses.

- **VARIABLE EXPENSES:**

These are the expenses which are directly related to production. They vary according to the level of production. These expenses change constantly according to the

production volume. If the production volume increases, such expenses also increase, the production volume decreases, such expenses also decrease, the production volume is zero, such expenses also remain zero. So, it can be pointed out that such expenses have straightly relation with the production volume. Such variable expenses are direct materials, direct wages, power and fuel, lighting, heating, cooling, repairs and maintenance etc.

- **SEMI-VARIABLE EXPENSES:**

These are certain expenses which are partly fixed and partly variable. These are fixed costs but after that level is passed, they become variable. e.g, telephone charge are fixed up to certain number of calls but then increase in the proportion to the calls made thereafter. Hence, it can be noted that these expenses have both the type of nature of expenses. i.e. fixed expenses and variable expenses.

• **BY CONTROLLABILITY:**

And last but not the least, the fourth group is by controllability. On the basis of how can keep control over overheads in reference to the levels of activity, they can be parted in to two types i.e. Controllable overheads and Uncontrollable overheads. These are as follows:

- **CONTROLLABLE OVERHEADS:**

These are the expenses which can be controlled if proper and regular managerial vigilance is kept. Such expenses are termed as Controllable overheads. It can be said that variable costs are known as Controllable overheads.

- **UNCONTROLLABLE OVERHEADS:**

These are the expenses which are beyond the managerial control. It means that though proper and regular managerial control is kept, such expenses have to be incurred. Fixed costs are normally referred as Uncontrollable overheads.

5. IMPORTANCE OF OVERHEAD PRODUCTIVITY:

The third element of total cost of any product is overhead cost. It almost consists of one-third part of the total cost of any product. It means it has a special importance in present competitive.

The overhead cost depends on the size of an organization along with the nature of its product range, technology and the trend of the markets. The over burden of overhead cost is a question for a large manufacturing unit. As the field becomes large, the overhead cost also increases. So, the control over overhead cost is become necessary. Thus, overhead productivity is very much important to increase the overall productivity and profitability for any manufacturing organization.

Many factors are related with overhead cost. This factors increase the overhead cost of any product. They are as under:

- Large scale operations
- Variety of product line and product mix
- Product diversification
- Specialization in production
- Market competition
- Technological development
- Different range of markets
- Increasing complexity etc.....

Accounting for overhead cost should be done in a manner which would help the top management in controlling the cost and taking policy level decisions. So, controlling overheads is the primary aim of accounting for overheads.

6. NEED FOR ACCOUNTING IN A PROPER MANNER AND CHECK OF OVERHEAD :

Everyone uses the different form of accounting everyday. Buyers or consumers account for the money they spend, students have to plan for their educational expenses and organizations use accounting to measure the performance of their operating activities.

So, accounting is a different and dynamic discipline. Prima facie, Accounting is the process of recording the economic transactions in a proper manner, then to anal use, classify it and in turn report it to the users. In the same way, accounting for overhead cost should be done in a proper manner which would help to the top management in controlling the total cost of a product and taking the policy level business decisions. It should be done in a proper manner because overhead cost is a crucial factor affecting to the total cost.

Control is the basic aim for accounting of overhead costs, because overhead is an important factor in the total cost which changes a lot. In this reference, Brock Palmer and Archer say, “Management wants to maintain the same close control over overhead cost as they do over the cost of material and labor.”⁽⁵⁾

However, Phil Carrole stated,” Very few companies have made anything like the same intense studies of overhead costs as they have been carrying on to reduce plants cost for many years.”⁽⁶⁾

J. Batty states that “Every function which involves an indirect cost should be surveyed. The correct use of internal transport, light, motors and other essential services should be stressed, maximum efficiency in utilization being the aim.”⁽⁷⁾

Charles T. Horngren also believes that the importance for efficiency in overhead cost has also been counted. He says, “Some costs result from inefficiency and these can hardly be viewed as being inventorially as assets. Customers are rarely willing to pay for inefficiency.”⁽⁸⁾

John G. Blocker and W. Keith Weltmer point out that “When overhead cost are properly classified, management is given the opportunity to scrutinize them in detail and to eliminate or to decrease outlays which are not essential to efficient operation. It is a widely recognized proverb that it is easier to increase overhead cost than it is to decrease them.”⁽⁹⁾

To keep maximum control over expenses accountability by individuals should be fixed, expenses should be forecasted, actual should be compared with forecasting, actions to be taken should be chalked out and benefits and incentives should be provided for best results. So, control of overhead costs should not be thought as a need for getting more profit but it should be considered as the basic need for survival.

7. STEPS IN ACCOUNTING FOR OVERHEAD PRODUCTIVITY:

- **INPUTS OF OVERHEAD:**

The total cost of any product is calculated with direct expenses and indirect expenses. There are other expenses which cannot be charged directly to the product. Such expenses are to be allocated and apportioned to cost unit on some suitable basis. These are called indirect expenses or overheads. The productivity accounting for overheads will help to provide necessary overhead input data for the calculation of total productivity of co-operative Milk Dairy plants. Moreover, it will also give contribution towards the successful comparison of co-operative milk Dairy plants.

Here, overhead productivity is computed by dividing the total outputs by total overheads input. There are many overhead expenses, which are as under:

- Power and fuel
- Consumable stores like oil, grease etc.
- Repairs & Maintenance
- Depreciation
- Factory expenses
- Insurance premium of building, plant etc.
- Supervisor's salaries

**FACTORY OR
PRODUCTION
OVERHEADS**

- Salaries of office staff
- Office rent and rates
- Depreciation of office building
- Telephone & postage
- Printing & stationery
- Audit Fees & Legal charges
- Insurance premium of office building
- Advertisement expenses

**OFFICE
OVERHEADS**

- Salaries of sales manager
- Commission of salesmen
- Packing charges
- Carriage & Freight outward
- Insure premium of
- Sales office expenses
- Cash discount
- Bad debts

**SELLING &
DISTRIBUTION
OVERHEADS**

Overhead productivity can find out by the under Written Formula:

$$\text{Overhead Productivity} = \text{Output} / \text{Total Overhead inputs}$$

- **HYPOTHESIS:**

For the aim of interpreting and analyzing the overhead productivity it is calculated. Overhead productivity means productivity ratios and indices which are and overhead input. Two hypotheses based on statistical methods are used. The first one is based on chi-square test and another is based on Kruskal Wallis one-way analysis of Variance test. The hypothesis has been used to solve the difficulty & interpreting and analyzing the result.

- **NULL HYPOTHESIS:**

“Overhead productivity indices can be represented by the straight line trend based on least square method.”

- **ALTERNATIVE HYPOTHESIS:**

“Overhead productivity indices can not be described by straight line of the best fit.”

- **LEVEL OF SIGNIFICANCE:**

5 percent

- **STATISTICAL TEST USED:**

Chi-square test

- **CRITICAL VALUE:**

2.17

Another null Hypothesis has been tested to know if there is any significant difference between the overhead productivity ratios of the co-operative milk dairy industry of the Gujarat state. This Hypothesis based on kruskal wall is one-way analysis of variance test. For the acceptance of null hypothesis, the critical value of chi-squire test should

remain more than the calculated value. If critical value is less than the calculated value, the alternative hypothesis will be refereed. The acceptance of the indices based on least square straight line trend may truly represent the style and growth of overhead productivity.

The second one,

- **NULL HYPOTHESIS:**

“There is no significant difference between the overhead productivity of the co-operative dairy and milk supply units of Gujarat state.”

- **ALTERNATIVE HYPOTHESIS:**

“There is no significant difference between the overhead productivity of the co-operative dairy and milk supply units of Gujarat state.”

- **LEVEL OF SIGNIFICANCE:**

5 percent

- **STATISTICAL TEST USED:**

Kruskal Wallis one-way analysis of variance test.

- **CRITICAL VALUE:**

2.17

• **CALCULATION OF OVERHEAD PRODUCTIVITY:**

To find out overhead productivity ratio, the output is divided by the overhead input. Total output is a combination of all inputs such as material, labour, overhead, capital etc. Co-efficient of factorial productivity is multiplied with the O-I ratio and net partial productivity / Co-efficient of factorial productivity is also calculated.

Overhead productivity indices are assumed 100 for the base year i.e. 1996-‘97. If overhead productivity index comes out to below 100, it means that there is negative

trend in productivity and if it comes out to above 100, it indicates that there is positive trend in productivity in comparison to the productivity index of the base year. Input-output ratio makes clear about input used for a rupee of output. This ratio also helps in determining the possible savings in every year.

- **CALCULATION OF POSSIBLE SAVINGS IN OVERHEAD INPUTS:**

The possible savings will be computed by the under written formula:

$$\text{POSSIBLE SAVINGS} = \text{Actual Overhead Inputs} - \text{Standard Overhead Inputs}$$

Here, the term, actual overhead inputs means the actual amount of overhead inputs and the term, Standard overhead inputs means the product of minimum requirement per rupee of output during the study period,

8. OVERHEAD PRODUCTIVITY ACCOUNTING IN THE CO-OPERATIVE DAIRY AND MILK SUPPLY UNITS OF GUJARAT STATE:

Production process is nothing but the process of converting the raw material to the finished goods, with the support of manpower, money power, material and some other factors. Overhead expenses are one of the important inputs in production of Co-operative milk dairy industry; overhead cost is a part of total input cost. Overhead productivity should be improved for the improvement of total productivity of the dairy. In the words of Hubert, “Measuring productivity can be a first step to improve productivity.”⁽¹⁰⁾ Through overhead productivity accounting, we can know about the overhead inputs value required for the calculation of total productivity of Co-operative milk dairy industry, Moreover, inefficient use of overhead is also measured, So that necessary actions can be taken for the improvement of overhead productivity. The overhead productivity accounting for the Co-operative dairy and milk supply nit of the Gujarat state calculated as under:

Table 6.1
Overhead Productivity of " Amul Dairy" - Anand

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	4,001,021,578	357,384,222	11.195	100.00	84.80	0.0893	351,793,890	5,590,332
1997-98	4,173,534,355	478,443,391	8.723	77.92	86.37	0.1146	366,962,251	111,481,140
1998-99	4,623,462,516	480,051,422	9.631	86.03	87.94	0.1038	406,522,642	73,528,780
1999-00	4,871,408,788	510,725,163	9.538	85.20	89.51	0.1048	428,323,570	82,401,593
2000-01	5,091,912,736	536,617,519	9.489	84.76	91.08	0.1054	447,711,604	88,905,915
2001-02	4,687,806,783	461,868,286	10.150	90.76	92.65	0.0985	412,180,177	49,688,109
2002-03	4,883,366,669	472,490,914	10.335	92.32	94.22	0.0968	429,374,979	43,115,935
2003-04	5,459,302,648	482,243,883	11.321	101.13	95.79	0.0883	480,014,735	2,229,148
2004-05	6,004,696,000	527,969,000	11.373	101.59	97.35	0.0879	527,969,000	0
Total	43,796,512,073	4,307,793,800	91.755	819.71	819.71	0.8894	3,850,852,848	456,940,952
Average	4,866,279,119	478,643,756	10.195	91.08	91.08	0.0988	427,872,539	50,771,217

Standard Deviation : 62.87
Co-efficient of variation : 69.07

Chi-Square : 0.53

OVERHEAD PRODUCTIVITY IN AMUL DAIRY – ANAND:

The table 6.1 provides the mathematical data regarding input of overheads and output, Output-Input ratio, productivity indices, trend value, Input-Output ratio, co-efficient factor and possible savings. It also works out some statistical data like standard deviation, Co-efficient of variation, chi-square and growth rate of Amul Dairy – Anand from the year 1996-‘97 to 2004-‘05.

In reference to the Amul Dairy’s output, the table indicates that it increases from 400.10 crores in 1996-‘97 to 509.19 crores in 2000-’01. The fluctuation spread of output works out to be 27.27%. While input of overhead increases from 35.74 crores in 1996-’97 to 53.66 crores in 2000-’01. The fluctuation spread of input works out to be 50.14%. Here, the input of overhead increases more than the output. It shows poor overhead productivity of Amul Dairy during this particular period. In the year 2001-’02 suddenly both the output and input of overhead decrease highly. And then, they increase year by year till the year 2004-’05. Output increases from 468.78 crores in the 2001-02 to 600.47 crores in the 2004-05. The fluctuation expansion of output comes out to be 28.09%. on the other hand, input of overhead increases 46.19 crores in the year 2001-02 to 52.80 crores in the year 2004-05. The fluctuation spread of input of overhead comes out to be 14.31%. Here, output is increasing more than the input of overhead during this period. So, it indicates good overhead Productivity of Amul dairy during this particular period. Productivity ratio with the support of co-efficient of factorial productivity stays in mixed trend during the study period.

Overhead productivity ratio [O-I ratio] comes out 11.195 for the base year, - 1996-’97. The average productivity ratio comes out 10.195 for the period of the research. The O-I ratio of 2002-‘03 [10.335], 2003-’04 [11.321] and 2004-’05 [11.373] are registered higher than the average ratio. While the O-I ratio of 1997-’98 [8.723], 1998-’99 [9.631], 1999-’00 [9.538] 2000-’01 [9.489] and 2003-’02 [10.150] are registered lower than the average ratio. By seeing these figures, it can be said that there should be lack of qualitative manpower and utilization of latest machinery in the production operations in the dairy.

The factorial overhead productivity in the base year i.e. 1996-'97 is 0.2623. It decreases to 0.2077 in 1997-'98. Then, it increases and goes to 0.2455 in 1998-'99. Then after, it decreases and climbs down to 0.2242 in 2000-'01. Then, it goes up to 0.2547 in 2001-'02. After that, it decreases to 0.2401 and again it increases to 0.2495 in 2004-'05. So, it fluctuates continuously factorial productivity ratio comes out to be 0.2396 which is lower than the base year ratio. It states the negative trend of overhead productivity during the work out period. It can be said that productivity of any individual element doesn't depend only on an individual input but it is very much sensitive with respect to other factors also like material and labour.

The productivity index which is assumed 100 for the base year 1996-'97. It decreases in the first initial year and goes down to 77.92. Then, it increases and reaches to 86.03 in 1998-'99. Then after, it decreases and touches to 84.76 in 2000-'01. After that year, it increases constantly for four years and reaches to 101.59 in 2004-'05, Which is the highest level during the study period. Productivity index gives the analysis of Variation in Output-Input ratio for the years under the research. The table shows that the average productivity index works out to be 91.07 which is less by 8.93% from the base year. Here, it shows that there should be improper control and management over overhead in Amul Dairy which increases the overhead cost and overhead related losses itself.

The overall result of overhead productivity is considered in respect to the value of standard deviation, co-efficient of variation and chi-square. Standard deviation of the Amul Dairy is 62.87 While co-efficient of variation is 69.07. These figures make clear that there is some variation in the productive indices. The calculated value of chi-square comes out 0.53 while the critical value of chi-square 2.17. So the critical value is more than the calculated value. It gives permission to accept the null hypothesis, "Overhead productivity indices can be represented by the straight line trend based on least square method." It means, "There is no significant difference between the overhead productivity of the co-operative milk dairy plants of Gujarat state" The calculated value of productivity index. The average requirement of overhead per rupee of output for Amul Dairy is 0.10. Input-Output ratio is the lowest during the year 2004-'05. It indicates that the dairy gets its maximum efficiency in overhead

input during this year. Moreover, the table shows that the possible savings in overhead input works out 5.08 crores per year for the dairy.

Overhead Productivity of Amul Dairy - Anand.

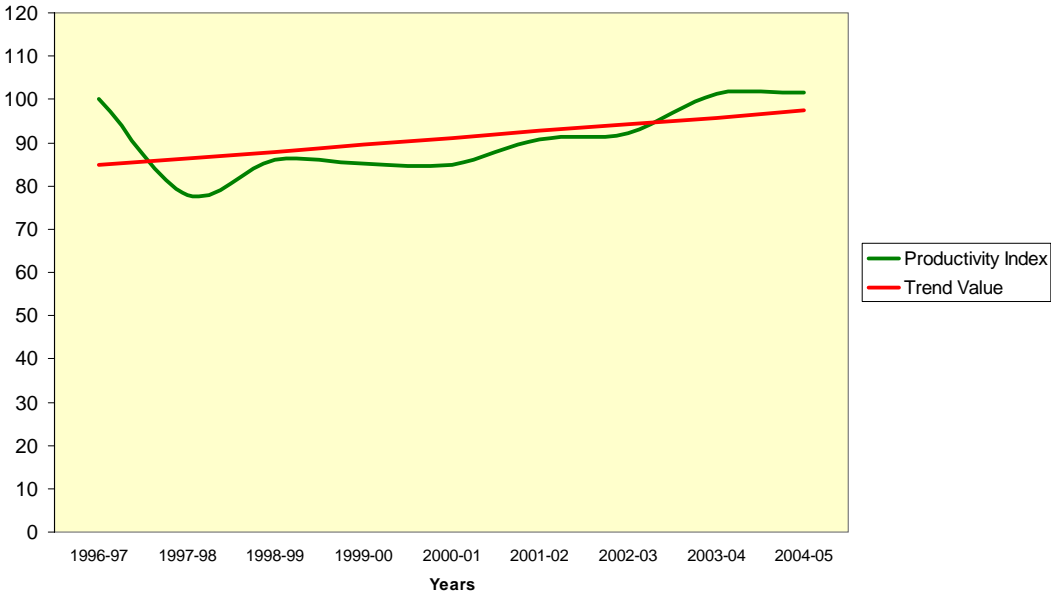


Table 6.2
Overhead Productivity of "Gopal Dairy" - Rajkot

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	174,685,012	17,798,604	9.815	100.00	123.54	0.1019	7,906,010	9,892,594
1997-98	216,556,153	17,323,340	12.501	127.37	138.55	0.0800	9,801,042	7,522,298
1998-99	268,575,714	17,619,646	15.243	155.30	153.55	0.0656	12,155,378	5,464,268
1999-00	372,833,832	20,604,711	18.095	184.36	168.56	0.0553	16,873,960	3,730,751
2000-01	458,274,780	22,294,890	20.555	209.42	183.57	0.0486	20,740,904	1,553,986
2001-02	506,238,891	22,911,695	22.095	225.11	198.57	0.0453	22,911,695	0
2002-03	678,063,418	31,879,208	21.270	216.71	213.58	0.0470	30,688,243	1,190,965
2003-04	665,709,864	31,346,698	21.237	216.37	228.59	0.0471	30,129,138	1,217,560
2004-05	871,822,330	40,845,753	21.344	217.46	243.59	0.0469	39,457,512	1,388,241
Total	4,212,759,994	222,624,545	162.155	1652.10	1652.10	0.5377	190,663,882	31,960,663
Average	468,084,444	24,736,061	18.017	183.57	183.57	0.0597	21,184,876	3,551,185

Standard Deviation : 1850.96
Co-efficient of variation : 1008.33

Chi-Square : 1.95

OVERHEAD PRODUCTIVITY IN GOPAL DAIRY – RAJKOT:

The table 6.2 shows the figures regarding overhead productivity of Gopal Dairy – Rajkot and also generates some necessary statistical data of the research period i.e. 1996-'97 to 2004-'05.

So far the output of Gopal Dairy is concerned, it is apparent from the table that it increases from 17.47 crores in 1996-'97 to 67.81 crores in 2002-'03. The variability spread of output works out to be 288.15%. While in case of input of overhead, it increases from 1.78 crores in 1996-'97 to 3.19 crores in 2002-'03. The variability spread of overhead input works out to be 79.21%. Here, output is increasing more than the overhead input. It indicates the positive trend of overhead productivity. The productivity ratio which creates the Co-efficient of factorial productivity ratio moves in mixed trend during the research period.

Overhead productivity ratio [O-ratio] comes out 9.815 for the base year-1996-'97. The average productivity ratio works out 18.017 for the study period. The O-I ratio of 1999-'00 (18.095), 2000-'01 (20.555), 2001-'02 (22.095), 2002-'03 (21.270), 2003-'04 (21.237) and 2004-'05 (21.344) are recorded higher than the average ratio. While the O-I ratio, of 1997-98 (12.501) and 1998-'99 (15.243) are recorded lower than the average ratio. Here, this numerical picture point out that there should be used the qualitative manpower and well as properly in the dairy.

Factorial productivity is computed on the basis of co-efficient factor of productivity. The factorial productivity ratio of the base year is 0.5213. It increases constantly for three years and reaches to 0.6267 in 1999-'00. Then, it decreases and goes down to 0.6164 in the year 2000-'01. Then after, it increases and goes up to 0.6208 in 2001-'02. Then, again it decreases and then, it increases. In the last year of the study period, it decreases to 0.5041. The average factorial productivity ratio comes out to 0.5728 which is bigger than the base year ratio. So, overall, it shows the positive trend of overhead productivity. It can be said that productivity of any individual input such as material and labour.

The productivity index which is assumed 100 for the base year. Then it continuously increases and reaches to 225.11 in the year 2001-'02 which is the highest level during the study period. Then, it decreases slightly and goes down to 216.37 in 2003-'04. Then again, it increases and reaches to 217.46 in 2004'05. As the analyzing point of view, the productivity index clears the picture of variation in Output-Input ratio for the years under the study. The average productivity index works out to be 183.57, which is more by 83.57% from the base year. It shows an increasing trend and supports the view that there is much control and proper management of overhead in the dairy. And it helps to reduce overhead related extra expenses automatically.

The overall result of overhead productivity is kept in view in reference to the value of standard deviation, Co-efficient of variation and Chi-square value. Standard deviation of Gopal Dairy comes out to 1850.96 while co-efficient of variation works out to 1008.33. So, these figures say that there is so much variation in the productive indices. The calculated value of Chi-square is 1.95 while the critical value of Chi-square is 2.17. Here, the critical value is more than the calculated value. So, it permits to allow the acceptance of null Hypothesis, "overhead productivity indices can be expressed by the straight line trend based on least square method". It means, "There is no significant difference between the overhead productivity of the Co-operative milk dairy plants of Gujarat state." The calculated value of productivity index. The average requirement of overhead per rupee of output for Gopal Dairy is 0.06. Input-Output ratio stays lowest in the year 2001-'02. It makes clear that the dairy gets its maximum efficiency in overhead input during this year. In the reference to the possible savings in overhead input, the table shows that it works out at 35.52 lacs per year for the dairy.

