Chapter - I

Review of Literature and Methodology
1.0 INTRODUCTION

The Sugarcane plant is thought to have originated in New Guinea over 2,000 years ago. From there it spread to the other Islands of South-East Asia, and later to India and China.¹

Structurally, there are two main stages of production within the Sugarcane Industry. The primary stage covers all the activities and process of production from the preparation of the land, planting, and tending the sugarcane plants right up to and including harvesting of the cane and its transportation to the mills or factories for processing into sugar. The secondary stage of the Industry encompasses the production of sugar, whether raw or refined, and the manufacture of its by-products. Once the sugar has been produced, it has to be marketed and distributed.²

The efficiency of milling operations, as measured by the amount of cane it takes to produce a tonne of sugar, depends on a combination of technical and economic factors. At the technical level, the size of plant and scale of operations are clearly crucial factors. If, for example, there will be substantial under Utilization of capacity. Although, technically the extra capacity could be used to expand the scale of operations, this has to be set against the increased cost of transporting cane from further a field. While, on the other hand, a series of smaller mills each drawing cane from a smaller supply area, will reduce transport costs, it will push up processing costs per unit of output and
the scale of operations will be too small to reap the benefits of economics of scale. A trade-off between processing costs and transport costs is thus one of the main determinants in the selection of the optimum size and location of sugar mills.

India is the largest producer of sugarcane as well as sugar in the world. The sugar industry is the second largest agro-based industry in India. While the new generation of 2500 tpd mills produce better results, a number of old mills are in need of modernisation. Introduction of co-generation, electronic controls is being encouraged to optimise production parameters and improve productivity.

The world production of sugar was 1731 lakh metric tonnes for the year 1997-98. Out of it 16 per cent was produced by India. Which is first and foremost, Brazil and Cuba follow.

Sugarcane has been one of the major commercial crops of India. It is mentioned in Vedas, Samhitas and Sutras (IKSU the term Sugarcane). Indians were carrying on trade in Sugar during medieval period. Later, East India Company played very important role in the promotion and development of Sugar Industry in India. So the Sugarcane is an indigenous to India which is beyond to dispute.
In addition, Indian Literature provides enough evidence of availability of sugarcane in the ancient period. Sugarcane Plant and its Juice find mention in the medicinal works of Charaka and Susruta. Sugarcane was not used for chewing alone. Charaka and Susruta notice the difference in the nature and effect of sugarcane Juice when the cane is chewed between the teeth and when it is squeezed out in a press.

In the Jatakas, there is a reference to pressing of sugarcane in machines. The occupation of cane pressing and the machine used in the process are specifically mentioned. The sugarcane press and allied machines were known by the name of mahajanta (Pkt = Skt mahayantra or Kolluka). (Compare, with Vernacular word Kolhu) The Vyavahara Bhasya refers to Sheds where such pressing machines were installed. India early evolved the technique of manufacturing sugar. The Arthasastra includes the manufacture of sugar from cane juice in a list of works called Simbanika.

From early Buddhist works, it seems that Sugarcane was a Common Crop and Sugarcane Juice a popular object of consumption. Sugarcane fields greeted the eyes of a traveller wherever he went. The importance of the crop in the economy of the country was well appreciated.

The Sugar Industry is the second largest Agro-based industry in India next to textile. Though the New Guinea, and its neighbouring Islands