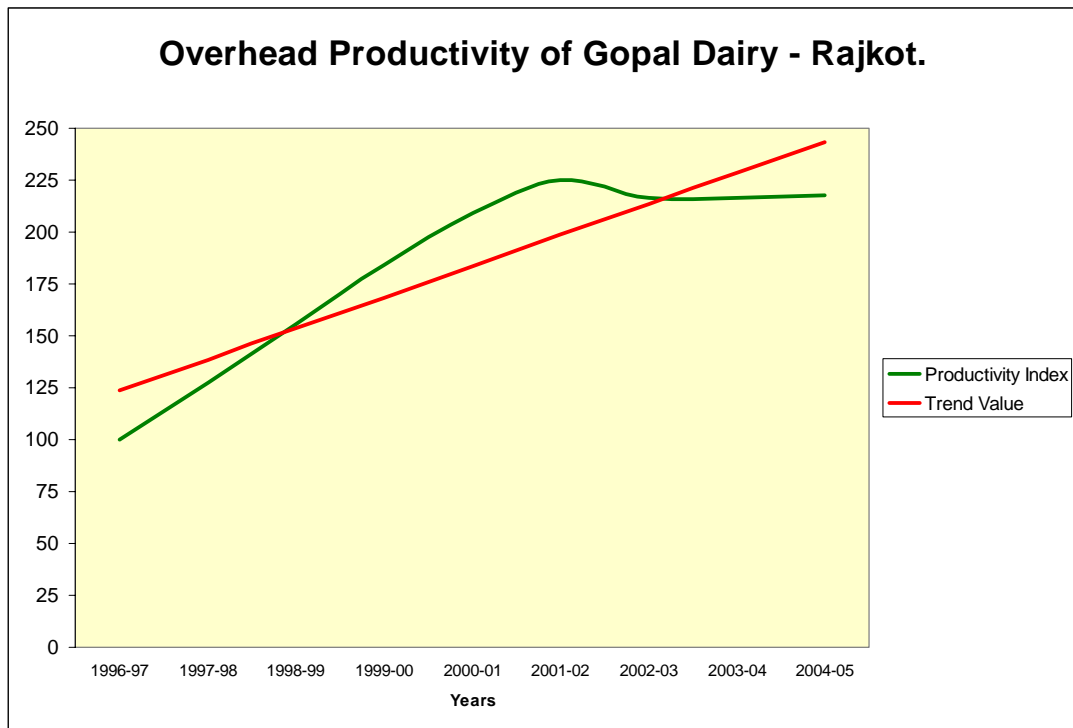


Table 6.3
Overhead Productivity of "Uttam Dairy" - Ahmedabad

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	511,784,952	32,389,435	15.801	100.00	95.20	0.0633	32,373,190	16,245
1997-98	573,701,471	36,996,376	15.507	98.14	94.28	0.0645	36,289,748	706,628
1998-99	689,645,318	45,652,066	15.107	95.61	93.35	0.0662	43,623,829	2,028,237
1999-00	687,372,508	52,016,649	13.214	83.63	92.43	0.0757	43,480,061	8,536,588
2000-01	734,114,121	57,352,356	13.846	87.63	91.50	0.0722	50,232,051	7,120,305
2001-02	808,915,447	60,188,281	13.440	85.06	90.58	0.0744	51,168,315	9,019,966
2002-03	850,566,046	58,739,604	14.480	91.64	89.65	0.0691	53,802,943	4,936,661
2003-04	906,794,648	70,200,478	12.917	81.75	88.73	0.0774	57,359,709	12,840,769
2004-05	1,064,493,178	67,335,001	15.809	100.05	87.80	0.0633	67,335,001	0
Total	6,827,387,689	480,870,246	130.121	823.51	823.51	0.6261	435,664,847	45,205,399
Average	758,598,632	53,430,027	14.458	91.50	91.50	0.0696	48,407,205	5,022,822

Standard Deviation : 46.64
Co-efficient of variation : 50.98

Chi-Square : 0.45

OVERHEAD PRODUCTIVITY IN UTTAM DAIRY – AHMEDABAD:

The table 6.3 gives the numerical information regarding input of overhead, output, Output-Input ratio, co-efficient factor, trend value, productivity index, Input-Output ratio and possible savings. It also computes standard deviation, co-efficient of variation, value of Chi-square and growth rate of Uttam Dairy Ahmedabad from the year 1996-'97 to 2004-'05.

Regarding to Uttam Dairy's output, It is evident from the table that it increases from 51.18 crores in 1996-'97 to 68.96 crores in 1998-'99. The fluctuation expansion of output comes out to be 34.74% while, in case of input of overhead, it increases from 3.24 crores in 1996-'97 to 4.57 crores in 1998-'99. The fluctuation expansion of input of overhead comes out to be 41.05%. So here, input of overhead is bigger by 6.31% than the output. It indicates poor overhead productivity of, Uttam Dairy. In the year 1999-'00 output decreases but then it continuously increases till 2004-'05 while till 2001-'02, the overhead input also increases constantly trend. The partial productivity ratio with the help of co-efficient of factorial productivity moves in mixed trend during the study period.

Overhead productivity ratio [O-I ratio] comes out 15.801 for the base year i.e. 1996-'97. The average overhead productivity ratio works out to 14.458 for the study, period. The O-I ratio of 1997-'98 [15.507], 1998-'99 [15.107], 2002-'03 [14.480], and 2004-05 [15.809] are registered higher than the average productivity ratio while during the years 1999-'00 [13.214], 2000-'01 [13.846], 2001-'02 [13.440], and 2003-'04 [12.917], are registered lower than the average ratio, So overall it clears the positive trend of the overhead productivity. By seeing these figures, it can be said that, these should not be the compute utilization of qualitative manpower and latest machinery in the dairy.

The factorial productivity ratio of the base year is 0.4714. It increases to 0.4779 in the first initial year i.e. 1997-'98. Then, it decreases for two year and goes down to 0.4546 in 1999-'00. Then again it increases constantly for three years and reaches to

0.5028 in 2002-'08. Then after it decreases any again it increases in 2004-'05. The average factorial productivity ratio comes out to 0.4704 which is lower than the base year ratio. It interprets the negative trend of overhead factorial productivity during the period under the study.

The productivity index which is assumed 100 for the 1996-'97 i.e. base year. Then it decreases in the first three initial years and goes down to 83.63 in year 1999-'00. Then it increases in the year 2000-'01 but not so significantly. Then after it decreases and again it increases. In the year, 2003-'04 it decreases and reaches to 81.75 which is the lowest level of the study period And again in the year 2004-'05, it increases and reaches to 100.05. It can be said that in the last year it maintains the increasing trend the average productivity index works out 91.50 which is less by 8.50% from the base year. It shows an overall negative trend and makes the fact clear that, there is no proper management and control over overhead expenses which converts to some losses of overhead itself.

The overall result of overhead productivity is depending on the value of standard deviation, co-efficient of variation and Chi-square value. The calculated value of standard deviation is 46.64 while co-efficient of variation is 50.98. So there is some variation in the productive indices. The calculated value of Chi-square comes out to 0.45, while the critical value of Chi-square is 2.17. So the critical value is bigger than the calculated value. These figures permit to allow the acceptance of null Hypothesis, "Overhead productivity indices can be expressed by the straight line trend based on least square method." It means, "There is no significant difference between the overhead productivity of the Co-operative milk dairy plants of Gujarat State." The calculated Value of productivity index. The average requirement of overhead per rupee of output for Uttam Dairy is 0.07. Input-Output ratio stays at the lowest level in the year 2004-'05. It clears that the Dairy achieves its maximum efficiency in overhead during this year. In reference input, the table makes clear that it works out at 50.23 lacs per for the dairy.

Overhead Productivity of Uttam Dairy - Ahmedabad.

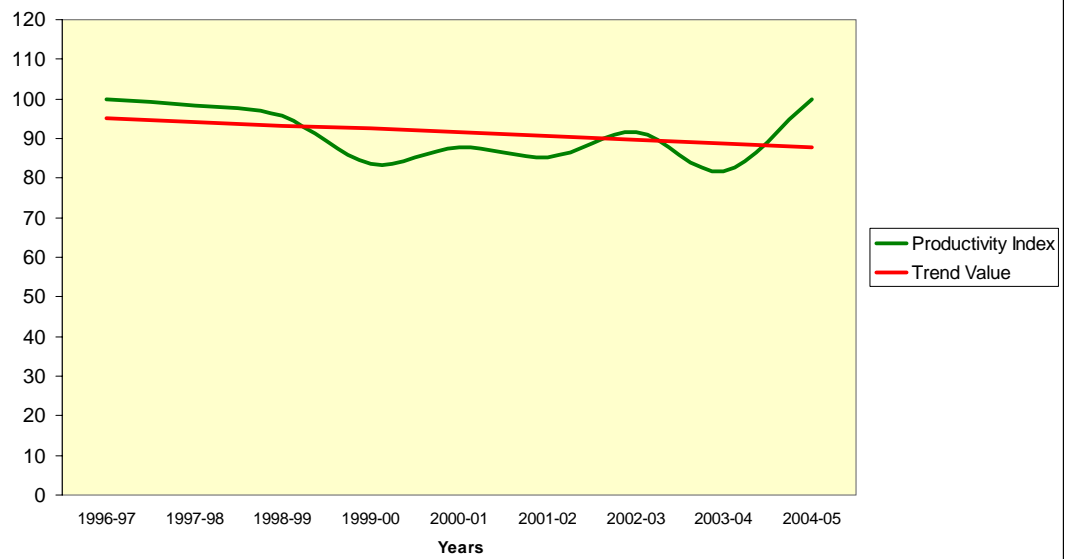


Table 6.4
Overhead Productivity of "Madhur Dairy" - Gandhinagar

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	290,221,515	10,526,357	27.571	100.00	103.50	0.0363	7,118,844	3,407,513
1997-98	360,325,063	16,611,741	21.691	78.67	104.30	0.0461	8,838,415	7,773,326
1998-99	410,278,514	19,429,255	21.117	76.59	105.10	0.0474	10,063,723	9,365,532
1999-00	489,815,303	12,014,681	40.768	147.87	105.91	0.0245	12,014,681	0
2000-01	552,144,201	15,476,034	35.677	129.40	106.71	0.0280	13,543,547	1,932,487
2001-02	606,154,453	18,027,922	33.623	121.95	107.51	0.0297	14,868,364	3,159,558
2002-03	649,934,804	19,722,352	32.954	119.52	108.32	0.0303	15,942,253	3,780,099
2003-04	666,809,710	19,934,065	33.451	121.33	109.12	0.0299	16,356,177	3,577,888
2004-05	738,683,878	41,178,626	17.939	65.06	109.92	0.0557	18,119,179	23,059,447
Total	4,764,367,441	172,921,033	264.791	960.39	960.39	0.3279	116,865,183	56,055,850
Average	529,374,160	19,213,448	29.421	106.71	106.71	0.0364	12,985,020	6,228,428

Standard Deviation : 699.14
Co-efficient of variation : 655.18

Chi-Square : 6.49

OVERHEAD PRODUCTIVITY IN MADHUR DAIRY – GANDHINAGAR:

The table 6.4 productivity the numerical picture in respect to input of overhead, output, output –Input ratio, productivity index, trend value Input –output ratio, co-efficient factor and possible savings of Madhur Dairy - Gandhinagar. It also computes some statistical like standard deviation co-efficient like standard deviation, co-efficient of variation. Chi- square and growth rate of the period of the study i.e. 1996-1997 to 2004-2005.

As regard the output of Madhur Dairy, it is evident from the ruble that it increases from 29.02 crores in 1996-1997 to 41.03 in 1998-1999. The fluctuation spread of output come out to 41.39%. While in case of input of overhead, it increases for 1.05 crores in 1996-'97 to 1.94 crores in 1998-'99. The fluctuation spread to input out to be 84.76% Then in the year 1999-'00 the then it, increases like output till 2004-'05 the output increases from 48.98 crores in 1999-'00 to 73.87 crores in 2004-'05. The fluctuation spread of output comes out to be 50.82% while in case of input of overhead, it in creases from 1.20 crores in 1999-'00 to 4.12 crores in 2004-'05 The fluctuation spread of input comes out to be 243.33% So Here in both the times the input of overhead increases more than the output. It can be said that, it shows the negative of overhead productivity of Madhur Dairy. Productivity ratio with the help of Co-efficient of factorial productivity stays in fluctuating ways during the period under the research.

Overhead productivity ratio [O-I ratio] come out 27.571 for the base year i.e. 1996-'97. The average productivity ratio comes out 29.421 for the research period. The O-I ratio of 1999-'00 [40.768], 2000-'01 [35.677], 2001-'02 [33.623], 2002-'03 [32.954] and 2003-'04 [33.451] are registered bigger than the average ratio while the O-I ratio of 1997-'98 [21.691], 1998-'99 [21.117], and 2004-'05 [17.939] are registered smaller than the average ratio smaller than the average ratio. By viewing this result it can be said that there is an overall good performance of the dairy.

The factorial overhead productivity is 0.3633 for the base year i.e.1996-'97. Then it decreases goes down to 0.3090 in the first initial year. Then it increases and reaches to 0.4868 in 1999-'00. Then it decreases in the year 2000-'01 to 0.4388. Then after, it increases and reaches to 0.5373 which is the highest level during the study period, in 2003-'04. In the year 2004-'05, again it decreases and goes down to 0.3611. The average factorial productivity ratio comes out 0.4216 which is bigger then the base year ratio. It gives intimation of positive trend of overhead productivity, during the period under the research

The productivity index which is assumed 100 for 1996-'97 i.e. base year, Then it decreases and goes down to 76.59 in 1998-'99. Then it increases and reaches to 147.87 in the vela next year which is the highest level during the research period. Then after, it decreases constantly for three years and goes, down to 119.52 in the year 2002-'03. Then again it increases in 2003-'04 but not So significantly. In the year 2004-'05 suddenly it decreases and goes down to 65.06 which is lowest level during the research period. It can be said that productivity index gives an idea about the fluctuation in Output-Input ratio as the an atypical point of view is concerned The table states that productivity index comes on average to 106.71 which is more by 6.71% in comparison to the base year. It states the positive trend and emphases that the control and management over overhead have improved in Madhur Dairy, which cuts off some losses which are related to overhead expenses itself.

The overall result of overhead productivity is taken in to consideration with the help of standard deviation, co-efficient of variation and Chi-square value. Standard deviation of the Madhur Dairy is 699.14 while co-efficient of variation is 655.18 So, It can be said that there is some variation in the productive indices. The table the calcite value chi- square comes out to 6.49 while the critical value is 2.17. So it makes the clarification that, the calculated value is more then the critical accept alternative Hypothesis, "overhead productivity indices can not be the straight line fiend based on least square method." It means. "There is significant difference between the overhead productivity of the co-operative milk dairy plants of Gujarat stale." The calculated value of productivity index. The average requirement of overhead per rupee of output for Madhur Dairy is 0.04. Input –output ratio goes down to 0.0245 in 1999-2000 which is the lower level during the research period. It clarifies that the dairy obtains

its maximum efficiency in overhead during this year. Moreover the table states that the possible saving out at 62.28 lacs per year for the dairy.

Overhead Productivity of Madhur Dairy - Gandhinagar.

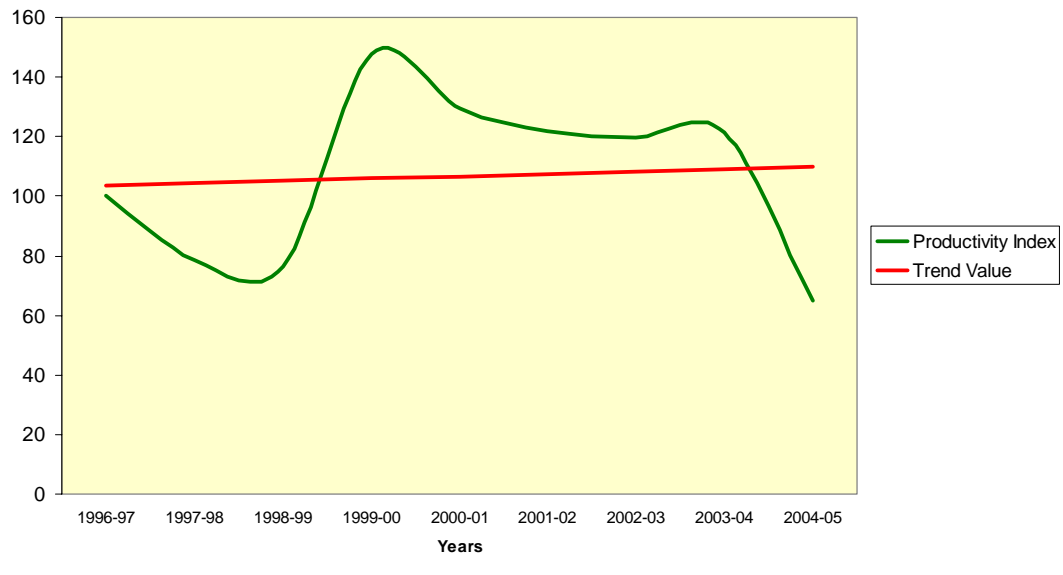


Table 6.5
Overhead Productivity of "Sugam Dairy" - Baroda

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	1,279,285,046	11,371,985	11.487	100.00	90.70	0.0871	96,212,114	15,159,871
1997-98	1,368,463,465	121,212,353	11.290	98.29	93.45	0.0886	102,919,020	18,293,333
1998-99	1,559,187,195	156,681,554	9.951	86.63	96.20	0.1005	117,262,917	39,418,637
1999-00	1,759,366,077	168,089,032	10.467	91.12	98.96	0.0955	132,317,915	35,771,117
2000-01	1,929,278,983	187,949,984	10.265	89.36	101.71	0.0974	145,096,677	42,853,307
2001-02	2,034,018,057	160,773,078	12.651	110.13	104.46	0.0790	152,973,864	7,799,214
2002-03	2,300,039,628	174,590,769	13.174	114.69	107.22	0.0759	172,980,741	1,610,028
2003-04	2,479,889,172	186,506,815	13.297	115.76	109.97	0.0752	186,506,815	0
2004-05	2,578,392,763	205,151,277	12.568	109.41	112.72	0.0796	193,915,046	11,236,231
Total	17,287,920,386	1,372,326,847	105.150	915.39	915.39	0.7788	1,300,185,109	172,141,738
Average	1,920,880,043	152,480,761	11.683	101.71	101.71	0.0865	144,465,012	19,126,860

Standard Deviation : 111.42
Co-efficient of variation : 109.55

Chi-Square : 0.61

OVERHEAD PRODUCTIVITY IN SUGAM DAIRY – BARODA:

The table 6.5 gives the numerical picture regarding overhead productivity of Sugam Dairy of Baroda and finds out necessary statistical data of the research period, i.e. 1996-'97 to 2004-'05.

As the out of Sugam Dairy is concerned, it is clear from the table that it increases from 127.93 crores in 1996-'97 to 192.93 crores in 2000-'01. The fluctuations spread of output works out to be 50.81% while in case of input of overhead, it increases from 11.14 crores in 1996-'97 to 18.78 crores in 2000-'01. The fluctuation spread of input works out to be 68.67%. Here, input of increases more than the output. It shows poor overhead productivity of Sugam Dairy. After the year 2000-01, output is increasing continuously till the year 2004-05. While in the year 2001-02, input of overhead decreases and then it increases constantly till the last year i.e. 2004-05. Productivity ratio with the backing of co-efficient of factorial productivity moves in fluctuating ways during the research period.

Overhead productivity ratio [O-I Ratio] comes out at 11.487 for the base year 1996-'97. The average productivity ratio comes out 11.683 for the study period. The O-I ratio of 2001-'02 [12.651], 2002-'03 [13.174], 2003-'04 [13.297], 2004-'05 [12.568] are recorded higher than the average ratio, while the O-I ratio of 1997-'98 [11.290], 1998-'99 [9.951], 1999-'00 [10.467], 2000-'01 [10.265] are recorded lower than the average ratio. By viewing this result, it can be said that it is overall good performance of the dairy.

The factorial overhead productivity in the pose year is 0.4272. It increases to 0.4401 in the very first initial year. Then it decreases to 0.4139 in 1998-'99. Then after it constantly increases for five years and touches to 0.5249 in 2003-'04. In the year 2004-'05 it decreases to 0.5108 but not so significantly. The average factorial productivity ratio is 0.4650, which higher than the base year ratio. It indicates that there is an overall bullish trend of overhead productivity during the research period. It should be said that productivity of any individual element does not depend only on a

individual input but it is very sensitive with respect to other factors also such as material and labour.

The productivity index which is 100 for the base year 1996-'97 productivity index means that it is the reflection of variation in output-input ratio. In the initial two years, it decreases and goes down to 86.63 in the year 1998-'99. Then it increases to 91.12 in the year 1999-'00. Then again it decreases to 89.36 in year 2000-'1. Then it increases constantly for three years and touches to 115.76 and than it decrease to 109.41 in 2004-'05. Productivity index comes on an average to 101.71 which is more by 1.71% from the base year. So, overall, it states the positive trend and gives. Support to the view that overhead management has improved at some level in Sugam Dairy which help to decrease some losses of overhead automatically.

The overall result of overhead productivity is considered in reference to the value of standard deviation, co-efficient of variation and chi-square. Standard deviation of the Sugam Dairy is 111.42 and co-efficient of variation is 109.55; it makes clear that there is no much variation in the productivity indices. The calculated of chi-square is 0.61 while the table value is 2.17. So, the table value is more than the calculated. It allows the acceptance of null hypothesis, "overhead productivity indices can be represented by the straight line based on least square method." It means, "There is no significant difference between the overhead productivity of the co-operative milk dairy plant." The calculated of productivity index. The average requirement of overhead per rupee of output for Sugam Dairy is 0.07. Input-output ratio is the lowest in the year 2003-'04. It indicates that the unit gets its maximum efficiency in overhead during this year. The table also states that the possible saving in overhead input comes per year for the dairy.

Overhead Productivity of Sugam Dairy - Baroda.

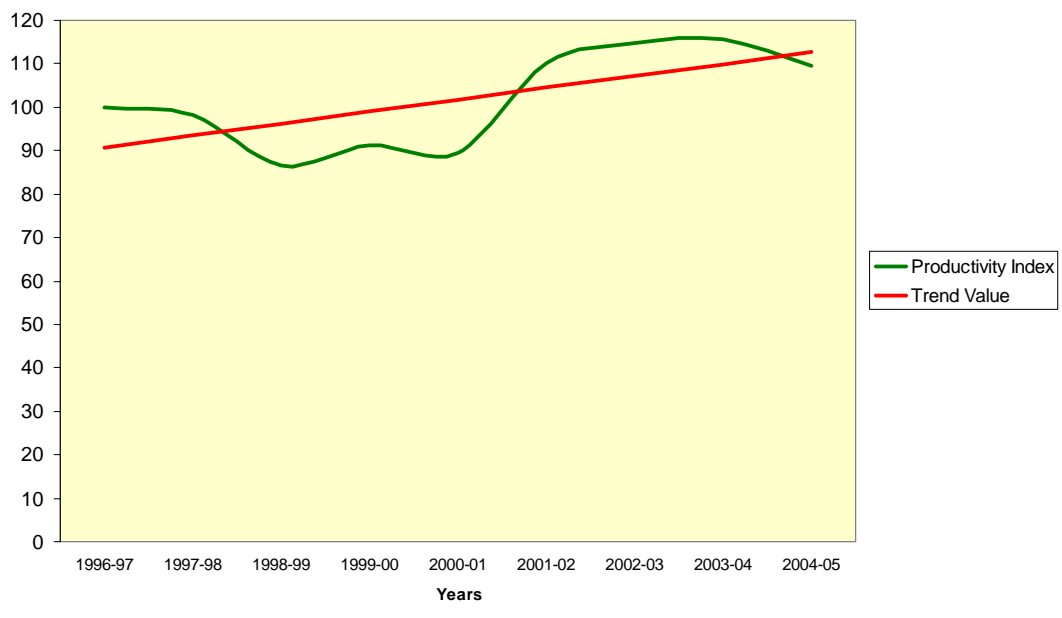


Table 6.6
Overhead Productivity of "Dudhsagar Dairy" - Mehsana

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	4,554,175,019	232,926,366	19.552	100.00	101.63	0.0511	178,560,116	54,366,250
1997-98	5,377,138,889	263,194,544	20.430	104.49	103.08	0.0489	210,826,888	52,367,656
1998-99	6,529,840,740	293,004,284	22.286	113.98	104.54	0.0449	256,022,028	39,682,256
1999-00	6,591,432,019	319,492,923	21.494	109.93	106.00	0.0465	269,251,057	50,241,866
2000-01	6,657,700,671	359,672,336	18.326	93.73	107.45	0.0546	258,436,899	101,235,437
2001-02	6,867,247,088	346,534,579	19.212	98.26	108.91	0.0521	261,035,161	85,499,418
2002-03	7,471,835,291	354,136,788	21.099	107.91	110.37	0.0474	292,955,755	61,181,033
2003-04	8,739,200,513	344,679,355	25.505	130.45	111.82	0.0392	344,679,355	0
2004-05	8,791,045,501	412,609,999	21.180	108.33	113.28	0.0472	342,646,617	69,963,382
Total	61,579,615,731	2,926,251,174	189.084	967.08	967.08	0.4319	2,414,413,876	511,837,298
Average	6,842,179,526	325,139,019	21.009	107.45	107.45	0.0480	268,268,208	56,870,811

Standard Deviation : 101.75
Co-efficient of variation : 94.69

Chi-Square : 0.80

OVERHEAD PRODUCTIVITY IN DUDHSAGAR DAIRY – MEHSANA:

The table 6.6 given the figures in reference to input of overhead, output, Output-Input ratio, productivity indices, trend value, Input-Output ratio, co-efficient factor and possible savings. It also computes some statistical figures like standard deviation, co-efficient of variation, Chi-square and growth rate of Dudhsagar Dairy-Mehsana from the year 1996-'97 to 2004-'05 i.e. the research period.

In reference to the output of Dudhsagar Dairy, it is observed from the table that it increases from 455.42 crores in 1996-'97 to 686.72 crores in 1999-'00. The fluctuation spread of output comes out to be 50.79% while input of overhead increases from 23.29 crores in 1996-'97 to 31.95 crores in 1999-'00. So, the fluctuation spread of input comes out to be 37.18%. So, here output is increasing more than the input of overhead comparatively. It shows good and positive overhead productivity of Dudhsagar Dairy. Then, from the year 2000-01 to 2003-04 output increases constantly year by year. In the last year i.e. 2004-05 it again decreases. While input of overhead stays in a mixed trend till the year 2004-05. Productivity ratio with the help of co-efficient of factorial productivity stays in mixed trend during the study period.

Overhead productivity ratio [O-I ratio] come out 19.552 for the base year i.e. 1996-'97. The average productivity ratio comes out 21.009 for the research period. The O-I ratio of 1998-'99 [22.286] 1999-'00 [21.494] 2002-'03 [21.099] 2003-'04 [25.505] 2004-'05 [21.180] are registered higher than the average ratio, while the O-I ratio of 1997-'98 [20.430] 2000-'02 [18.326] 2001-'02 [19.212] are registered lower than the average ratio These figures speak that manpower and latest technology should be utilized completely and properly in the dairy. So, overall there is a good overhead productivity in the dairy.

The factorial overhead productivity in the base year is 0.3117. It decreases in the first two initial years and goes down to 0.2669 in 1998-'99. Then, it increases in the very next year. Then, again it decreases. And goes down to 0.3374 in 2000-'01. Then, it

increases and reaches to 0.4314 in 2003-'04 which is the highest level during the research period. In the year 2004-'05, it decreases to 0.3982. The average factorial productivity ratio is 0.3520 which is bigger than the base year ratio. So, it suggests the upward trend of overhead factorial productivity ratio during the study period. It can be said that productivity of any one factor doesn't depend only on an individual input but it is very much affected by other factors also like material and labour.

The productivity index which gives an idea about the variation in Output-Input ratio for the years under the research. It is assumed 100 for the base year i.e. 1996-'97. It increases to 113.98 in 1998-'99. Then it decreases to 93.73 in 2000-'01. Then after it increases and reaches to 130.45 in 2003-'04. Then again it decreases in 2004-'05 but still it is above from the base year. It may be noted that the productivity index comes on an average to 107.45 which is more by 7.45% from the base year. It says an overall positive trend and makes clear that there is good and balanced control and management over overhead in Dudhsagar Dairy which offsets some overhead related losses itself.

The overall result of overhead productivity is computed in reference to the value of standard deviation, Co-efficient of variation and Chi-square value. It is observed from the table that standard deviation of the Dudhsagar Dairy deviation comes out to 94.69. So, there is some variation in the productive indices. The calculated value of Chi-square is 0.80 while the critical value is 2.17. So, the calculated value is smaller than the critical value and it permits to allow the acceptance of null hypothesis. "Overhead productivity indices can be expressed by the straight line trend based on least square method." It means, "There is no significant difference between the overhead productivity of the co-operative milk dairy plants of Gujarat State". The calculated value of productivity index. The average requirement of overhead per rupee of output for Dudhsagar Dairy is 0.05. The Input-Output ratio stays at the lowest level during the year 2003-'04. It is observed from the table that dairy gets its maximum efficiency in overhead input in this year. Moreover, it may be noted that the possible savings in overhead input comes out at 5.69 crores per year for the dairy.

Overhead Productivity of Dudhsagar Dairy - Mehsana.

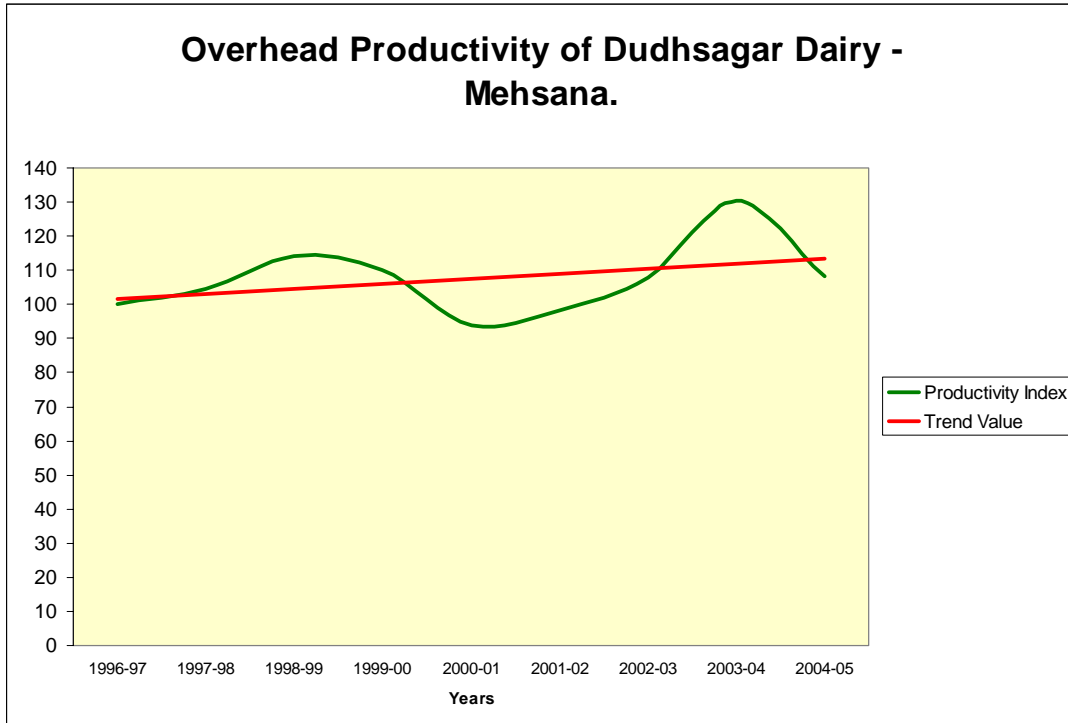


Table 6.7
Overhead Productivity of "Vasudhara Dairy" - Alipur

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	695,053,623	43,890,109	15.836	100.00	90.86	0.0631	43,890,109	0
1997-98	772,578,793	60,762,101	12.715	80.32	85.01	0.0786	48,785,542	11,976,559
1998-99	827,345,634	59,161,971	13.984	88.31	79.16	0.0715	52,243,868	6,918,103
1999-00	226,295,942	26,845,683	8.430	53.23	73.31	0.1186	14,289,766	12,555,917
2000-01	1,363,097,348	106,024,152	12.856	81.18	67.47	0.0778	86,074,641	19,949,511
2001-02	1,514,945,909	205,190,691	7.383	46.62	61.62	0.1354	95,663,326	109,527,365
2002-03	1,759,795,585	216,529,628	8.127	51.32	55.77	0.1230	111,124,692	105,404,936
2003-04	2,259,975,028	263,422,963	8.579	54.17	49.92	0.1166	142,709,206	120,713,757
2004-05	2,630,211,146	319,180,396	8.241	52.04	44.07	0.1214	166,088,270	153,092,126
Total	12,049,299,008	1,301,007,694	96.151	607.19	607.19	0.9060	760,869,420	540,138,274
Average	1,338,811,001	144,556,410	10.683	67.47	67.47	0.1007	84,541,047	60,015,363

Standard Deviation : 350.99
Co-efficient of variation : 520.25

Chi-Square : 1.81

OVERHEAD PRODUCTIVITY IN VASUDHARA DAIRY – ALIPUR(CHIKHLI):

The table 6.7 displays the mathematical data in reference overhead input, output, index, trend value, Input- Output ratio, co-efficient factor and phoebe savings. It also computes some other statistical data like Stanford deviation, co-efficient of variation, chi-square and growth rate of Vasudhara Dairy Alipur (chikhli) from the year 1996-1997 to 2004-2005 i.e. nine years.

The table 6.7 indicates that the output of Vasudhara Dairy increases from of Vasudhara 69.51 crores dairy 1996-1997 to 82.73 crores in 1998-1999. The fluctuation expansion of output works out to be 19.02%. While it increases from 4.39 crores in 1996-'97 to 5.92 crores in 1998-'99. The fluctuation expansion of overhead input works out to be 34.85%. Here; the overhead input is increasing more than the output during this particular period. And then, the overhead input and output decreases suddenly in the year 1999-'00. Then, they increase more and more year by year. The output increases from 22.63 crores in 1999-'00 to 263.02 crores in 2004-'05. The fluctuation spread of output comes out to be 1062.26%. While the overhead input increases from 2.68 crores to 31.92 crores during the same period. The fluctuation spread of input comes out to be 1091.04%. So, these figures say that the overhead input is increasing more than the output in both the times. It can be said that there is a negative trend of overhead productivity in Vasudhara Dairy. Productivity ratio with the help of co-efficient factor moves in mixed trend during the study period.

Overhead productivity ratio (O-I ratio) comes out 15.836 for the base year i.e. 1996-'97 and it is the highest level during the study period. The average productivity ratio comes out 10.683 for the research period. The O-I ratio of 1997-'98 (12.715), 1998-'99 (13.984) and 2000-'01 (12.856) are recorded higher than the average ratio. While the O-I ratio of 1999-'00 (8.430), 2001-'02 (7.383), 2002-'03 (8.127), 2003-'04 (8.579) and 2004-'05 (8.241) are recorded lower than average ratio. By viewing these figures, it can be said that there should not be utilized or technology properly and efficiently in the dairy.

The factorial overhead productivity is 0.4194 in 1996-'97 i.e. base year. It decreases to 0.3319 in the very next year. Then, it increases and reaches to 0.4060 in 1998-'99 which is the highest level during the study period except the base year ratio. Then again, it decreases and increases. In the year 2001-'02, it decreases and goes down to 0.2416. Then after, it increases and goes up to 0.2523 in 2003-'04. In the year 2004-'05, it decreases to 0.2486. The average factorial productivity ratio comes out 0.3099 which is lower than the base year ratio. So it indicates overall negative trend of overhead productivity during the study period. It can be said that productivity of any one factor doesn't depend only on an individual input but it is very much affected by other factors also like material and labour.

Now, the productivity index which is 100 for the base year, 1996-'97. In the first initial year, it decreases and goes down to 80.32. Then it increases to 88.32. Then it increases to 88.31 in 1998-'99. Then, suddenly it decreases to 53.23 in the very next year. Then again, it increases and reaches to 81.18 in 2000-'01. Then after, it decreases and goes down to 46.62 in 2001-'02, which is the lowest level during the research period. Then again, it increases but not so significantly in the year 2003-'04. In the year 2004-'05, it decreases to 52.04. So, in then end, it continues the decreasing trend. It may be noted from the table that the average productivity index comes out 67.47 which is less by 32.53% from the base year. It displays the decreasing or negative trend and supports the view that there is no proper and good control and management over overhead expenses in the Vasudhara Dairy. So, it also creates some losses which are related to overhead expenses itself.

The overall result of overhead productivity is considered in respect to the value of standard deviation, co-efficient of Variation and Chi-square value. Standard deviation of Vasudhara Dairy Works out to 350.99 while co-efficient of variation works out to 520.25. It clarifies that there is much variation in the productive indices. The calculated value of Chi-square is 1.81 while the critical value is 2.17. So, the critical value is more than the calculated value. It allows of accept the null Hypothesis "Overhead productivity indices can be expressed by the straight line trend based on least square method" It means, "There is no significant difference between the overhead productivity of the co-operative milk dairy plants of Gujarat state" The calculated value of productivity index. The average requirement of overhead input per

rupee of output for Vasudhara Dairy is 0.10. Input-Output ratio says at the lowest level during the year 1996-'97. It indicates that the dairy gets its maximum efficiency in overhead input during this year. Moreover, the table suggests that the possible savings in overhead input comes out at 6.0 crores per year for the dairy.

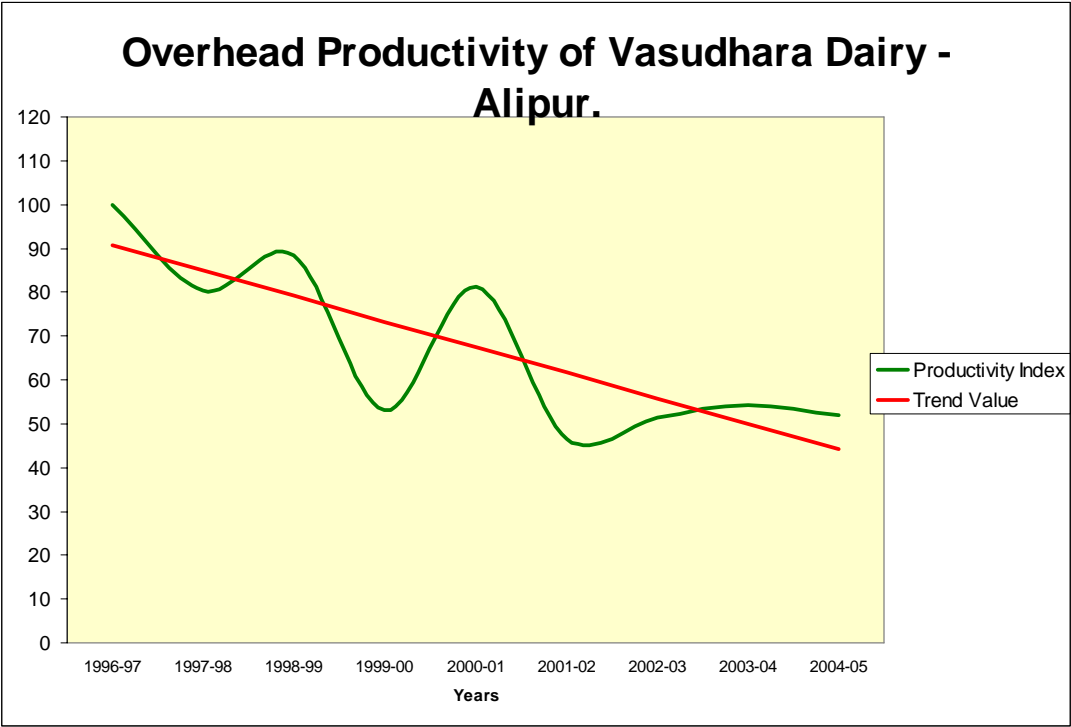


Table 6.8
Overhead Productivity of "Sumul Dairy" - Surat

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	2,344,676,397	140,697,000	16.665	100.00	90.80	0.0600	140,697,000	0
1997-98	2,875,563,460	194,789,930	14.762	88.58	89.56	0.0677	172,553,941	22,235,989
1998-99	2,900,606,810	201,620,489	14.386	86.32	88.33	0.0695	174,056,717	27,563,772
1999-00	3,106,651,642	225,850,615	13.755	82.54	87.09	0.0727	186,420,850	39,429,765
2000-01	3,446,899,795	254,822,435	13.527	81.17	85.86	0.0739	206,838,121	47,984,314
2001-02	3,525,635,053	281,799,086	12.511	75.07	84.62	0.0799	211,562,788	70,236,298
2002-03	3,818,751,083	256,095,967	14.911	89.47	83.39	0.0671	229,151,802	26,944,165
2003-04	4,251,273,272	298,504,872	14.242	85.46	82.15	0.0702	255,106,162	43,398,710
2004-05	4,600,686,233	328,272,650	14.015	84.10	80.91	0.0714	276,073,386	52,199,264
Total	30,870,743,745	2,182,453,044	128.774	772.71	772.71	0.6324	1,852,460,767	329,992,277
Average	3,430,082,638	242,494,783	14.308	85.86	85.86	0.0703	205,828,974	36,665,809

Standard Deviation : 41.48
Co-efficient of variation : 48.31

Chi-Square : 0.36

OVERHEAD PRODUCTIVITY IN SUMUL DAIRY – SURAT:

The table 6.8 draws the numerical picture in reference to overhead productivity of Sumul Dairy- Surat and finds out some necessary statistical data of the study period i.e. 1996-'97 to 2004-'05.

So far the output of Sumul Dairy is concerned it is clear from the table that it increases from 234.47 crores in 1996-'97 to 352.56 crores in 2001-'02. So, the upward trend comes out to be 50.36% While in case of overhead input, it increases from 14.07 crores in 1996-'97 to 28.18 crores in 2001-'02. The upward trend comes out to be 100.28% Here the overhead input is increasing more almost two times than the output. It shows the negative trend of overhead productivity of Sumul Dairy. But after 2001-'02, the output is increasing more and more year by year. While the overhead input decreases in 2002-'03 and then it increases more and more year by year. Productivity ratio with the support of co-efficient of factorial productivity status in mixed trend during the research period.

Overhead productivity ratio [O-I ratio] works out 16.665 for the base year i.e. 1996-'97. The average productivity ratio works out 14.308 for the study, period. The O-I ratio of 1997-'98 (14.762) 1998-'99 (14.386) and 2002-'03 (14.911) are registered higher than the average ratio while the O-I ratio of 1999-'00 (13.755), 2000-'01 (13.527), 2001-'02 (12.511), 2003-'04 (14.242), and 2004-'05 (14.015) are registered lower than the average ratio. By seeing these figures, it can be said that it indicates the negative trend of overhead productivity of the dairy. It is observed from the table that manpower and latest technology should not be utilized completely, properly and efficiently in the Sumul Dairy.

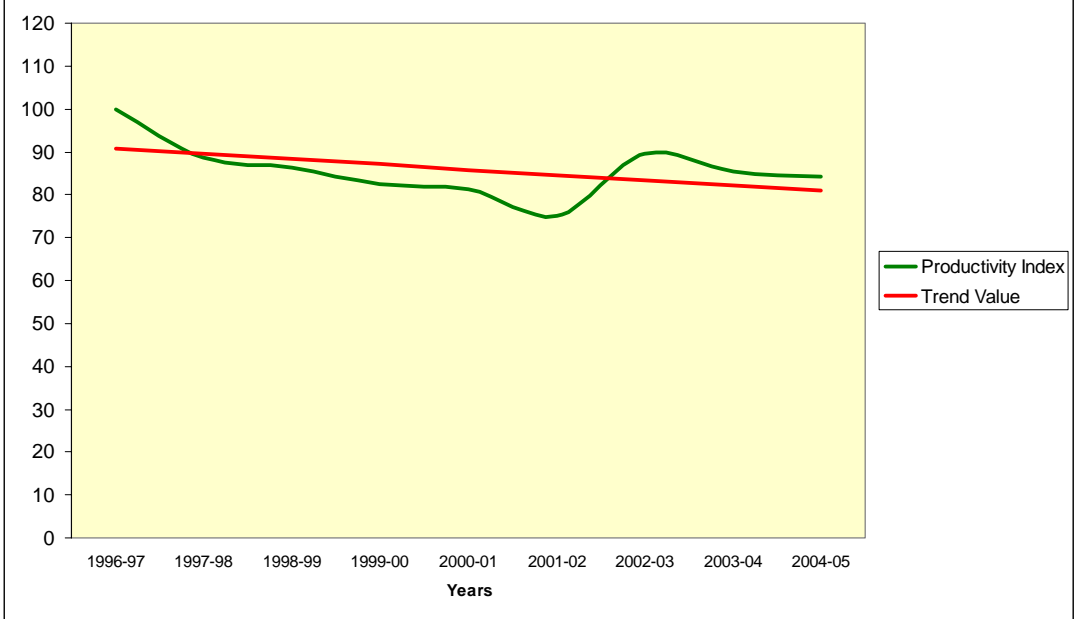
The factorial overhead productivity for the base year is 0.3461. Then, it decreases to 0.2954 in 1997-'98. Then after, it increases and goes up to 0.3416 in 1998-'99. Then, it suddenly starts the decreasing trend for three years constantly and goes down to 0.2652 in 2001-'02 which is the lowest level during the study period. Then, it increases to 0.3208 in 2002-'03. And then again, it is decreasing and goes down to 0.2931 in 2004-'05. So, in the end it stays in decreasing trend. The aver factorial

productivity ratio comes out to 0.3108 which is lower than the base year ratio. These figures display the negative trend of overhead productivity during the period under the research. It may be noted that productivity of any individual factor is not dependent only on an individual input but it is very much sensitive with respect to labour and material also.

The productivity index which is assumed 100 for the base year i.e.1996-'97. After 1996-'97, it is decreasing constantly for five years in a row and goes down to 75.07 in 2001-'02. Then, it increases to 89.47 in 2002-'03. But then after, it decreases and goes down to 84.10 in 2004-'05. So, at the end, it continues to decrease. So, it stays in a mixed trend but mostly in downward trend during the study period. As the analytical point of view, productivity index gives the numerical picture about the fluctuation in output-input ratio for the research period. It is observed from the table that the average productivity index comes out to 85.86 which is less by 14.14% from the base year. It displays the negative trend and supports the view that there is no proper control and management over overhead input which increases some losses itself.

The overall result of overhead productivity is determined in respect to the value of standard deviation, co-efficient of variation and chi-square. It is observed from the table that standard deviation is 41.48 while co-efficient of variation is 48.31. These figures make the picture clear that there is some variation in the productivity indices. The calculated of chi-square is 0.36 while the critical value is 2.17. So, the critical value is bigger than the calculated. It allows accepting the null hypothesis, "overhead productivity by the straight line trend based on least square method." It means, "There is no significant difference between the overhead productivity of the co-operative milk dairy plants of Gujarat state." The calculated of productivity index. The average requirement of overhead input per rupee of output for Sumul Dairy is 0.07. Input-Output ratio stays at the lowest level in the year 1996-'97. It makes clear that the dairy gets its maximum efficiency in overhead input during this year. The table also indicates that the possible savings in overhead input works out at 3.67 crores per year for the Sumul Dairy.

Overhead Productivity of Sumul Dairy - Surat.



9. OVERHEAD PRODUCTIVITY RATIO OF THE CO-OPERATIVE DAIRY AND MILK SUPPLY UNITS AND KRUSKAL WALLIS ONE WAY ANALYSIS OF VARIANCE TEST:

The comparative status of overhead productivity ratio of co-operative dairy and milk supply unit of Gujarat state have been stated in table 6.9 along with the application of Kruskal Wallis one-way analysis of variance test on these ratios for the period under the research.

Table 6.9

COMPARATIVE OVERHEAD PRODUCTIVITY RATIO OF CO-OPERATIVE DAIRY & MILK SUPPLY UNITS OF GUJARAT STATE WITH KRUSKAL WALLIS ONE-WAY ANALYSIS OF VARIANCE TEST

Year	AMUL DAIRY RATIO	R1	GOPAL DAIRY RATIO	R2	UTTAM DAIRY RATIO	R3	MADHUR DAIRY RATIO	R4	SUGAM DAIRY RATIO	R5	DUDH- SAGAR DAIRY RATIO	R6	VASU- DHARA DAIRY RATIO	R7	SUMUL DAIRY RATIO	R8
1996-97	11.195	16	9.815	10	15.801	44	27.571	66	11.487	20	19.552	52	15.836	46	16.665	47
1997-98	8.723	6	12.501	21	15.507	43	21.691	62	11.290	17	20.430	53	12.715	25	14.762	40
1998-99	9.631	9	15.243	42	15.107	41	21.117	56	9.951	11	22.286	64	13.984	35	14.386	38
1999-00	9.538	8	18.095	49	13.214	29	40.768	71	10.467	15	21.494	61	8.430	4	13.755	33
2000-01	9.489	7	20.555	54	13.846	34	35.677	70	10.265	13	18.326	50	12.856	26	13.527	32
2001-02	10.150	12	22.095	63	13.440	31	33.623	69	12.651	24	19.212	51	7.383	1	12.511	22
2002-03	10.335	14	21.270	59	14.480	39	32.954	67	13.174	28	21.099	55	8.127	2	14.911	41
2003-04	11.321	18	21.237	58	12.917	27	33.451	68	13.297	30	25.505	65	8.579	5	14.242	37
2004-05	11.373	19	21.344	60	15.809	45	17.939	48	12.568	23	21.180	57	8.241	3	14.015	36
Total		109		416		333		577		181		508		147		326

$$\begin{aligned}
H &= \frac{12}{N(N+1) \sum_{j=1}^k n_j} \frac{\sum^k (R_j)^2}{n_j} - 3(N+1) \\
&= \frac{12}{72(72+1)} \left[\frac{(109)^2}{9} + \frac{(416)^2}{9} + \frac{(333)^2}{9} + \frac{(577)^2}{9} + \frac{(181)^2}{9} + \frac{(508)^2}{9} + \frac{(147)^2}{9} + \frac{(326)^2}{9} \right] - 3(72+1) \\
&= \frac{12}{5256} \left[1320.11 + 19228.44 + 12321.00 + 36992.11 + 3640.11 + 28673.78 + 2401.00 + 11808.44 \right] - 219 \\
&= 265.72 - 219 \\
&= 46.72
\end{aligned}$$

The above table i.e. 6.9 displays that the calculated of H is 46.72 which is more than the critical value 2.17. So, the null hypothesis based on Kruskal Wallis one-Way Analysis of variation Test, at 5% percent level of significantly is rejected and alternative hypothesis is acceptance. It means, “There is significantly difference between the overhead productivity ratio of the co-operative dairy and milk supply units of Gujarat state.”

TABLE 6.10
COMPARATIVE ANALYSIS OF OVERHEAD PRODUCTIVITY IN CO-OPERATIVE DAIRY AND MILK SUPPLY UNITS OF
GUJARAT STATE FROM 1996-97 TO 2004-05.

UNIT	PRODUCTIVITY RATIO AVERAGE	RANK	PRODUCTIVITY INDEX AVERAGE	RANK	CO-EFFICIENT OF VARIATION		CHI-SQUARE		INPUT-OUTPUT RATIO	
					VALUE	RANK	VALUE	RANK	AVERAGE	RANK
AMUL DAIRY	10.195	8	91.07	6	69.07	3	0.530	3	0.0988	7
GOPAL DAIRY	18.017	3	183.57	1	1008.33	8	1.950	7	0.0597	3
UTTAM DAIRY	14.458	4	91.5	5	50.98	2	0.450	2	0.0696	4
MADHUR DAIRY	29.421	1	106.71	3	655.18	7	6.490	8	0.0364	1
SUGAM DAIRY	11.683	6	101.71	4	109.55	5	0.610	4	0.0865	6
DUDHSAGAR DAIRY	21.009	2	107.45	2	94.69	4	0.800	5	0.0480	2
VASUDHARA DAIRY	10.683	7	67.47	8	520.25	6	1.810	6	0.1007	8
SUMUL DAIRY	14.308	5	85.86	7	48.31	1	0.360	1	0.0703	5
COMBINED AVERAGE	16.222		104.42		319.55		1.625		0.0713	

10. COMPARATIVE ANALYSIS OF OVERHEAD PRODUCTIVITY IN CO-OPERATIVE DAIRY AND MILK SUPPLY UNITS OF GUJARAT STATE:

The comparative analysis of overhead productivity of co-operative dairy and milk supply units of Gujarat state for the period from 1996-1997 to 2004-2005 is provided in table 6.10, which is as under:

This table indicates that the combined average of overhead productivity ratio for the period under the research works out at 16.222; it makes clear that for every rupee spent on overhead the output ratio works out to 16.222 in co-operative milk dairy industry. The average productivity ratio of Gopal Dairy [18.017], Madhur Dairy [29.421] and Dudhsagar Dairy [21.009] are registered higher than the combined average productivity ratio for the period under the study while in case of Amul Dairy [10.195], Uttam Dairy [14.458], Sugam Dairy [11.683], Vasudhara Dairy [10.683], and Sumul Dairy [14.308] are registered lower than the combined average productivity ratio for the same period.

Moreover, the success of overhead productivity is concerned, it is observed from the overhead productivity indices of various dairies that the progress is made in overhead productivity during the study period, has been the highest at 183.57 for Gopal Dairy, 107.45 for Dudhsagar Dairy, for Madhur Dairy, 101.71 for Sugam Dairy, 91.50 for Uttam Dairy, 91.07 for Amul Dairy, 85.86 for Sumul Dairy and 67.47 for Vasudhara Dairy. The average development of Gopal Dairy, Dudhsagar Dairy and Madhur Dairy are better in comparison to the average combined ratio [104.42]. While, the development of Sugam Dairy, Uttam Dairy, Amul Dairy Sumul Dairy and Vasudhara Dairy are lower than the combined average in co-operative milk dairy industry.

Now, the co-efficient of variation comes out at the highest being 1008.33% for Gopal Dairy, 655.18% for Madhur Dairy, 520.25 for Vasudhara Dairy, which are bigger than the combined average [319.55], while in case of Sugam Dairy, it is 109.55, 94.69 for Dudhsagar Dairy, 69.07 for Amul Dairy, 50.98 for Uttam Dairy

and 48.31 for Sumul Dairy which are less than the combined average . These figures make the picture clear that there is lowest variability in overhead productivity in Sumul Dairy.

The above table shows that, the average value of chi-square is lower then the critical values of co-operative mile dairies seems to be nearer to the straight line type pattern. The null hypothesis based on chi-square test is rejected for Madhur Dairy, [6.49]. While in case of Gopal dairy [1.95], Vasudhara Dairy [1.81], Dudhsagar Dairy, [0.80] Sugam Dairy [0.61], Amul Dairy [0.53], Uttam Dairy [0.45] and Sumul Dairy [0.36], it is accepted. Therefore in Gopal dairy, Vasudhara Dairy, Dudhsagar Dairy, Vasudhara Dairy, Dudhsagar Dairy, Sumul Dairy, Amul Dairy, Uttam Dairy and Sumul Dairy, productivity indices seems to be nearer to straight line trend bladed on least square method as its chi-square value. Is lower than the critical value is lower than the critical value in case of, Madhur dairy, it seems to be opposed.

Overhead input requirement which is shown by Input output ratio of Madhur Dairy is the lowest among the others, For an average of input of one rupee, Re. 0.07 is spent on overhead input, Incase of Madhur Dairy it is 0.0364, the lowest input, registered in the study and Dudhsagar dairy , - it is 0.0480 , Gopal Dairy – it is 0.0597, Uttam Dairy –it is 0.0696, Sumul dairy –it is 0.0703, are lower while in case of Sugam Dairy –it is 0.0865, Amul Dairy –it is 0.0988, and Vasudhara dairy -it is 0.1007 are higher then the combined average ratio during the course of research.

REFERENCES

1. L.W.J. Owler and J.L. Brown, 'Wheldon's Cost Accounting and Costing Methods', Vikas Publication, Delhi – 1970, P. No. 153
2. IBID
3. Robert N. Anthony and James S. Heakimian, Operations Cost Central, Homewood, Llinois, Richard D. Irwin, Inc. – 1967, P. No. 33
4. Cost accounting, By S. P. Yange, 6th Edition – 1994.
5. Horace R. Block, Charles E. Palmer, Fred G. Archer, Cost Accountancy, New York, Greg Division – M.C. Graw-Hill books Co. – 1965, P .No. 259
6. Phil Carrole, "Overhead cost control", Mcgraw Hill – New York, 1964 P No. 10.
7. J. Batty, Standard Costing, London, The English Language Book Society and Mac-donald and Evans Ltd. – 1970, P. No. 57.
8. Charles T. Horngren, Cost Accounting, New Delhi, Prentice Hill – 1977, P. No. 221 & 222.
9. John G. Blocker and W. Keith Weltmer, Cost Accounting, New Delhi, Tata Mc-Graw Hill publishing Co. ltd.- 1978, P. No. 114
10. A.C. Hubert, The Productivity Pendium in the Productivity, New Delhi – NPC. Oct.-Dec. 1983, Vol. X XIV No. 3

CHAPTER – 7

**ANALYSIS OF TOTAL PRODUCTIVITY
OF CO-OPERATIVE DAIRY & MILK SUPPLY UNITS OF
GUJARAT STATE**

CHAPTER – 7

ANALYSIS OF TOTAL PRODUCTIVITY OF CO-OPERATIVE DAIRY & MILK SUPPLY UNITS OF GUJARAT STATE

1. CONCEPT OF TOTAL PRODUCTIVITY
 2. MEANING & DEFINITION.
 3. AIMS OF TOTAL PRODUCTIVITY
 4. STEPS IN ACCOUNTING FOR TOTAL PRODUCTIVITY
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1. CONCEPT OF TOTAL PRODUCTIVITY :

Productivity ratio is a relationship between output and input. It is a measure of input efficiency. When all the inputs like material, manpower (labour), overhead, capital etc. are counted together to calculate the productivity ratio, it is termed as overall or total productivity. However, when only one out of the several inputs is used to find out the productivity ratio, it is called as a factorial or partial productivity. In this reference, J.P. Shrivastava says, “When a number of factors are involved in the production process, but the output is related to any single factor unit, productivity thus measured is called partial or factorial productivity. When the output is related to entire input complex, the relation between output and input is multifactor or total productivity.”⁽¹⁾.

Partial or factorial productivity gives the results about the utilization of inputs. But when persons share of input in output do not count at the same time overall or total productivity becomes very crucial part to measure the efficiency of a manufacturing unit. There are two arguments in favor of total productivity. First, all goods and services i.e. output are the result of the mixing of all inputs and second, there is no direct way from output and input data to calculate the productivity ratio of any individual class of input. So, it becomes very crucial to measure an overall efficiency of a manufacturing unit.

2. MEANING AND DEFINITIONS :

Many authors and organizations had given definitions of total productivity as well as partial or factorial productivity. Some of them are as follows:

Solomon Fabricant states: “Of the several senses of ‘power to produce’ them it is to the comparison of output with input particularly, the ratio of the one to the other – that the term productivity is ordinarily attached.”⁽²⁾ ILO defined total productivity, “It is the ratio between the output of goods and services and the input of resources consumed in the process of production.”⁽³⁾

Hiram S. Davis says, that as common application of the term involves a notion of the rate or degree with which power to create or make is utilized, “the meaning of productivity in the economic field may be stated as the degree to which the power to make or provide goods or services having exchange value is utilized as measured by the output obtained for the resources expanded.”⁽⁴⁾

So, total productivity counted for the whole unit as well as for the particular departments or for the nation as a whole. With the result of total productivity, anyone can compare the efficiency from time to time and can have good control over production cost. It is a true yardstick of the performance of a manufacturing organization.

3. AIMS OF TOTAL PRODUCTIVITY :

Total productivity index shows the productivity health of a unit and also points out the progress of its goods and services. The main aims of total productivity are as under:

- To know the productivity indices at unit level
- To eliminate waste in all forms
- To co-ordinate it with the evaluation, planning and improvement phases of the productivity cycle.
- To give information and detail at different level that helps the top management in operation control.
- To achieve valuable information from strategic planners in making policy level decisions related to diversification of products.

4. STEPS IN ACCOUNTING FOR TOTAL PRODUCTIVITY:

The following steps have been used for the total Productivity of co-operative dairy and milk supply units of Gujarat state:

- **Hypothesis:**

To know and to analyses the productivity health of an individual unit the total productivity is calculated. It also points out the growth or decline in productivity and profitability of its goods and services. Total its goods and services. Total productivity means, “The ratio of total output to total inputs.” There are two Hypothesis which have been framed and used in the research work. These two Hypothesis i.e. null Hypothesis and its alternative hypothesis and its alternative hypotheses is are bases on statistical techniques I.E. chi- square test and Kruskal wails one –way analysis of variance test. The Hypothesis has been tested to interpret the result.

The first one,

- **NULL HYPOTHESIS:**

“The total productivity can be expressed by the straight line trend based on least square method.”

- **ALTERNATIVE HYPOTHESIS:**

“The total productivity can not be expressed by the straight line trend based on least square method.”

- **STATISTICAL TEST USED:**

Chi-square test

- **LEVEL OF SIGNIFICANCE:**

5%

- **CRITICAL VALUE:**

2.17

In this whole numerical procedure, if the calculated value of Chi-square comes out lower than the critical value (2.17), the null Hypothesis is accepted. The acceptances of null Hypothesis means that the total productivity indices can be expressed by the

straight line trend based on least square method. And if the calculated value comes out more than the critical value (2.17), the alternative Hypothesis will be accepted. The acceptance of alternative Hypothesis means that the total productivity indices cannot be expressed by straight line trend based on least square method.

The second,

- **NULL HYPOTHESIS:**

“There is no significant difference between the total productivity ratios of the co-operative dairy and milk supply units of Gujarat state.”

- **ALTERNATIVE HYPOTHESIS:**

“There is significant difference between the total productivity ratios of the co-operative dairy and milk supply units of Gujarat state.”

- **STATISTICAL TEST USED:**

Kruskal wall is one-way analysis of variance test

- **LEVEL OF SIGNIFICANCE:**

5%

- **CRITICAL VALUE:**

2.17

In this whole mathematical process, if the calculated value of H comes out lower than the critical value (2.17), the null Hypothesis is accepted. It means that there is no significant difference between the total productivity ratios of co-operative dairy and milk supply units of Gujarat State. So, it can be said that all the co-operative milk dairies in Gujarat may be considered equally efficient. And if the calculated value of H comes out higher than the critical value (2.17), the alternative Hypothesis will be accepted. It means that there is significant difference between the total productivity ratios of co-operative dairy and milk supply units of Gujarat State. So it can be said that some milk dairies in Gujarat use their inputs efficiently and properly in comparison to other co-operative milk dairies.

- **CALCULATION OF TOTAL PRODUCTIVITY:**

Total prod means, “The ratio of output to all input i.e. total input so, it can be said that it compares the output to all inputs which are employed in the manufacturing process. It records, analyzes and shows the trend of productivity and the level of productive efficiency of a every individual co-operative milk dairy. It can be find out by the under written

Formula:

$$\text{Total productivity} = \frac{\text{Output}}{\text{Material Input} + \text{Labour Input} + \text{Overhead Input}}$$

In the above formula, bath Output and Input are stated in value of rupee. Output-Input ratio i.e. total productivity ratio indicates the ratio of output to all inputs comparatively. Some as the O-I ratio, total productivity indices are also calculated. It is assumed 100 for the base year. Increase in total productivity ratio and productivity indices states that there is better utilization of all input inn the co-operative milk dairy and decrease in the same indicates that there is lower utilization or improper utilization of all input in co-operative milk dairy. Input-Output ratio gives an idea about input used for a rupee of output. Standard deviation, co-efficient of variation and chi-square value are also computed.

- **CALCULATION OF POSSIBLE SAVINGS IN TOTAL INPUTS:**

Is possible savings in total inputs calculated by the following formula:

$$\text{POSSIBLE SAVINGS} = \text{Actual Total Inputs} - \text{Standard Inputs.}$$

Here, actual total input mean the actual amount of total inputs and the term standard inputs mean the product of minimum requirement per rupee of output during the period under helps to find out the possible savings.

5. TOTAL PRODUCTIVITY ACCOUNTING IN THE CO-OPERATIVE DAIRY INDUSTRY OF GUJARAT STATE:

Production is nothing but the process of raw-material converted to finished goods or services. It is a combination of manpower, money power and other factors. Though, output is a combination of various inputs like material, labour and overheads etc. the total of individual productivity should be equal to total productivity. It can be shown in such manner, material productivity + labour productivity + Overhead productivity = Total or overall productivity. Total productivity means the reflection of efficiency level of the milk dairy and industry. With this calculation, one can determine their standards for the total requirements of all inputs to output. The total productivity accounting for the co-operative dairies of Gujarat State are calculated as under:

Table 7.1
Total Productivity of " Amul Dairy" - Anand

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	4,001,021,578	3,914,018,287	1.022	100.00	100.12	0.9783	3,888,949,270	25,069,017
1997-98	4,173,534,355	4,116,880,732	1.014	99.22	100.03	0.9864	4,056,629,805	60,250,927
1998-99	4,623,462,516	4,493,955,063	1.029	100.68	99.94	0.9720	4,493,955,063	0
1999-00	4,871,408,788	4,760,044,675	1.023	100.10	99.86	0.9771	4,734,956,131	25,088,544
2000-01	5,091,912,736	4,986,342,935	1.021	99.90	99.77	0.9793	4,949,283,560	37,059,375
2001-02	4,687,806,783	4,585,467,668	1.022	100.00	99.69	0.9782	4,556,496,988	28,970,680
2002-03	4,883,366,669	4,802,588,745	1.017	99.51	99.60	0.9835	4,746,579,061	56,009,684
2003-04	5,459,302,648	5,382,093,855	1.014	99.22	99.51	0.9859	5,306,382,541	75,711,314
2004-05	6,004,696,000	5,917,902,000	1.015	99.32	99.43	0.9855	5,836,498,922	81,403,078
Total	43,796,512,073	42,959,293,960	9.177	897.95	897.95	8.8262	42,569,731,341	389,562,619
Average	4,866,279,119	4,773,254,884	1.020	99.77	99.77	0.9807	4,729,970,149	43,284,735

Standard Deviation : 0.215
Co-efficient of variation : 0.215

Chi-Square : 0.002

TOTAL PRODUCTIVITY IN AMUL DAIRY – ANAND:

The table 7.1 displays the numerical picture regarding total inputs, output, Output-Input ratio, productivity indices, trend value, Input-Output ratio and possible savings. It also calculates some mathematical data such as standard deviation, Co-efficient of variation, Chi-square and growth rate of Amul Dairy- Anand for nine years i.e. 1996-'97 to 2004-'05.

So far the Amul Dairy's output is concerned, the table makes clear that it increases from 400.10 crores in 1996-1997 to 509.19 crores in 2000-2001. The increasing trend of output comes out to be 27.27%. On the other hand, total input are increasing from 391.40 crores in 1996-97 to 498.63 crores in 2000-2001. The increasing trend of total inputs works out to be 27.40%. So, here total inputs increase more than the output slightly. It indicates weak total productivity of Amul Dairy during this particular period. In the year 2001-02, both the output and total inputs decrease. And then after, they increase more year by year output is increasing from 468.78 crores in the year 2001-02 to 600.47 crores in the 2004-05. The fluctuation spread of output works out to be 28.09%. While in case of total inputs increase from 458.55 crores in the year 2001-02 to 591.79 crores in the year 2004-05. The fluctuation spread of total inputs works out to be 29.06%. So, here total inputs increase more than the output slightly. It indicates the negative trend of total Productivity of the Amul Dairy during this period. Moreover, productivity ratio moves in mixed trend during the research period. In the year 2001-2002, both output and total inputs decrease. Then after, they are increasing year by year.

Total productivity ratio [O-I ratio] comes out 1.022 for the year 1996-1997 I.E. base year. The average out 1.020 for the period under the research. The O/I ratio of 1998-1999 (1.029), 1999-2000 (1.023), 2000-2001 (1.021) and 2001-2002 (1.022) are recorded higher than the average ratio. While the O/I ratio of 1997-1998 (1.014), 2002-2003 (1.017), 2003-2004 (1.014) and 2004-2005 (1.015) are recorded lower than the average ratio. So, overall these figures indicate average productivity of the Amul Dairy. It can be said that there should be utilized qualitative manpower and latest technology ordinarily.

Now, productivity index which is assumed 100 for the year 1996-1997 i.e. base year. It decreases in 1997-1998 and goes down to 99.22. Then, it increases to 100.68 in the next year which is the biggest level during the study period. Then again, it is decreasing and goes down to 99.90 in 2000-2001. Then after, it increases to 100.00 which is the equal level to the base year. After 2001-2002, it is decreasing and goes down to 99.22 in 2003-2004. In the year 2004-2005, it increases to 99.32. It can be said that it moves in positive trend at the end of the research period. Productivity index interpreters the fluctuation in Output-Input ratio for the present study. The table states that the adverse productivity index is 99.77 which is less by 0.23% from the base year. There is no proper control and management over all inputs in Amul Dairy. Indices of 1998-1999 (100.68), 1999-2000 (100.10), 2000-2001 (99.90) and 2001-2002 (100.10) are recorded higher than the average productivity index. These figures indicate that utilization of total input have improved averagely in Amul Dairy.

The overall result of total productivity is to be finalized in respect to the value of standard deviation, co-efficient of variation and chi-square value. The table displays that the standard deviation is 0.215 while co-efficient of variation is also 0.215. It clarifies that there is no variation in the productivity indices. The calculated value comes out to 0.002 while the critical value is 2.17 so the critical is bigger than the calculated value. It grants to accept the null Hypothesis, "Total productivity indices can be expressed by the straight line trend based on least square method." It means "There is no significant difference between the total productivity of the co-operative milk dairy plants of Gujarat State". The calculated value of productivity index. The average requirement of total inputs per rupee of output for Amul Dairy is 0.98. Input-Output ratio is stayed at the minimum level in the year 1998-'99. It analyses that the dairy gets its maximum efficient in total input during this year. Moreover, the table also suggests that the possible savings in total input comes out to be 4.33 crores per year for the Amul Dairy.

Total Productivity of Amul Dairy - Anand.

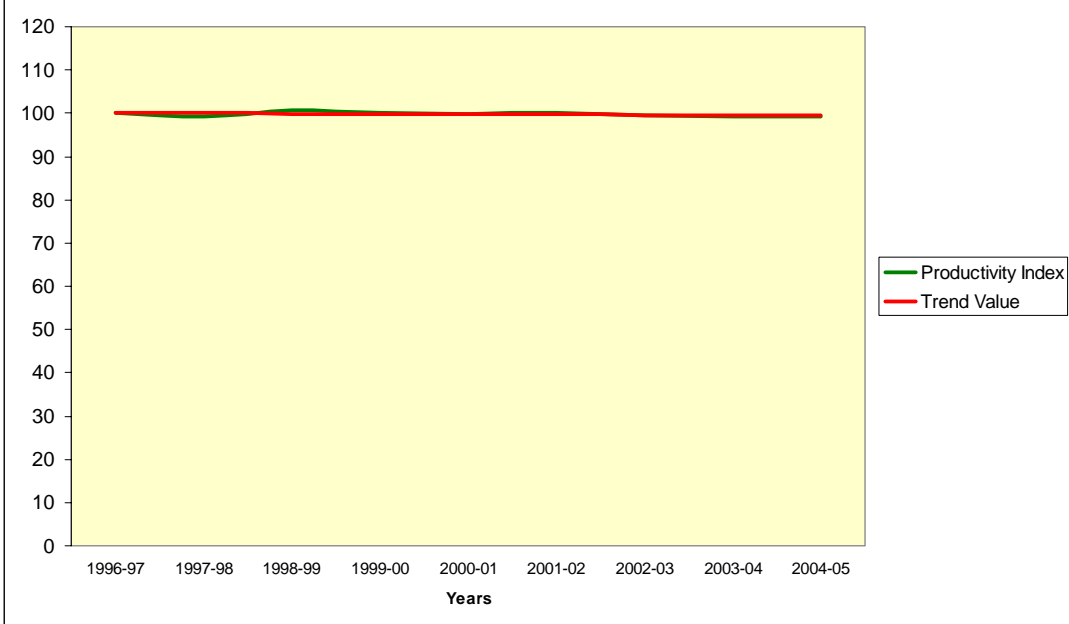


Table 7.2
Total Productivity of "Gopal Dairy" - Rajkot

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	174,685,012	169,124,997	1.033	100.00	100.44	0.9682	168,287,253	837,744
1997-98	216,556,153	208,624,882	1.038	100.48	100.01	0.9634	208,624,882	0
1998-99	268,575,714	263,248,165	1.020	98.74	99.59	0.9802	258,739,250	4,508,915
1999-00	372,833,832	361,269,372	1.032	99.90	99.16	0.9690	359,178,962	2,090,410
2000-01	458,274,780	450,755,449	1.017	98.45	98.74	0.9836	441,490,674	9,264,775
2001-02	506,238,891	491,809,828	1.029	99.61	98.32	0.9715	487,698,121	4,111,707
2002-03	678,063,418	672,373,562	1.008	97.58	97.89	0.9916	653,229,653	19,143,809
2003-04	665,709,864	664,333,238	1.002	97.00	97.47	0.9979	641,328,542	23,004,696
2004-05	871,822,330	870,595,887	1.001	96.90	97.04	0.9986	839,892,232	30,703,655
Total	4,212,759,994	4,152,135,380	9.180	888.66	888.66	8.8240	4,058,469,569	93,665,711
Average	468,084,444	461,348,376	1.020	98.74	98.74	0.9804	450,941,063	10,407,301

Standard Deviation : 1.618
Co-efficient of variation : 1.639

Chi-Square : 0.004

TOTAL PRODUCTIVITY IN GOPAL DAIRY – RAJKOT:

The table 7.2 shows the figures regarding total productivity of regarding total productivity of Gopal Dairy –Rajkot and also generates some necessary statistical data, of the research period I.E. 1996-1997 to 2004-2005.

In reference to the Output of Gopal Dairy , it is evident from the table that it is increasing from 17.47 crores in 1996-1997 to 67.81 crores in 1996-1997 to variability spread of output comes out to be 288.15%. While on the other hand, total inputs increase 16.91 crores in 1996-1997 to 67.24 crores in 2002-2003 The variability spread of be 297.63 % .So, here total inputs are more input slightly. It points out the negative trend of total productivity of Gopal dairy. It suggests weak total productivity of the dairy. Moreover, productivity ratio says in mixed trend during the study period. In the year 2003-2004, both output and total inputs decrease .Then, they are increasing.

Total productivity ratio (O/I- Ratio) comes out 1.033 for the base year, i.e. 1996-1997. The average total productivity ratio works out 1.020 for the period of 1997-1998 (1.038), 1999-2000 (1.032) and 2001-2002 (1.0029) are registered higher than the average ratio. While the O-I-ratio of 2000-2001 (1.017), 2002-2003 (1.008), 2003-2004 (1.002) and 2004-2005 (1.001) are registered lower than the average ratio is smaller than the base year ratio. It can be employed all input properly and comparative in the dairy.

The productivity index which is assumed 100 for the year 1996-'97 i.e. base year. It increases in the first initial year and reaches to 100.48 in 1997-'98. Which is the highest level during the study period then it decreases and goes down to 98.74 in the very next year. Then again it increases to 99.90 in 1999-'00. Then it decreases and again it increases. From the year 2002-'03, it starts the decreasing trend and goes down to 96.90 in 2004-'05. So far the analytical point of view is concerned, productivity index reflects the numerical picture of fluctuation in Output-Input ratio for the study. The table indicates that the average productivity index is 98.74 which is

less by 1.26% from the base year. There is no proper control and management over all inputs in the dairy. It suggests the downward trend.

The overall result of total productivity is kept in view to the value of standard deviation, co-efficient of variation and chi-square value. Standard deviation of Gopal Dairy comes out to 1.62 while co-efficient of variation works out to 1.64. So there figures clarity that there is some variation in the productive indices. The calculated value of chi-square is 0.004 while the critical value of chi-square is 2.17. Here the calculated value is less than the critical value. So, it grants the permission to accept the null hypothesis, "Total productivity indices can be represented by the straight line trend based on least square method." It means, "There is no significant difference between the total productivity of the co-operative milk dairy plants of Gujarat State." The calculated value of productivity index. The average per rupee of output for Gopal Dairy is 0.98. Input-Output ratio goes down at the minimum level in the year 1997-'98. It suggest that the dairy gets its maximum efficiency in to tall inputs during this year. Moreover the table also gives a view about the possible savings in total input. It comes out to 1.05 crores per year for the Gopal Dairy.

Total Productivity of Gopal Dairy - Rajkot.

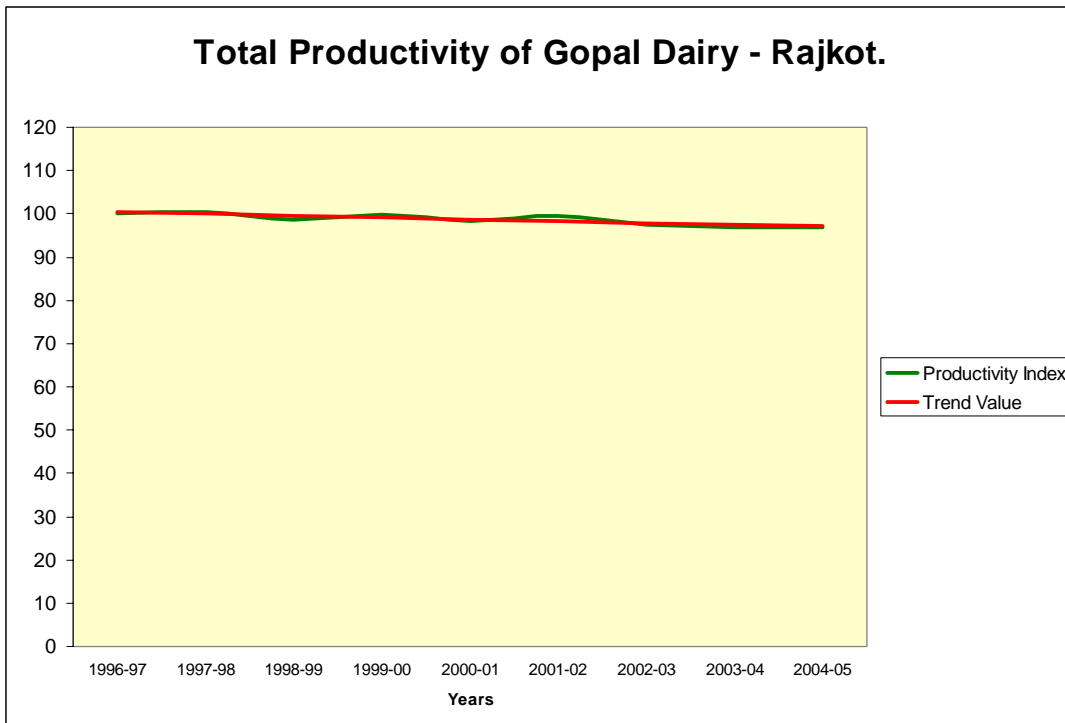


Table 7.3
Total Productivity of "Uttam Dairy" - Ahmedabad

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	511,784,952	498,091,405	1.027	100.00	100.71	0.9732	492,137,793	5,953,612
1997-98	573,701,471	551,677,369	1.040	101.27	100.70	0.9616	551,677,369	0
1998-99	689,645,318	665,429,343	1.036	100.88	100.69	0.9649	663,170,192	2,259,151
1999-00	687,372,508	664,029,464	1.035	100.78	100.68	0.9660	660,984,634	3,044,830
2000-01	734,114,121	769,501,892	1.032	100.49	100.67	0.9690	763,628,492	5,873,400
2001-02	808,915,447	777,910,524	1.040	101.27	100.66	0.9617	777,861,602	48,922
2002-03	850,566,046	828,443,012	1.027	100.00	100.65	0.9740	817,913,257	10,529,755
2003-04	906,794,648	874,129,816	1.037	100.97	100.64	0.9640	871,983,272	2,146,544
2004-05	1,064,493,178	1,032,282,924	1.031	100.39	100.63	0.9697	1,023,627,837	8,655,087
Total	6,827,387,689	6,661,495,749	9.305	906.05	906.05	8.7041	6,622,984,448	38,511,301
Average	758,598,632	740,166,194	1.034	100.67	100.67	0.9671	735,887,161	4,279,033

Standard Deviation : 0.208
Co-efficient of variation : 0.207

Chi-Square : 0.002

TOTAL PRODUCTIVITY IN UTTAM DAIRY – AHMEDABAD:

The table 7.3 presents the numerical data regarding total inputs, output, Output-Input ratio, productivity index, trend value, Input-Output ratio and possible savings. It also calculates the value of standard deviation, co-efficient of variation, chi-square and growth rate of Uttam Dairy – Ahmedabad, from the year 1996-'97 to 2004-'05

Regarding to the output of Uttam Dairy, it is clear from the table that it increases from the table that it increases from 51.18 crores in 1996-'97 to 68.96 crores in 1998-'99. The fluctuation spread of output works out to be 34.74% on the other hand total input increase from 49.81 crores in 1996-'97 to 66.54 crores in 1996-'97. The fluctuation spread of all inputs comes out to be 33.59%. So here output is increasing more than the total inputs during this period. It indicates the positive trend of total productivity of Uttam Dairy. Then output and total inputs increase more and more as year by year. Output increases from 68.74 crores in 1999-'00 to 106.45 crores in 2004-'05. The fluctuation expansion of output works out to be 54.86%. While in the same period, Total inputs increase from 66.40 crores to 103.23 crores. The fluctuation expansion of total inputs works out to be 55.47%. Here total input very slightly. It suggests the average total productivity of the Uttam Dairy. Moreover productivity ratio fluctuated in mixed trend during the research period.

Total productivity ratio [O-I ratio] comes out 1.027 for the base year. i.e. 1996-'97. The average productivity ratio works out 1.034. per year for the study period. The O-I ratio of 1997-'98 [1.040], 1998-'99 [1.036], 1999-'00 [1.035], 2001-'02 [1.040] and 2003-'04 [1.037] are registered higher than the average ratio while one O-I ratio of 2000-'01 [1.032], 2002-'03 [1.027], and 2004-'05 [1.031] are registered lower than the average ratio. So overall these figures point out the upward trend. It can be said that all inputs are utilized properly and completely in the dairy.

The productivity index is assumed 100 for the base year, 1996-'97. It increases to 101.27 in the first initial year after 1996-'97. It is the highest level during the study period. Then, it decreases slightly year by year. This trend continues for three years constantly till 2000-'01. And goes down to 100.49 in the third year. Then, it increases

and reaches to the highest level at second time during the study period. Then after it decreases and increases. In the year 2004-'05, it decreases slightly and goes down to 100.39. As it is seen from the analytical point of view, it resolves the fluctuation in Output-Input ratio for the present study. The table shows that the average productivity index is 100.67 which is more by 0.67% from the base year. There is proper control and management over all inputs in the dairy. Indices of 1997-'98 (101.27), 1998-'99 (100.88), 1999-'00 (100.78), 2001-'02 (101.27) and 2003-'04 (100.97) are recorded higher than the average productivity index. These figures display that utilization of total inputs has done substantially and efficiently in Uttam Dairy.

The overall result of total productivity is depending on the value of standard deviation, co-efficient of variation and chi-square. The calculated value of standard deviation is 0.208 while the co-efficient of variation is also 0.207. So, there is no much variation in the productive indices. The calculated value of chi-square works out chi-square is 2.17. So, the critical value is bigger than the calculated value. It allows the acceptance of null Hypothesis, "Total productivity indices can be represented by the straight line trend based on least square method." It means, "There is no significant difference between the total productivity of the co-operative milk dairy plants of Gujarat State." The calculated value of productivity index. The average requirement of total productivity per rupee of output for Uttam Dairy is 0.97. Input-Output ratio goes to the lowest level in the year 1997-'98. It means that the dairy obtains its maximum efficiency in total input during this year. In reference to the possible savings in total inputs, the table shows that it works out at 42.79 lacs per year for the dairy.

Total Productivity of Uttam Dairy - Ahmedabad.

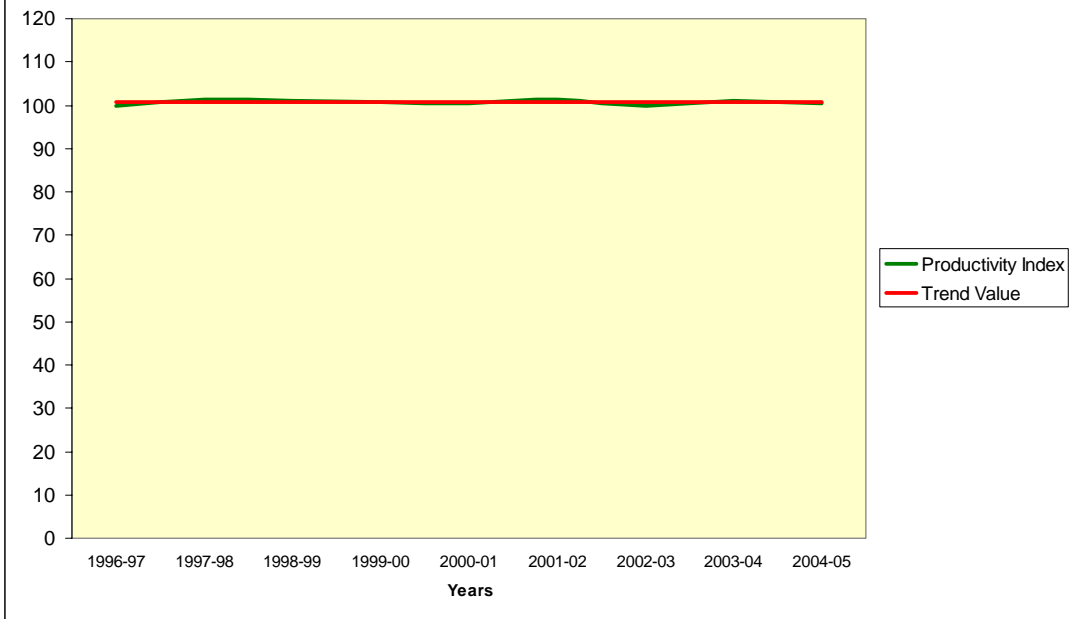


Table 7.4
Total Productivity of "Madhur Dairy" - Gandhinagar

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	290,221,515	288,582,483	1.006	100.00	99.95	0.9944	286,372,435	2,210,048
1997-98	360,325,063	357,367,616	1.008	100.20	100.03	0.9918	355,546,231	1,821,385
1998-99	410,278,514	406,880,891	1.008	100.20	100.11	0.9917	404,837,171	2,043,720
1999-00	489,815,303	487,316,197	1.005	99.90	100.19	0.9949	483,319,099	3,997,098
2000-01	552,144,201	548,084,801	1.007	100.10	100.27	0.9926	544,821,356	3,263,445
2001-02	606,154,453	600,822,351	1.009	100.30	100.35	0.9912	598,115,294	2,707,057
2002-03	649,934,804	643,567,967	1.010	100.40	100.43	0.9902	641,315,006	2,252,961
2003-04	666,809,710	659,123,556	1.012	100.60	100.51	0.9885	657,966,107	1,157,449
2004-05	738,683,878	728,887,040	1.013	100.70	100.59	0.9867	728,887,040	0
Total	4,764,367,441	4,720,632,902	9.078	902.40	902.40	8.9220	4,701,179,739	19,453,163
Average	529,374,160	524,514,767	1.009	100.27	100.27	0.9913	522,353,304	2,161,463

Standard Deviation : 0.062
Co-efficient of variation : 0.062

Chi-Square : 0.0002

TOTAL PRODUCTIVITY IN MADHUR DAIRY – GANDHINAGAR:

The table 7.4 provides the mathematical picture in respect to total inputs, output, Output-Input ratio, productivity index, trend value, Input-Output ratio and possible savings. It also computes some statistics like standard deviation, co-efficient of variation, chi-square and growth rate of Madhur Dairy – Gandhinagar for the period of the study i.e.1996-'97 to 2004-'05.

As regard the output of Madhur Dairy, it is evident from the table that it increases from 29.02 crores from 1996-'97 to 73.87 crores in 2004-'05. The fluctuation expansion of output works out to be 154.55%. While in case of total input it increase from 28.86 crores in 1996-'97 to 72.89 crores in 2004-'05. The fluctuation expansion of total input comes out to be 152.56%. Here, these figures prove that the output is increasing more than the total input slightly. It indicates good total productivity of Madhur Dairy. Moreover, productivity ratio fluctuates in mixed trend but most of in increasing trend during the study period.

Total productivity ratio (O/I ratio) works out to 1.006 for the year 1996-'97 which is the base year. The average total productivity ratio works out to 1.009 for the period under the research. The O-I ratio of 2002-'03 (1.010), 2003-'04 (1.012) and 2004-'05 (1.013) are recorded higher than the average ratio. While the O/I ratio of 1997-'98 & 1998-'99 (1.008), 1999-'00 (1.005), 2000-'01 (1.007) are recorded lower than the average ratio. While the O-I ratio of 2001-'02 (1.009) comes out to equal to the average ratio. It is to be stated that there should not be used all inputs properly and completely in the dairy.

The productivity index is assumed 100 for 1996-'97 which is the base year. It increases in the first initial year and reaches to 100.20 in 1997-'98. Then it stays at the same level of previous year. Then after, it decreases and goes down to 99.90 in 1999-'00. Then, it increases constantly and goes up to 100.70 in the year 2004-'05 which is the highest level during the study period. By calculating the productivity index, one can know their fluctuation in Output-Input ratio. The table points out that the average

productivity index is 100.27 which is more by 0.27% from the base year. It can be said that there is proper control and management over all input in the dairy. It suggests the upward trend.

The overall result of total productivity is taken into consideration with the help of standard deviation, co-efficient of variation and chi-square value. The table says that standard deviation is 0.062 while the co-efficient of variation is also 0.062. So, it should be stated that there is no any variation in the productive indices. The calculated value of chi-square comes out to 0.00020 while the critical value of chi-square is 2.17. So, the calculated value is very lower than the critical value. It grants the acceptance of null hypothesis, "Total productivity indices cannot be expressed by the straight line trend based on least square method." It means, "There is no significant difference between the total productivity of the co-operative milk dairy plants of Gujarat State." The calculated value of productivity index. The average requirement of total input per rupee of output for Madhur Dairy is 0.99. Here, Input-Output ratio goes down to the lowest level in the year 2004-'05. It means that the dairy acquires its maximum efficiency during this year. Moreover, the table also makes clear that the possible savings in total inputs works out to 21.61 lacs per year for the dairy.

Total Productivity of Madhur Dairy - Gandhinagar.

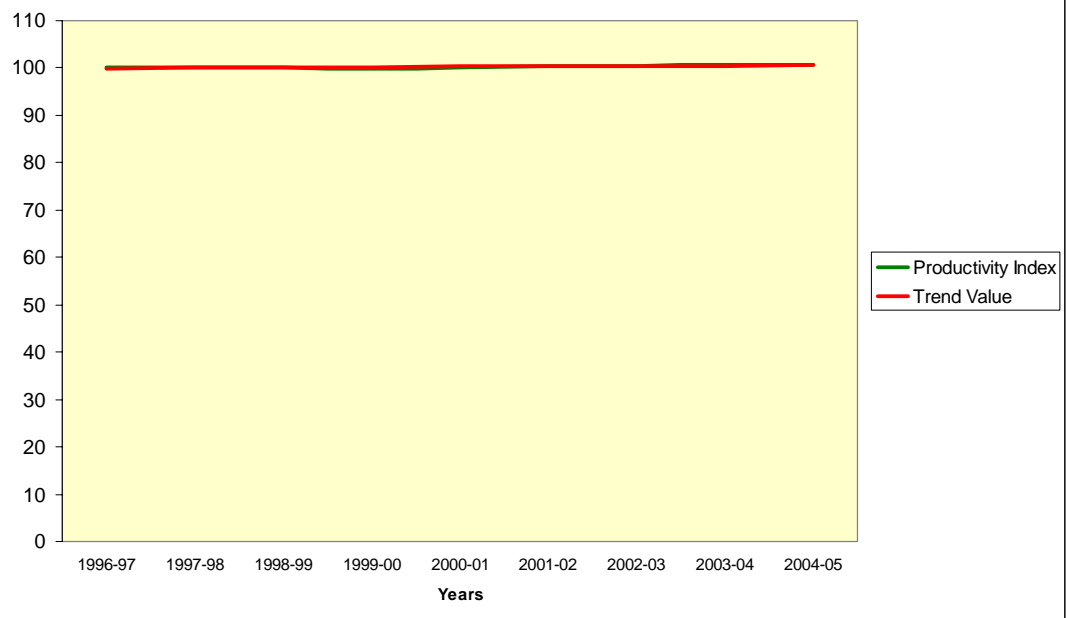


Table 7.5
Total Productivity of "Sugam Dairy" - Baroda

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	1,279,285,046	1,270,090,318	1.007	100.00	100.62	0.9928	1,257,281,644	12,808,674
1997-98	1,368,463,465	1,349,258,327	1.014	100.70	100.59	0.9860	1,344,926,215	4,332,112
1998-99	1,559,187,195	1,537,377,562	1.014	100.70	100.55	0.9860	1,532,369,542	5,008,020
1999-00	1,759,366,077	1,735,288,289	1.014	100.70	100.51	0.9863	1,729,105,394	6,182,895
2000-01	1,929,278,983	1,902,420,048	1.014	100.70	100.48	0.9861	1,896,095,838	6,324,210
2001-02	2,034,018,057	1,999,033,425	1.018	101.09	100.44	0.9828	1,999,033,425	0
2002-03	2,300,039,628	2,277,505,154	1.010	100.30	100.40	0.9902	2,260,479,488	17,025,666
2003-04	2,479,889,172	246,140,907	1.008	100.10	100.37	0.9925	2,437,235,662	24,166,245
2004-05	2,578,392,763	2,561,664,728	1.007	100.00	100.33	0.9935	2,534,045,014	27,619,714
Total	17,287,920,386	14,878,778,758	9.106	904.29	904.29	8.8962	16,990,572,222	103,467,536
Average	1,920,880,043	1,653,197,640	1.012	100.48	100.48	0.9885	1,887,841,358	11,496,393

Standard Deviation : 0.134
Co-efficient of variation : 0.133

Chi-Square : 0.001

TOTAL PRODUCTIVITY IN SUGAM DAIRY – BARODA:

The table 7.5 gives the numerical picture regarding total productivity of Sugam Dairy – Baroda and finds out some necessary statistical data of the research period i.e.1996-'97 to 2004-'05.

As the output of Sugam Dairy is concerned, it makes clear from the table that it increases from 127.93 crores in 1996-'97 to 257.84 crores in 2004-'05. The fluctuations diffusion of output comes out to be 101.55%. while on the other hand total inputs increase from 127.01 crores in 1996-'97 to 256.17 crores in 2004-'97 to 256.17 crores in 2004-'05. The fluctuations diffusion of total input comes out to be 101.69%. So, in this numerical scenario, it is clear that total inputs are increasing more than the output very slightly. It is more by 0.14%. It suggests average total productivity or medium total productivity of the dairy. It is also stated that productivity ratio moves in mixed trend during the research period.

Total productivity ratio (O/I ratio) comes out 1.007 for the year 1996-'97 i.e. the base year. The average total productivity ratio comes out 1.012 during the study period. The O/I ratio of 1997-'98, 1998-'99, 1999-'00, 2000-'01 (1.014) and 2001-'02 (1.018) are recorded higher than the average ratio. While the O/I ratio of 2002-'03 (1.010), 2003-'04 (1.008) and 2004-'05 (1.007) are registered lower than the average ratio. It shows the positive trend of total productivity. It can be said that all inputs are used fully and efficiently in the dairy.

The productivity index which is assumed 100 for the base year i.e.1996-'97. It increases in the first initial year and goes up to 100.70 in 1997-'98. Then it stays stable at the level of 100.70 for constant three years i.e. from 1998-'99 to 2000-'01. Then after, it increases and reaches to 101.09 which is the highest level during the study period. Then it decreases for constant three years and goes down to 100.00 in the year 2004-'05. By finding out the productivity index, it can be possible to know the variation in Output-Input ratio. The average productivity index is 100.48 which are more by 0.48% from the base year. There is proper control and management over all inputs in the dairy. Indices of 1997-'98, 1998-'99, 1999-'00, 2000-'01 (100.70)

and 2001-'02 (101.09) are registered higher than the average productivity index. It indicates that all inputs have been utilized substantially and properly in Sugam Dairy. And this situation really helps to reduce some losses automatically.

The overall result of total productivity is concerned in reference to the value of standard deviation, co-efficient of variation and chi-square. Standard deviation of Sugam Dairy is coming out to 0.134 while the co-efficient of variation is coming out to 0.133. So, there is no much variation in the productive indices. The calculated value of chi-square comes out 0.001 while the critical value is 2.17. It means the critical value is more than the calculated value. It allows the acceptance of null Hypothesis, "Total productivity indices can be expressed by the straight line trend based on least square method." It means, "There is no significant difference between the total productivity of the co-operative milk dairy plants of Gujarat State." The calculated value of productivity index. The average requirement of total inputs per rupee of output for Sugam Dairy is 0.99. Input-Output ratio goes down to the lowest level in the year 2001-'02. It suggests that the dairy obtains its maximum efficiency in total inputs during this year. The table also states that the possible savings in total input come out to be 1.15 crores per year for the dairy.

Total Productivity of Sugam Dairy - Baroda.

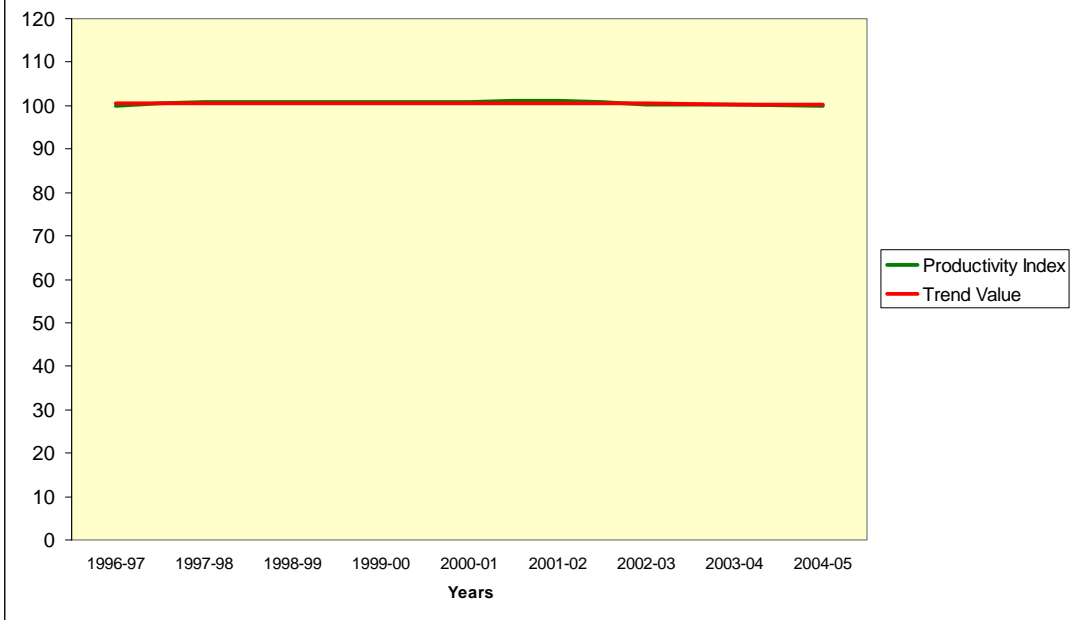


Table 7.6
Total Productivity of "Dudhsagar Dairy" - Mehsana

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	4,554,175,019	4,494,445,670	1.013	100.00	100.08	0.9869	4,472,371,088	22,074,582
1997-98	5,377,138,889	5,280,552,549	1.018	100.49	100.06	0.9820	5,280,552,549	0
1998-99	6,529,840,740	6,476,717,497	1.008	99.51	100.04	0.9919	6,412,549,104	64,168,393
1999-00	6,867,247,088	6,796,435,553	1.010	99.70	100.01	0.9897	6,743,894,823	52,540,730
2000-01	6,591,432,019	6,486,201,157	1.016	100.30	99.99	0.9840	6,473,034,055	13,173,102
2001-02	6,657,700,671	6,558,237,061	1.015	100.20	99.97	0.9851	6,538,112,363	20,124,698
2002-03	7,471,835,291	7,356,748,757	1.016	100.30	99.94	0.9846	73,376,231,688	19,125,589
2003-04	8,791,045,501	8,714,576,422	1.009	99.61	99.92	0.9913	8,633,137,192	81,439,230
2004-05	8,739,200,513	8,643,467,405	1.011	99.80	99.90	0.9890	8,582,223,465	61,243,940
Total	61,579,615,731	60,807,382,071	9.116	899.91	899.91	8.8845	126,512,106,327	333,890,264
Average	6,842,179,526	6,756,375,786	1.013	99.99	99.99	0.9872	14,056,900,703	37,098,918

Standard Deviation : 0.109
Co-efficient of variation : 0.109

Chi-Square : 0.001

TOTAL PRODUCTIVITY IN DUDHSAGAR DAIRY – MEHSANA:

The table 7.6 gives the figures in reference to total input, output, Output-Input ratio, productivity index, trend value, Input-Output ratio and possible savings. It also computes some statistical figures like standard deviation, co-efficient of variation, chi-square and growth rate of Dudhsagar Dairy – Mehsana from the year 1996-'97 to 2004-'05 i.e. the research period.

In reference to the output of Dudhsagar Dairy, it is observed from the table that it increases from 455.42 crores in 1996-'97 to 686.72 crores in 1999-'00. The fluctuation spread of output works out to be 50.79%. while total input in 1996-'97 to 679.64 crores in 1999-'00. The fluctuation spread of total inputs comes out to be 51.22%. Here, it is fact that total inputs are increasing more than the output slightly during this period. Then in the year 2000-'01, both output and total inputs decreases. And then they increases more and more year by year. Output increases from 659.14 crores in 2000-'01 to 873.92 crores in 2004-'05. The fluctuation expansion of output comes out to be 32.58%. while total inputs increase from 648.62 crores in 2000-'01 to 864.35 crores in 2004-'05. The fluctuation expansion of total input works out to be 33.26%. So, also here total inputs increase more than the output slightly during this particular period. It shows the negative trend but overall it can be considered as an average total productivity of Dudhsagar Dairy. Moreover, total productivity ratio moves in mixed trend during the study period.

Total productivity ratio (O/I ratio) comes out to 1.013 for the year 1996-'97 which is base year. The average total productivity ratio also comes out to 1.013 for the study period. The O-I ratio of 1997-'98 (1.018), 2000-'01 (1.016), 2001-'02 (1.015) and 2002-'03 (1.016) are registered higher than the average ratio. While the O-I ratio of 1998-'99 (1.008), 1999-'00 (1.010), 2003-'04 (1.009) and 2004-'05 (1.011) are registered lower than the average ratio. So, overall these figures indicate average total productivity of the dairy. It can be stated that all input should be utilized ordinarily in the dairy.

Now, productivity index which is based on Output-Input ratio. As the analytical point of view, it is calculated to find out the variation in Output-Input ratio. It is assumed 100 for the base year i.e.1996-'97. It increases in the first initial year and reaches to 100.49 which is the highest level during the study period. Then, it decreases to 99.51 in 1998-'99 which is the lowest level during the study period. Then again, it increases and goes up to 100.30 in 2000-'01. Then, it decreases and increases. In the year 2003-'04, it decreases to 99.61 and then it increases to 99.80 in 2004-'05. So, in the end, it moves in increasing trend. It may be noted that the productivity index comes on an average to 99.99 which is less by 0.01% from the base year. It indicates average trend of total productivity. It can be stated that there is balanced control and management over all input in the dairy.

The overall result of total productivity is calculated in reference to the value of standard deviation, co-efficient of variation and chi-square. It is noted from the table that standard deviation comes out to 0.109 while the co-efficient of variation also works out to 0.109. So, there is no any variation in the productive indices. The calculated value of chi-square is 0.001 while the critical value of chi-square is 2.17. So, the calculated value is lower than the critical value. It means the null hypothesis will be accepted. "Total productivity indices can be expressed by the straight line trend based on least square method." It means, "There is no significant difference between the total productivity of the co-operative milk dairy plants of Gujarat State." The calculated value of productivity index. The average requirement of total inputs per rupee of output for Dudhsagar dairy is 0.99. Input-Output ratio goes down to the bottom level in the year 1997-'98. It states that the dairy gets its maximum efficiency in total inputs during this year. Moreover, in reference to the possible savings, it is observed from the table that it comes out to 3.71 crores per year for the dairy.

Total Productivity of Dudhsagar Dairy - Mehsana.

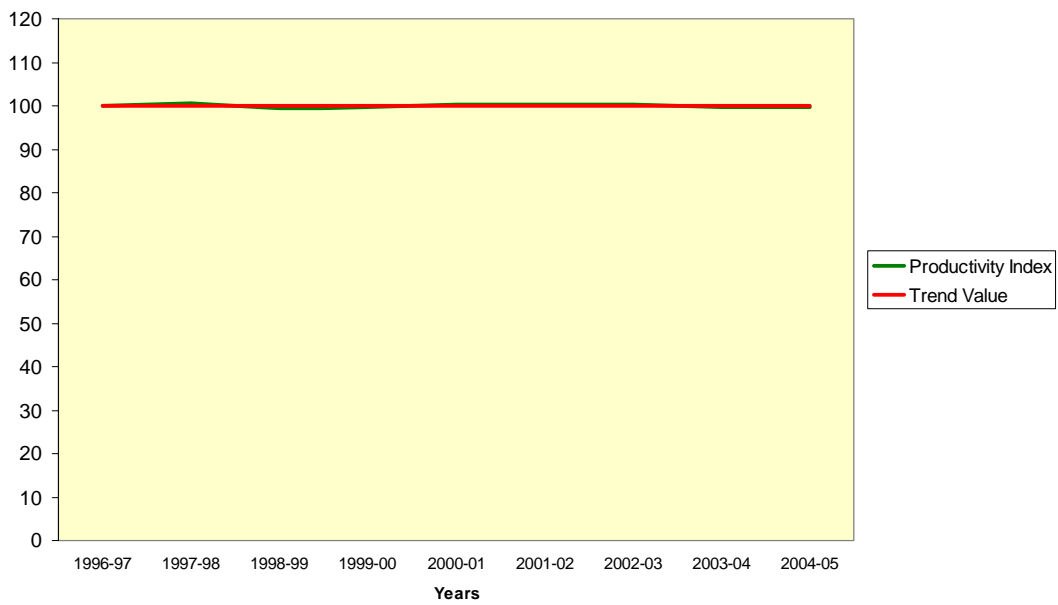


Table 7.7
Total Productivity of "Vasudhara Dairy" - Alipur

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	695,053,623	681,789,832	1.019	100.00	100.09	0.9809	664,870,269	16,919,563
1997-98	772,578,793	774,456,410	0.998	97.94	99.99	1.0024	739,028,836	35,427,574
1998-99	827,345,634	806,604,728	1.026	100.69	99.88	0.9749	791,417,376	15,187,352
1999-00	226,295,942	216,468,829	1.045	102.55	99.77	0.9566	216,468,829	0
2000-01	1,363,097,348	1,342,521,922	1.015	99.61	99.66	0.9849	1,303,903,570	38,618,352
2001-02	1,514,945,909	1,507,463,418	1.005	98.63	99.56	0.9951	1,449,157,966	58,305,452
2002-03	1,759,795,585	1,732,356,497	1.016	99.71	99.45	0.9844	1,683,374,815	48,981,682
2003-04	2,259,975,028	2,260,665,160	1.000	98.14	99.34	1.0003	2,161,833,498	98,831,662
2004-05	2,630,211,146	2,588,086,842	1.016	99.71	99.24	0.9840	2,515,991,766	72,095,076
Total	12,049,299,008	11,910,413,638	9.140	896.98	896.98	8.8635	11,526,046,925	384,366,713
Average	1,338,811,001	1,323,379,293	1.016	99.66	99.66	0.9848	1,280,671,881	42,707,412

Standard Deviation : 1.763
 Co-efficient of variation : 1.769

Chi-Square : 0.017

TOTAL PRODUCTIVITY IN VASUDHARA DAIRY – ALIPUR(CHIKHLI):

The table 7.7 displays the numerical data in reference to total inputs, output, Output-Input ratio, productivity index, trend value, Input-Output ratio, and possible savings. It also computed some other numerical data such as standard deviation, co-efficient of variation chi-square and growth rate of Vasudhara Dairy from the year 1996-'97 to 2004-'05 i.e. nine years.

The table 7.7 indicates that the output of Vasudhara dairy increases from 69.51 crores in 1996-'97 to 82.73 crores in 1998-'99. The fluctuation expansion of output works out to be 19.02%. While in case of total inputs, they increase from 68.18 crores in 1996-'97 to 80.66 crores in 1998-'99. The fluctuation spread of total input comes out to be 18.30%. Here, output increases slightly more than the total inputs during this particular period. Then, in the year 1999-'00, both the output and total inputs decrease suddenly. And then after, they are increasing more and more year by year. The output increases from 22.63 crores in 1999-'00 to 263.02 crores in 2004-'05. The fluctuation diffusion of output comes out to be 1062.26%. While the total input increase from 21.65 crores in 1999-'00 to 258.81 crores in 2004-'05. The fluctuation diffusion of total input comes out to be 1095.43%. So, here total input are increasing more than the output after the year 1999-'00. It suggests the negative trend of total productivity in Vasudhara Dairy Moreover productivity ratio moves in mixed trend during the period under the research.

Total productivity ratio (O/I ratio) works out to 1.019 for the base year i.e.1996-'97. The average total productivity ratio comes out to 1.016 for the study period. The O/I ratio of 1998-'99 (1.026) and 1999-'00 (1.045) are registered higher than the average ratio. While the O-I ratio of 1997-'98 (0.998), 2000-'01 (1.015), 2001-'02 (1.005) and 2003-'04 (1.000) are registered lower than the average ratio. While the O-I ratio of 2002-'03 (1.016) and 2004-'05 (1.016) are registered equal to the average ratio. It points out the negative trend of total productivity. It can be stated that there should not be used all input fully and efficiently in the dairy.

Now, the productivity index which gives an idea about the Variation in Output-Input ratio for the present study. It is assumed 100 for the base year i.e.1996-'97. It decreases in the first initial year and goes down to 97.94 in 1997-'98. Then, it increases for two years constantly and reaches to 102.55 in 1999-'00 which is the top level during the study period. Then again it decreases and goes down to 98.63 in 2001-'02. Then after, it increases and decreases. In the year 2004-'05, it increases to 99.71. So, in the end it starts the increasing trend. The productivity index comes on an average to 99.66 which is less by 0.34% from the base year. These figures point out that there is balanced or average control and management over all inputs in the dairy.

The overall result of total productivity is considered in respect to the value of standard deviation, co-efficient of Variation and chi-square. Standard deviation of Vasudhara Dairy comes out to 1.763 while the co-efficient of variation comes out to 1.769. It clarifies that there is variation in the productive indices. The calculated value of chi-square works out to 0.017 while the critical value of chi-square 2.17. So, the critical value is bigger than the calculated value of chi-square. It orders to accept the null hypothesis," Total productivity indices can be expressed by the straight line trend based on least square method". It means, "There is no significant difference between the total productivity of the co-operative milk dairy plants of Gujarat State". The calculated value of productivity index. The average requirement of total input per rupee of output for Vasudhara Dairy is 0.98. Input-Output ratio stays at the lowest level in the year 1999-'00. It indicates that the dairy achieves its maximum efficiency in total input during this year. Moreover, the table shows that the possible savings in total inputs comes out to 4.27 crores per year for the dairy.

Total Productivity of Vasudhara Dairy - Alipur.

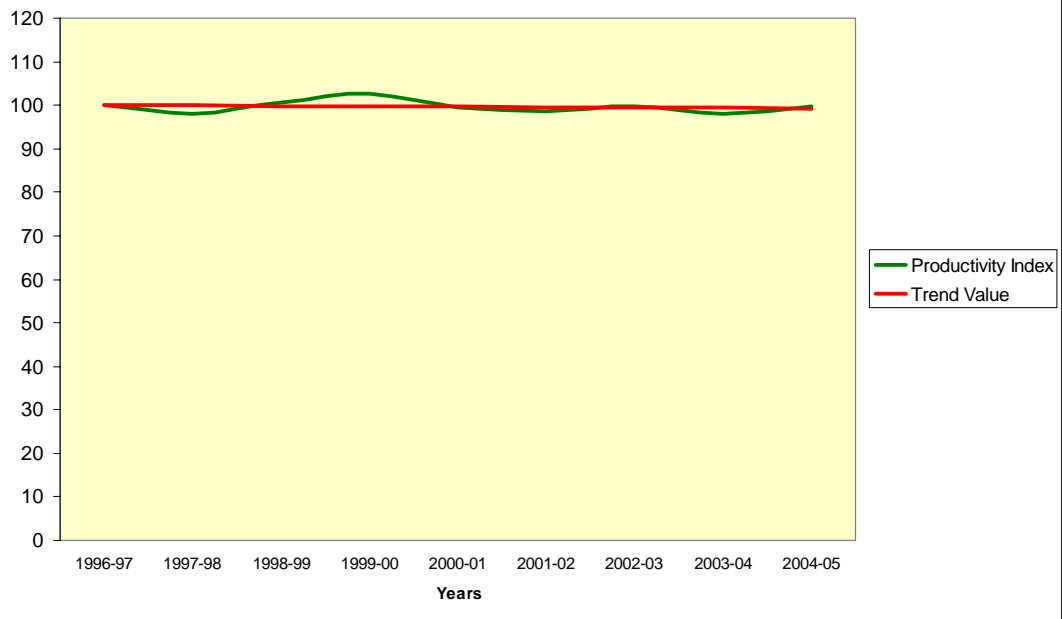


Table 7.8
Total Productivity of "Sumul Dairy" - Surat

Year	Output	Input	O/I Ratio	Productivity Index	Trend Value	I/O Ratio	STD Input	Possible Savings
1996-97	2,344,676,397	2,328,199,990	1.007	100.00	100.03	0.9930	2,328,199,990	0
1997-98	2,875,563,460	2,857,138,419	1.006	99.90	99.90	0.9936	2,855,356,427	1,781,992
1998-99	2,900,606,810	2,886,471,439	1.005	99.80	99.78	0.9951	2,880,223,793	6,247,646
1999-00	3,106,651,642	3,095,571,650	1.004	99.70	99.65	0.9964	3,084,820,716	10,750,934
2000-01	3,446,899,795	3,438,811,593	1.002	99.50	99.53	0.9977	3,422,677,892	16,133,701
2001-02	3,446,899,795	3,521,688,891	1.001	99.40	99.40	0.9989	3,500,859,865	20,829,026
2002-03	3,818,751,083	3,823,372,196	0.999	99.21	99.28	1.0012	3,791,916,123	31,456,073
2003-04	4,251,273,272	4,253,962,288	0.999	99.21	99.15	1.0006	4,221,398,911	32,563,377
2004-05	4,600,686,233	4,614,858,276	0.997	99.01	99.02	1.0031	4,568,356,493	46,501,783
Total	30,792,008,487	30,820,074,742	9.020	895.73	895.73	8.9796	30,653,810,210	166,264,532
Average	3,421,334,276	3,424,452,749	1.002	99.53	99.53	0.9977	3,405,978,912	18,473,837

Standard Deviation : 0.106
Co-efficient of variation : 0.107

Chi-Square : 0.00001

TOTAL PRODUCTIVITY IN SUMUL DAIRY – SURAT:

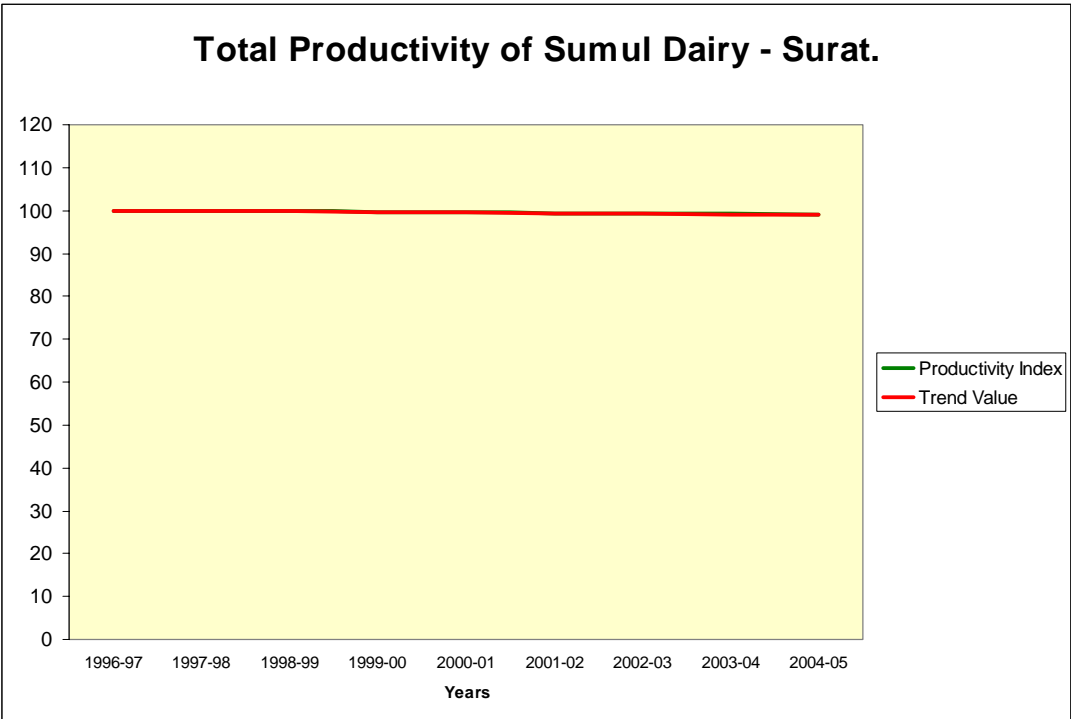
The table 7.8 draws the statistical picture in reference to total productivity of Sumul Dairy-Surat and finds out some necessary numerical data of the study period i.e. 1996-'97 to 2004-'05.

So for the output of Sumul Dairy is concerned, it is clear from the table that it increases from 234.47 crores in 1996-'97 to 460.07 crores in 2004-'05. The fluctuation spread of output comes out to be 96.22%. While in case of total inputs, they increase from 232.82 crores in 2004-'05. The fluctuation spread of total inputs comes out to be 98.22%. So, these figures point out that total input are increasing more than the output slightly. It shows the negative trend of total productivity of Sumul Dairy. Moreover, the total productivity ratio moves in decreasing trend during the period under the research.

Total productivity ratio (O-I ratio) works out to 1.007 for the 1996-'97 i.e. base year. The average total productivity ratio works out to 1.002 for the research period. The O/I ratio of 1997-'98 (1.006), 1998-'99 (1.005) and 1999-'00 (1.004) are registered higher than the average ratio. While the O-I ratio of 2001-'02 (1.001), 2002-'03 (0.999), 2003-'04 (0.999) and 2004-'05 (0.997) are registered lower than the average ratio. While the O-I ratio of 2000-'01 (1.002) comes out to equal to the average ratio. It indicates the downward trend of total productivity. It is to be stated that all inputs should not be utilized fully and efficiently in the dairy.

As the interpretation and analytical point of view, the productivity index is required to find out the variation in Output-Input ratio during the study period. It is assumed 100 for the base year i.e. 1996-'97. Then, it decreases year by year. It starts to decrease from 100 in 1996-'97 to 99.01 in 2004-'05. It is clear from the table that it moves in downward trend continuously. It decreases constantly and goes down to 99.01 in the last year of the study period. The average productivity index comes out to 99.53 which is less by 0.47% from the base year. It points out the negative trend. It can be said that there is no proper control and management over all inputs in the dairy.

The overall result of total productivity is finalized in respect to the value of standard deviation, co-efficient of variation and chi-square. It is noted from the table that standard deviation is 0.106 while the co-efficient of variation is also 0.107. So, these figures make clear that there is no much variation in the productivity indices. The table makes clear that the calculated value of chi-square is 0.00001 while the critical value of chi-square is 2.17. So, here the critical value is more than the calculated value. It suggests the acceptance of null hypothesis, "Total productivity indices can be represented by the straight line trend based on least square method." It means, "There is no significant difference between the total productivity of Gujarat State." The calculated value of productivity index. The average requirement of total inputs per rupee of output for Sumul Dairy is 0.997. It means that their requirement is almost equal. Input-Output ratio moves at the lowest level in the year 1996-'97. It interpreters that the dairy obtainers its maximum efficiency in total inputs during this year. Moreover, in reference to the possible savings, the table makes clear that it comes out to 1.85 crores per year for the dairy.



6. TOTAL PRODUCTIVITY RATIOS OF THE CO-OPERATIVE DAIRY AND MILK SUPPLY UNITS AND KRUSKAL WALLIS ONE-WAY ANALYSIS OF VARIANCE TEST:

The comparative status of total productivity ratios of co-operative dairy and milk supply units of Gujarat State have been provided in table 7.9 along with the application of variance test on these ratios for the period under the study.

Table 7.9

COMPARATIVE TOTAL PRODUCTIVITY RATIO OF CO-OPERATIVE DAIRY & MILK SUPPLY UNITS OF GUJARAT STATE WITH KRUSKAL WALLIS ONE-WAY ANALYSIS OF VARIANCE TEST

Year	AMUL DAIRY RATIO	R1	GOPAL DAIRY RATIO	R2	UTTAM DAIRY RATIO	R3	MADHUR DAIRY RATIO	R4	SUGAM DAIRY RATIO	R5	DUDH- SAGAR DAIRY RATIO	R6	VASU- DHARA DAIRY RATIO	R7	SUMUL DAIRY RATIO	R8
1996-97	1.022	52.5	1.033	63	1.027	56.5	1.006	14.5	1.007	17.5	1.013	32.5	1.019	49	1.007	17.5
1997-98	1.014	36.5	1.038	67	1.040	68.5	1.008	22	1.014	36.5	1.018	47.5	0.998	2	1.006	14.5
1998-99	1.029	58.5	1.020	50	1.036	65	1.008	22	1.014	36.5	1.008	22	1.026	55	1.005	12
1999-00	1.023	54	1.032	61.5	1.035	64	1.005	12	1.014	36.5	1.010	28	1.045	70	1.004	10
2000-01	1.021	51	1.017	45.5	1.032	61.5	1.007	17.5	1.014	36.5	1.016	42.5	1.015	41	1.002	8.5
2001-02	1.022	52.5	1.029	58.5	1.040	68.5	1.009	25.5	1.018	47.5	1.015	41	1.005	12	1.001	6.5
2002-03	1.017	45.5	1.008	22	1.027	56.5	1.010	28	1.010	28	1.016	43.5	1.016	43.5	0.999	3.5
2003-04	1.014	36.5	1.002	8.5	1.037	66	1.012	31	1.008	22	1.009	25.5	1.000	5	0.999	3.5
2004-05	1.015	41	1.001	6.5	1.031	60	1.013	32.5	1.007	17.5	1.011	30	1.016	42.5	0.997	1
Total		428		383		567		205		279		313		320		77

$$\begin{aligned}
H &= \frac{12}{N(N+1) \sum_{j=1}^k n_j} \frac{\sum^k (R_j)^2}{n_j} - 3(N+1) \\
&= \frac{12}{72(72+1)} \left[\frac{(428)^2}{9} + \frac{(382.5)^2}{9} + \frac{(566.5)^2}{9} + \frac{(205)^2}{9} + \frac{(278.5)^2}{9} + \frac{(312.5)^2}{9} + \frac{(320)^2}{9} + \frac{(77)^2}{9} \right] - 3(72+1) \\
&= \frac{12}{5256} \left[20353.78 + 16256.25 + 35658.03 + 4669.44 + 8618.03 + 10850.69 + 11377.78 + 658.78 \right] - 219 \\
&= 247.59 - 219 \\
&= 28.59
\end{aligned}$$

The above table i.e. 7.9 points out that the calculated value of H comes out to 28.59 which is more than the critical value i.e.2.17. So, these figures indicate that the null Hypothesis based on Kruskal Wallis one-way analysis of variance test at 5% level of significantly is rejected and alternative Hypothesis is accepted. It analyses that “There is significantly difference between the total productivity ratios of co-operative dairy and milk Supply units of Gujarat state.”

TABLE 7.10
COMPARATIVE ANALYSIS OF TOTAL PRODUCTIVITY IN CO-OPERATIVE DAIRY AND MILK SUPPLY UNITS OF
GUJARAT STATE FROM 1996-97 TO 2004-05.

UNIT	PRODUCTIVITY RATIO		PRODUCTIVITY INDEX		CO-EFFICIENT OF VARIATION		CHI-SQUARE		INPUT-OUTPUT RATIO	
	AVERAGE	RANK	AVERAGE	RANK	VALUE	RANK	VALUE	RANK	AVERAGE	RANK
AMUL DAIRY	1.02	2.5	99.77	5	0.215	6	0.002	5.5	0.9807	3
GOPAL DAIRY	1.02	2.5	98.74	8	1.639	7	0.004	7	0.9804	2
UTTAM DAIRY	1.034	1	100.67	1	0.207	5	0.002	5.5	0.9671	1
MADHUR DAIRY	1.009	7	100.27	3	0.062	1	0.000	2	0.9913	7
SUGAM DAIRY	1.012	6	100.48	2	0.133	4	0.001	3.5	0.9885	6
DUDHSAGAR DAIRY	1.013	5	99.99	4	0.109	3	0.001	3.5	0.9872	5
VASUDHARA DAIRY	1.016	4	99.66	6	1.769	8	0.017	8	0.9848	4
SUMUL DAIRY	1.002	8	99.53	7	0.107	2	0.000	1	0.9977	8
COMBINED AVERAGE	1.016		99.89		0.53		0.003		0.9847	

**7. COMPARATIVE ANALYSIS OF TOTAL PRODUCTIVITY
IN CO-OPERATIVE DAIRY AND MILK SUPPLY UNITS
OF GUJARAT STATE:**

The comparative analysis of total productivity in co-operative dairy and milk supply units of Gujarat state for the period from 1996-'97 to 2004-'05 is shown in table 7.10 which is as follows:

This table reveals that the combined average of total productivity ratio for the research period works out at 1.016. It makes clear that for every rupee spent on total input, the output ratio comes out to 1.016 in co-operative milk dairy industry. The average total productivity ratio of Uttam Dairy [1.034], Amul Dairy [1.020] and Gopal Dairy [1.020] are registered higher than the combined average total productivity ratio for the present study. While in case of Dudhsagar Dairy [1.013], Sugam Dairy [1.012], Madhur Dairy [1.009] and Sumul Dairy [1.002] are registered lower than the combined average total productivity ratio for the research period. While in case of Vasudhara Dairy [1.016] are registered equal to the combined average total productivity ratio for the same period.

So far the success of total productivity is concerned it is noted from the total productivity indices of various dairies that the progress is made in total productivity during the research period has been the highest at 100.48 for Sugam Dairy, 100.27 for Madhur Dairy, 99.99 for Dudhsagar Dairy, 99.77 for Amul Dairy 99.66 for Vasudhara Dairy, 99.53 for Sumul Dairy and 98.74 for Gopal Dairy. The average development of Uttam Dairy, Sugam Dairy, Madhur Dairy and Dudhsagar Dairy are better in comparison to the average combined ratio [99.89]. While the development of Amul Dairy, Vasudhara Dairy, Sumul Dairy and Gopal Dairy are lower than the combined average ratio in co-operative milk dairy industry.

Next, the co-efficient of Variation. It comes out at the highest being 1.769 for Vasudhara Dairy and 1.639 for Gopal Dairy which are bigger than the combined average [0.530]. While in case of Amul Dairy, it is 0.125, 0.207 for Uttam Dairy, 0.133 for Sugam Dairy, 0.109 for Dudhsagar Dairy, 0.107 for Sumul Dairy and 0.062 for Madhur Dairy are less than the combined average. These figures point out that there is lowest variability in total productivity in Madhur Dairy.

This table shows that the average value of chi-square is lower than the critical value. So the productivity indices of co-operative milk dairies seem to be nearer to the straight line type pattern. The null hypothesis based on chi-square test is accepted for all the dairies that are Vasudhara Dairy [0.0170], Gopal Dairy [0.0040], Uttam Dairy [0.0020], Amul Dairy [0.0020], Sugam Dairy [0.0010], Dudhsagar Dairy [0.0010], Madhur Dairy [0.0002] and Sumul Dairy [0.0001] So, it is analyzed from the above figures that productivity indices of all dairies seems to be nearer to straight line trend based on least square method as its chi-square value is lower than the critical value.

Total input requirement which is shown by Input-Output ratio. The ratio of Uttam Dairy is the lowest among the others. For an average output of one rupee, Rs. 0.98 is spent on total input. In case of Uttam Dairy, it is 96.71 which is the lowest input registered in the study and Gopal Dairy it is 0.9804, Amul Dairy – 0.9807 are lower. While in case of Vasudhara Dairy it is 0.9848, Dudhsagar Dairy it is 0.9872, Sugam Dairy it is 0.9855, Madhur Dairy it is 0.9913 and Sumul Dairy it is 0.9977 are higher than the combined average ratio during the research period.

REFERENCES

1. J.P. Shrivastava, "Labour Productivity", [New Delhi: Oxford and IBH Publishing Company, 1982], PP. 42-43.
2. Solomon Fabricant, "Meaning & Measurement of productivity" in labor productivity Eds., John T. Dunlop and Vasilii P. Diatchenko, McGraw Hill Book Co., New-York 1964, P. No. 13.
3. ILO, Higher Productivity in Manufacturing Industries, P. No. 1
4. Hiram S. Davis, "The meaning & measurement of productivity in Industrial Productivity", Ed. By L. Reed Tripp, Industrial Relations Research Association, 1951, PP. 3-4.

CHAPTER – 8

SUMMARY OF FINDINGS & SUGGESTIONS

CHAPTER – 8

SUMMARY OF FINDINGS & SUGGESTIONS

India is basically, an agricultural country, and mostly depends upon the weather. Animal Husbandry is one of the branches of the agriculture moreover, the Indian culture is self – reliant, self sufficient and contended. In this past, every family domesticated cows to fulfill their own need but dairy industry was not developed as a business, or as a profession. With the advent of the 19th century, the condition was getting changed and in real sense, the people of India adopted Dairy industry professionally.

To fulfill the need of the dairy, the cattle breeding centers were started during the English rule. The first cattle breeding center was established at Allahabad in 1891. Later on, such type of cattle breeding centers were started at Bangalore, Poona, Kurnal and Hissar. In 1923, expert services of Imperial Dairy were started by the British Government. Then after, the Bangalore centre was converted into Imperial Dairy Research Institute (IDRI) in the year 1941.(6) After the First World War, such cattle breeding centers were handed over to central Government and after that they were put under the control of concerned state Governments. In these centers, cattle's breeding was done on a scientific basis and item like paneer was also started to be made. Thus, in India the Dairy Development was introduced in this fashion.

The Dairy Co-operative movement in Gujarat is similar to the Co-operative movement in India. “AMUL” is the pioneer of the Dairy Co-operative in Gujarat and in India also. Before the birth of AMUL DAIRY Anand, there was no systematic marketing for milk in India. As milk is perishable item, milk producer's farmers had to seu their milk to the middlemen for whatever they were offered. Middlemen bought the milk from milk producers at a lower price and sold it to cities with the huge margin of profit. Many times, milk producers were compelled to sell cream and ghee at throw away prices. Thus, the middlemen exploited the milk producers, farmers.

Though many farmers were illiterate, they knew that the system under which private traders bought their milk and milk products at lower prices and sold it to huge margin of profit was just not true and fair. In 1945, the Government of Bombay started the Bombay milk scheme. At that time, the “Polson Dairy” – the private dairy had got monopoly to collect milk from Kaira district to be sold at Bombay and exploited the farmers. The Government of Bombay found it profitable and Polson Dairy also kept good margin of profit. But, in spite of this situation, nobody had tried to determine the price of milk to the benefits of the farmers. As such unsatisfaction among the farmers grew. So, they decided to have their own milk Co-operatives to save their own interest. In this reference, they determined to supply the milk as an organization and not as an individual. The motivation for this came from Sardar Vallabhbhai Patel. In shaping and creating the AMUL, the vital role of leaders like Morarji Desai, Tribhuvandas Patel, dedicated professionals like Dr. V. Kurien and Dr. Dalaya was very valuable. The Bombay Government in the milk industry. In this reference, the milk producers of Kaira district went on strike for 15 days. So, not even a drop of milk was sold to private traders. And they could not provide a drop of milk to Bombay. So, the scheme had collapsed, due to the strike of milk producers. After seeing the strong determination of the milk producers – farmers, the Bombay Government had to obey to the demand for the establishment of milk Co-operatives.

Eventually, the Kaira District Co-operatives milk producers, Union Ltd. Which is known as “AMUL DAIRY” – Anand was started in 1946. In the starting, the AMUL DAIRY collected just 250 liters of milk per day with the help of two Co-operative societies of the union. Due to AMUL DAIRY, farmers were obtaining fair and sufficient reward on the basis of fat content of the milk. They were paid promptly also. So, more and more farmers jointed the union, and the union got much strength. It turned today into 7,56,600 litres of milk per day, being collected from 1073 village Co-operative societies with the help of 6,15,415 farmer members Late Tribhuvandas Patel and Dr. V. Kurien have given the name of “AMUL” as excellence in Asia and have brought the ‘White Revolution’ in Gujarat as well as in India. And the milk producers also supported and co-operated their efforts nicely and realized the spirit of co-operation in a real sense.

Productivity may be defined as the ratio of output to input. Higher productivity also stands for proper utilization of available resources to achieve the best result with minimum cost of expenditure. Productivity drive has a great role in increasing the production per unit of input and thereby augmenting the economic planning of under developed countries which suffer from inadequacy of capital growth, production and productivity are the two significant elements. The link between productivity and economic growth is almost self-evident. Increase in productivity in an industry is an essential factor for stepping up of the rate of economic growth. Productivity is concerned with the efficient utilization of resources in producing goods or services (output). So it is again in simple words, the ratio of output produced to the input used.

There are several methods for measurement of productivity, viz.,

1. Kendrik – Crammer Model
2. Craig – Harris Model
3. APC Model
4. Production Based Model
5. Productivity Accounting Model.

However, the model entitled “Productivity Accounting” was elected for the present study, after extensive review of literature, to measure and analyze the productivity of the Co-operative Milk Dairy Plants as it seems better on several grounds. First, it is an overall measure of productivity although measurement of partial productivity ratios on the basis of this technique is possible; secondly, it gives an accounting measure of productivity. Finally, it is easy to understand and use.

In the course of this study, productivity ratios, productivity index, input-output ratios are calculated for the period of 1996-97 to 2004-05. Statistical tools like Standard Deviation, Co-efficient of variation and chi-square are used for the present study. The 1996-97 was selected as the base year for the present study. The data collected for the study are from the annual published reports of various companies and some supporting materials are also considered.

In the present study, two hypothesis have been tested from the analysis of productivity of Co-operative Milk Dairy of Gujarat. First hypothesis is “Productivity indices of Co-operative Milk Dairies may be represented by the straight line trend based on the least square method.”

In other words, this hypothesis based on the assumption that the productivity index of the Co-operative milk dairy industry followed by straight line trend. Chi-square test is used study inter unit productivity direction and growth. The second hypothesis is indicated as, “There is no significant difference between the productivity ratios of the Co-operative milk dairy units under the study.” It is based on Kruskal Wallis one way analysis of variance test and is concerned with inter unit comparisons.

- **MATERIAL PRODUCTIVITY:**

Any manufacturing & processing activity needs raw-materials and it consumes very high quantum, both in quality value and in monetary value. Thus, it is important to review material productivity of Co-operative Dairy & Milk Supply Units of Gujarat.

The combined average of material input comes to 0.86 per Rupee of output of Co-operative dairy and milk supply units. In other words, other things stay unchanged; material input is 86% of total value of output. In this research work, combined industrial average of material productivity is compared with individual dairy units.

Combined industrial average of material productivity ratio during the research period is come out at 1.16 from the analytical point of view, for every rupee spent on material the output value for the Co-operative milk dairy industry is 1.16. If we compare this with the individual units, SUGAM DAIRY (1.22), GOPAL DAIRY (1.20), UTTAM DAIRY (1.20), VASUDHARA DAIRY (1.19) and AMUL DAIRY (1.18) are higher than the combined industrial average of material productivity. While SUMUL DAIRY (1.12), DUDHSAGAR DAIRY are lower than the combined industrial average material productivity ration of the industry, so far as the achievement of material productivity is concerned, it can be said from the material productivity indices of various Co-operative milk dairy units that progress made in the material productivity during the research period has been the highest at 103.81 for VASUDHARA DAIRY. While it is 102.11 for UTTAM DAIRY, 101.83 for SUGAM DAIRY, 101.03 for MADHUR DAIRY, 100.78 for AMUL DAIRY, 100.61 for SUMUL DAIRY, 100.03 for DUDHSAGAR DAIRY but in GOPAL DAIRY it comes out to 89.55 which is lower than the combined industrial average of productivity which shown an average declining trend in material productivity indices.

The Co-efficient of Variation comes out to 7.12 of the industry which present the variation in material productivity ration during the research period, works out at the highest being 35.89% for GOPAL DAIRY, 11.41% for VASUDHARA DAIRY which are higher than the combined average. While it comes out to 2.99 for MADHUR DAIRY, 1.97 for AMUL DAIRY, 1.79 for UTTAM DAIRY, 1.35 for SUGAM DAIRY, 1.19 for DUDHSAGAR DAIRY and 0.36 for SUMUL DAIRY which are lower than the combined average. From this numerical picture, it can be pointed out that the SUMUL DAIRY has the lowest variability in material productivity.

Moreover, it also suggests that the average value of Chi-square value of Co-operative milk dairy industry as a whole is lower than the critical value, consequently the productivity indices of Co-operative milk dairy industry as a while seems to be nearer to the straight line type pattern. The null, hypothesis based on Chi-square test is accepted regarding for all the dairies such as VASUDHARA DAIRY (0.8), GOPAL DAIRY (0.02), AMUL DAIRY (0.01), SUGAM DAIRY (0.01) and SUMUL DAIRY (0.003) respectively. So, in all the dairies, productivity indices seems nearest to the straight line assumption as their chi-square value are lower than the critical value.

Material input requirement displayed by input-output rations for SUGAM DAIRY is the lowest. For average of one rupee output, there is requirement of Rs. 0.86 as material input. It is required Rs. 0.82 by SUGAM DAIRY 0.83, VASUDHARA DAIRY 0.84, AMUL DAIRY 0.85, SUMUL DAIRY 0.89, DUDHSAGAR DAIRY 0.91 and MADHUR DAIRY 0.93 during the course period. So MADHUR DAIRY, DUDHSAGAR DAIRY and SUMUL DAIRY need more Material for production of milk dairy.

The second null hypothesis based on Kruskal Wallis one-way analysis of variance test at 5% level of significant is rejected as value of $H=46.49$ is higher than the critical value – 2.17 and alternative hypothesis is accepted. It clarifies that there is significant difference between the material productivity ratios of the Co-operative Dairy and Milk Supply units of Gujarat State. It can be also pointed out that some of the Co-operative Dairy and Milk Supply Units, so that individual efforts are necessary.

It is also necessary to say that the plant should take needful actions to improve their material productivity some suggestions are:

- Latest technological machinery can improve output in MADHUR DAIRY.
- Proper material handling of material can decrease waste of material.
- A saving in industry material cost is possible by sharp management of material input in MADHUR DAIRY, DUDHSAGAR DAIRY and SUMUL DAIRY. It also should be applied in other milk dairy units.
- Proper quality and proper process can improve output effectively. MADHUR DAIRY, DUDHSAGAR DAIRY and SUMUL DAIRY can improve their material productivity by using their quality standardization.

● **LABOUR PRODUCTIVITY:**

Labour cost is the second most significant factor production cost after the cost of raw materials, even today. It is only labour which converts raw materials into finished products. It is the live and very sensitive element in all production activities. It is the factor which handles the entire organization it is an essential cost factor requiring continuously measurement, control and analysis. Efficient and latest technological machineries increase the labour productivity.

The combined average of average labour productivity ratio for the study period is come out at 25.64. It indicates, other things being equal, for every rupee spent in labour there is an output of Rs. 25.64 in cooperative Dairy and Milk Supply Units of Gujarat State. The highest labour productivity in recorded in MADHUR DAIRY (39.59), which followed by DUDHSAGAR DAIRY (38.59), AMUL DAIRY (32.01), SUMUL DAIRY (30.80), VASUDHARA DAIRY (22.73), UTTAM DAIRY (16.12), GOPAL DAIRY (12.90) and SUGAM DAIRY (12.50). The average performance of VASUDHARA DAIRY, UTTAM DAIRY, GOPAL DAIRY, and SUGAM DAIRY is lower than the performance of the industry in labour productivity.

Achievement of labour productivity, indices during the research period has been the highest at 155.64 for GOPAL DAIRY, 105.77 for VASUDHARA DAIRY, 102.40 for AMUL DAIRY, 100.30 for SUMUL DAIRY, 92.37 for UTTAM DAIRY, 89.97 for DUDHSAGAR DAIRY, 86.85 for SUGAM DAIRY and 82.77 for MADHUR DAIRY the average performance GOPAL DAIRY, VASUDHARA DAIRY and AMUL DAIRY are better in comparison to the combined average ratio. While the performance of SUMUL DAIRY, UTTAM DAIRY, DUDHSAGAR DAIRY, SUGAM DAIRY and MADHUR DAIRY are lower than the combined average of the industry. It states that labour input is not properly utilized by these Co-operative mil dairy units. The co-efficient of variation indicates the variability in labour productivity in the units, it is worked out at the highest being 1454.58% in GOPAL DAIRY, 366.88% DUDHSAGAR DAIRY, 325.02% in SUGAM DAIRY 245.79% in MADHUR DAIRY, 64.44% in SUMUL DAIRY, 59.09% in UTTAM DAIRY, 41.97% in VASUDHARA DAIRY and 31.68% lowest variance shown by AMUL DAIRY performed during the study period. The combined average of co0efficient of variation is worked out 323.62% in this variation of Goal Dairy is highest.

The average value of Chi-square test for Co-operative Dairy and Milk Supply industry is lower than the critical value consequently; the production indices of Co-operative Dairy and Milk Supply Units seem to be nearer to the straight-line type pattern. In null hypothesis based on Chi-square test, that the productivity indices can be approximated as a straight-line trend based pattern is accepted for all the dairies, these are AMUL DAIRY, GOPAL DAIRY, UTTAM DAIRY, MADHUR DAIRY, SUGAM DAIRY, DUDHSAGAR DAIRY, VASUDHARA DAIRY and SUMUL DAIRY as their Chi-square value is lower than the critical value.

Labour input requirement displayed by the input-output ration for an average output of one rupee, there is Rs. 0.05 should be spent on labour input by the milk industry. It is required Rs. 0.02 by MADHUR DAIRY, Rs. 0.03 by DUDHSAGAR DAIRY, Rs. 0.03 by AMUL DAIRY, Rs. 0.03 by SUMUL DAIRY, Rs. 0.04 by VASUDHARA DAIRY, Rs. 0.06 by UTTAM DAIRY, Rs. 0.08 by SUGAM DAIRY and Rs. 0.09 by GOPAL DAIRY. In this reference, it can be pointed out that GOPAL DAIRY, SUGAM DAIRY and UTTAM DAIRY need more labour input for the production of milk dairy unit.

The second null hypothesis is based on Kruskal Wallis one-way analysis of variance test, at 5% level of significant, is rejected as value of $H=62.24$ is higher than the critical value-2.17 and alternative hypothesis accepted. It displays that there is significant difference between the labour productivity ratios of the Co-operative Dairy and Milk Supply Units of Gujarat State. It is also needful to say that some of the Co-operative Dairy and Milk Supply Units utilize their labour input efficiently compared to other Co-operative Dairy and Milk Supply Units. So, individual efforts are necessary.

The Labour Productivity of Co-operative Dairy and Milk Supply Units of Gujarat State can be improved, following suggestion are made in this reference;

- Sufficient wages and incentive schemes can also motivate the workers to improve the labour productivity.
- GOPAL DAIRY, UTTAM DAIRY, SUGAM DAIRY, and VASUDHARA DAIRY, have some labour problems, if they are sorted out, these units can improve their labour productivity.
- Efficiency of existing staff should be increased through the methods of time study, work study and motion study. It is also necessary to apply “Can Do Approach” because if works really and it effects mentally to the live human beings.

● **OVERHEAD PRODUCTIVITY:**

Last but not least important element of cost is overhead cost. Today in the competitive scenario, overhead expenses have a special importance in the total cost of a product. It covers 1/3 part of the total cost of a product, so overhead productivity is one of the important measurements of a manufacturing organization. Accounting for overhead costs should be made in such a way that, it can help the top management in controlling cost and decision making.

The combined average of overhead productivity ration for the research period is come out to 16.22. It indicates other things being equal, for every rupee spent in overhead; there is an output of Rs. 16.22 in Co-operative dairy and milk supply unit of Gujarat State. The average productivity ration of MADHUR DAIRY (29.42), DUDHSAGAR DAIRY (21.01), and GOPAL DAIRY (18.02), are higher than the combined average productivity ration for the course period. While in case of UTTAM DAIRY (14.46), SUMUL DAIRY (14.31), SUGAM DAIRY (11.68), VASUDHARA DAIRY (10.68), and AMUL DAIRY (10.20) are lower than the combined average productivity ration for the same.

Now looking on the achievement of overhead productivity it is noted from the overhead productivity indices of various milk dairy units that progress made in overhead productivity during the study period has been the highest for GOPAL DAIRY at 183.57, DUDHSAGAR DAIRY at 107.45, MADHUR DAIRY at 106.71, SUGAM DAIRY 101.71, UTTAM DAIRY at 91.50, AMUL DAIRY at 91.07, SUMUL DAIRY at 85.86 and VASUDHARA DAIRY at 67.47. The average performance of GOPAL DAIRY, DUDHSAGAR DAIRY and MADHUR DAIRY indicates the better performance in comparison to the combined average productivity index ration. On the other hand, the performance of SUGAM DAIRY, UTTAM DAIRY, AMUL DAIRY, SUMUL DAIRY and VASUDHARA DAIRY are lower than the combined average productivity index ration.

The co-efficient of variation shows the variation in overhead productivity ration during the study period. The average co-efficient of variation works out at the highest being 1008.33% for GOPAL DAIRY, 65.18% for MADHUR DAIRY, 520.25% for VASUDHARA DAIRY, 109.55% for SUGAM DAIRY, 94.69% for DUDHSAGAR DAIRY, 69.07% for AMUL DAIRY, 50.98% for UTTAM DAIRY and VASUDHARA DAIRY are higher while in case of SUGAM DAIRY, DUDHSAGAR DAIRY, AMUL DAIRY, UTTAM DAIRY and SUMUL DAIRY are lower than the average variations of the milk industry. There is lowest variability in overhead productivity.

The average value of Chi-square for the Co-operative milk dairy industry is lower than the critical value consequently, the production of indices of Co-operative milk

dairy units seem to be nearer to the straight line type pattern. The null hypothesis is based on Chi-square test. It states that the overhead productivity of the milk dairy plants can be approximated by the straight line trend is accepted for all the dairies, there are AMUL DAIRY, GOPAL DAIRY, UTTAM DAIRY, MADHUR DAIRY, SUGAM DAIRY, DUDHSAGAR DAIRY, SUMUL DAIRY and VASUDHARA DAIRY. So, the null hypothesis is accepted because the Chi-square value of all the dairies are lower than the critical value. In this reference, it can be said that all the dairies seem nearer to the straight line type pattern.

Overall input requirement presented by the Input-output ratio for the milk dairy industry as a whole works out at 0.07. It means that for an average of one rupee output, there is Rs. 0.07 input of overhead in Co-operative milk dairy industry. Overhead Input in MADHUR DAIRY (0.04), is the lowest requirement in the study, it follows by DUDHSAGAR DAIRY (0.05), GOPAL DAIRY (0.06), UTTAM DAIRY (0.07), SUMUL Dairy (0.07) SUGAM DAIRY (0.09), AMUL DAIRY, SUGAM DAIRY and VASUDHARA DAIRY require more input in comparison to the requirement of other units. The second hypothesis is based on Kruskal Wallis one way analysis of variance test at 5% level of significance.

It indicates that there is no significant difference between the overhead productivity ratios of the Co-operative milk dairy plants is rejected as the value of H-46.72 which is higher than the critical value -2.17. Thus, the alternative hypothesis is accepted. It means, **“There is significant difference between the overhead productivity ration of the Co-operative milk dairy plant of Gujarat State.”** It can be also pointed out that sum of the Co-operative milk dairy units utilize their overhead input efficiently in comparison to the other milk dairy plants, so in this reference individual efforts are necessary.

The Overhead Productivity of Co-operative dairy and milk supply units of Gujarat State can be improved; the underwritten suggestions are made in this connection.

- There should be cost reduction program.
- There should be constant measurement of efficiency for each and every aspect.
- There should be proper cost records.

- AMUL DAIRY, VASUDHARA DAIRY, SUGAM DAIRY, SUMUL DAIRY and UTTAM DAIRY should improve their overhead productivity because their ratios are not good. One of the affecting factor for this result may be their major plant capacity.

- **TOTAL PRODUCTIVITY:**

Total Productivity ratio measures the productivity of all the resources used in production. Here, input means, the cost of material, labour and overhead are the total inputs. And the result is called output. (Production) total productivity ration indicates how efficiently all the inputs are consumed in production means it shows overall result of unit.

The combined average of total productivity ration for the study period is worked out at 1.02, thus if other inputs remain unchanged, for every rupee spent on total input, there is an average output of Rs. 1.02 in Co-operative milk dairy unit. The average productivity ratio of UTTAM DAIRY is 1.03, AMUL DAIRY is 1.02 GOPAL DAIRY is 1.02 and VASUDHARA DAIRY 1.02 than the combined average of productivity ratio of the Co-operative milk dairy industry. While of the DUDHSAGAR DAIRY is 1.01, SUGAM DAIRY is 1.01, MADHUR DAIRY is 1.01 and SUMUL Dairy is 1.00 are lower than the combined productivity average ration of the industry.

Regarding the achievement of total productivity, it can be noted from the total productivity indices of various units, that progress made on total productivity during the Study period has been the highest at 100.67 for UTTAM DAIRY, 100.48 for SUGAM DAIRY 100.27 for MADHUR DAIRY, 99.74 for GOPAL DAIRY, 99.66 for VASUDHARA DAIRY and 99.53 for SUMUL DAIRY. The average performance of UTTAM DAIRY, SUGAM DAIRY, MADHUR DAIRY and DUDHSAGAR DAIRY have proved a better performance in comparison to the combined average, while in case of AMUL DAIRY, GOPAL DAIRY, VASUDHARA DAIRY and SUMUL DAIRY have poor performance comparatively.

The co-efficient of variation works out at the highest being 1.77% for VASUDHARA DAIRY, 1.64% for GOPAL DAIRY, 0.22% for AMUL DAIRY, 0.21% UTTAM DAIRY, 0.13% for SUGAM DAIRY, 0.11% for DUDHSAGAR DAIRY, 0.11% for SUMUL DAIRY and 0.06% for MADHUR DAIRY. This ratio clears the variability in total productivity during the research period in various units. The average of co-efficient of variation of the industry comes out to 0.53 in comparison to the VASUDHARA DAIRY and GOPAL DAIRY have higher variation while in case of AMUL DAIRY, UTTAM DAIRY, SUGAM DAIRY, DUDHSAGAR DAIRY, SUMUL DAIRY and MADHUR DAIRY have lower variation. Out of them MADHUR DAIRY has the lowest variability.

The combined average value of Chi-square is lower than the critical value consequently, the productivity indices of Co-operative Dairy and Milk Supply Units seems to be nearer to the straight line type pattern. The null hypothesis based on Chi Square test that the overall productivity indices can be approximated by the straight line trend is accepted for all the dairies i.e. AMUL DAIRY, SUGAM DAIRY, DUDHSAGAR DAIRY, VASUDHARA DAIRY and SUMUL DAIRY as their value of Chi-square is lower than the critical value. So, it can be said that all the dairies seem nearer to the straight line type pattern. It indicates that some of the Co-operative milk dairy units utilize their total input efficiently in comparison to the other milk dairy plants.

Total input requirement shown by the input-output ratio for UTTAM DAIRY is the lowest at 0.96. for an average of output of one rupee, Rs. 0.98 is spent on total inputs by the industry. In case of GOPAL DAIRY, it is 0.99, MADHUR DAIRY, it is 0.99 and SUMUL DAIRY, it is 1.00. The combined average of input-output ratio comes out to 0.98. So, from these figures, it can be said that SUMUL DAIRY, MADHUR DAIRY, SUGAM DAIRY, DUDHSAGAR DAIRY requires more total inputs in comparison to the other units.

The second null hypothesis based Kruskal Wallis one way analysis of variance test at 5% level of significance, that there is no difference between total Productivity ratios of the Co-operative milk dairy industry is rejected and the alternative hypothesis is accepted because the value of H is 28.59 which is higher than the critical value, 2.17.

it means that there is significant difference between the total productivity ration of the Co-operative dairy and milk supply units of Gujarat State.

In Conclusion, Co-operative Dairy and Milk Supply Units of Gujarat State can improve their total Productivity by applying the following suggestions. These are;

- There should be scientific utilization of all the inputs.
- Efficiency and productive level should be measured regularly and it should be maintained constantly.
- The effective cost reduction programme should be applied.
- DUDHSAGAR DAIRY, SUGAM DAIRY, MADHUR DAIRY, and SUMUL DAIRY should improve their total productivity, by applying latest technological machineries, increasing output and other efforts.
- The top management also should have to be more efficient in their part.

BIBLIOGRAPHY

BOOKS:

1. Anthony Robert Reece, James S., Accounting Principles, A.I.T.B.S. Publishing Delhi - 6th Ed. 2003
2. Apte Prakash, International Financial Management, Tata Mc Graw Hill Publishing, New Delhi - 3rd Ed. 2003.
3. Bhilla V.K., International Financial Management Tax & Cases, Anmol Publishing House, 4th Ed. 2004
4. Bhattacharya S.K., Accounting For Management Tax & Cases, Vikas Publishing New Delhi, 2nd Rep. Ed. 2002.
5. Bhattacharyya Asish K., Principles And Practice Of Cost Accounting, Prentice Hill New Delhi.
6. Brealey Richard & Myers Stewart, Principles Of Corporate Finance, Tata Mc Graw Hill Publishing New Delhi - 5th Rep. 2003.
7. Brealey Richard A., Principles Of Corporate Finance, Tata Mc Graw Hill Publishing New Delhi - 7th Ed. 2005.
8. Buckley Adrian, Multinational Finance (3rd Ed.), Prentice Hill
9. Chandra Prasanna, Financial Management Theory And Practice, Tata Mc Graw Hill Publishing New Delhi - 5th Ed.
10. Chandra Prasanna, Financial Management : Theory And Practice, Tata Mc Graw Hill Publishing New Delhi - 5th Ed. 2004 & 8th Rep. 2004.
11. Chatterje B.K., Costing And Managerial Accounting For Managers, Jaico Publication Mumbai - 3rd Ed. -1999.
12. Chossen Sijbrn, Public Finance And Public Policy In The New Century, Pearson Education - (1st Pub. Rep. Ed. 2004).
13. Davies David, Finance And Accounting For Managers, Jaico Publication Mumbai - 2nd Ed. -1999.
14. Elteman, David K. And Others, Multinational Business Finance, Pearson Education - 10th Ed. 2004
15. Eun Cheol S. & Resnick Bruce, International Financial Management, Tata Mc Graw Hill Publishing New Delhi - 3rd Rep. 2003.
16. Ghosh T.P., Financial Accounting For Management, Taxmann Pub. New Delhi

17. Gupta Shashi K. & Sharma R.K., Financial Management Theory & Practice, Kalyani Publication New Delhi - 4th Rev.Ed.2003.
18. Icfai, Financial Management For Managers Work Book, Icfai Center Hyderabad
19. Icfai, Financial Management For Managers , Icfai Center Hyderabad
20. Icfai, Management Accounting Control Systems Work Book, Icfai Center Hyderabad
21. Icfai, Management Accounting And Control Systems, Icfai Center Hyderabad
22. Icfai, Financial Accounting And Financial Statement Analysis Work Book, Icfai Center Hyderabad
23. Icfai, Financial Accounting And Financial Statement Analysis , Icfai Center Hyderabad
24. Jachotiya G.P., Strategic Financial Management, Vikash Publication New Delhi - 2nd Rep.2005.
25. Jain P.K. And Others, International Financial Management Rep.Ed.2001, Macmillan India Ltd. - 1st Rep.Ed.2001.
26. Kaplan Robert S., Advanced Management Accounting, Pearson Education - 3rd.Rep.-2004.
27. Khan M.Y., Financial Management, Tata Mc Graw Hill Publishing – New Delhi - 4th Ed.2004.
28. Khan M.Y. & Jain P.K., Financial Management Text And Problems, Tata Mc Graw Hill Publishing New Delhi - 11th Rep. Ed. 2003.
29. Maheshwari S.N. (Dr.), Financial Management Principles And Practice, S.Chand & Company Ltd. New Delhi - 9th Rev.Ed.2004.
30. Maheshwari S.N. (Dr.), Principles Of Management Accounting, S.Chand & Company Ltd. New Delhi - 14th Rev.Ed.2003.
31. Maheshwari S.N. (Dr.), Principles Of Management Accounting, S.Chand & Company Ltd. New Delhi - 13th Rev.Ed.2001.
32. Mantravadi Pramod M., E-Finance, Icfai Press Hyderabad - Vol-1 (2003)
33. Narayana Swamy R., Financial Accounting, Prentic Hill - 9th Pri.2004
34. Narayana Swamy R., Financial Accounting, Prentic Hill - 2nd Ed.2005
35. Panday J.M., Financial Management, Vikash Publication New Delhi - 8th Ed.- 2005.

36. Pandey I.M., Financial Management, Vikas Publishing New Delhi - 8th Ed.2004
37. Pillai R.S.N.Bagavathi, Management Accounting, S.Chand & Company Ltd. New Delhi - 2nd Rep.Ed.2003
38. Satish D., Corporate Finance, Concepts And Cases, Icfai Press Hyderabad - Vol-3 (2003)
39. Saxena V.K., Cost Accounting Text Book, S.Chand & Company Ltd. New Delhi - 6th Ed.2003.
40. Shapiro Alan C., Multinational Financial Management, Prentic Hill - 4th Ed.2002.
41. Sharan Vyuptakesh, International Financial Management, Prentic Hill - 3rd Ed.2005.
42. Sharma R.K.& Gupta Shashi K., Management Accounting Principle & Practice, Kalyani Publication New Delhi - 9th Rev.2003 & 1st Ed.1991.
43. Sharma R.K.& Gupta Shashi K., Management Accounting, Kalyani Publication New Delhi - 9th.Rev.Ed.2003.
44. Siltan Chand & Sons New Delhi, International Financial Management :An Indian Perspective, S.Chand & Company Ltd. New Delhi - 1st Ed.2001
45. Vyas R.H. & Others, Elements Of Book Keeping And Accountancy, Gujarat State Bord Gandhinagar - Part-1/ Sta-11 & 1st Ed.2004.
46. James L. Riggs 'Production & System', Planning, Analysis & Control. John Wiley & Sons, New York 4th edition., Ch. 16, P.No. 640,641
47. Dr. shrinivas Gondhalekar, Dr. Uday Salunkhe, 'Productivity Techniques' Himalaya Publishing House, Mumbai, 1st edition, 2002. Ch. 1, p. no.1
48. O.P.Khanna, 'Industrial Engineering & Management' ,Dhanpat Rai & Sons, Delhi, 1996, ch.2, p.no. 2.7
49. S.K. Srivastava, R.S. Nigam,, Bishamber Sahai, Mrityunjoy Banerjee, 'Industrial Economics',S. Chand & Co., Delhi, 1967, Ch. 17, P.no. 236
50. B.K. Bhar, 'Cost Accounting', Methods & Problems, Academic Publishers – Calcutta, 9th Edition – 1993m Ch. 24, P.No. 24.3, 24.4
51. Dr. B. Kumar, 'Industrial Engineering', Khanna Publishers, Delhi, 3rd edition – 1982, 4th edition – 1985, Ch.1. 2-3, P.No. 4,
52. Adolph Matz, Authel J. Carry & George W. Frank, 'Cost accounting' New York South Western Publishing company – 1932, P. No. 110.

53. R. Gopalkrishana & M. Sudershan, 'Material Management', Prantic Hill India Pvt. Ltd., New Delhi – 1984, P No. 249
54. Solman Fabricant, A Primer on Productivity, Prantice Hill Publishing Ltd. – 1973.
55. Robert N. Anthony and James S. Heakimian, Operations Cost Central, Homewood, Llinois, Richard D. Irwin, Inc. – 1967, P. No. 33
56. Charles T. Horngren, Cost Accounting, New Delhi, Prentice Hill – 1977, P. No. 221 & 222.

ARTICLES:

1. Management of productivity In INDIA context management, vol 24, no.5, may 1985
2. The productivity pendulum, A.C. Hurbeart, A.C. hurbeart, productivity vol 24, oct – dec1983
3. How to increse efficiency of your men, V.K. ashwani, Management Review, Vol16 1981
4. Productivity and people M. Dillon, Productivity, Oct. 1983
5. Management productivity, gupta in management accounting may 1995
6. Effective reasorce management, Y.S. kapadia in steel industry, 1982.
7. Human resources at micro level, M.C. khandelval, India accounting journal, april, 1981
8. Total Productivity measurement, productivity oct 1993
9. Trade union and productivity in economic times new delhi, july 1995
10. Concept of productivity agreement by P.N. Krishna supplement, vol 1 productivity
11. Management improvement for public sector N.K.P. salve, sail, new delhi, 1994
12. Input management for productivity V. Subramaniy SAIL publication 1992
13. Innaugral Address, the productivity NPC, new delhi, 1982
14. Organisational the productivity in Lok Udyog, Vol 8, april 1984
15. Industrial Scale, Productivity Journal, Oct. 1983

PERIODICALS:

1. The Management Account
2. AMAI Report
3. The Economic Times
4. The Financial Express
5. Yojna
6. Productivity
7. Indian Journal of Commerce
8. Indian Accounting Journal
9. Business World
10. Capital Market

WEBSITES :

1. www.amulindia.com
2. www.npcindia.org.in
3. www.nddb.org.co.in
4. www.google.com
5. www.india.com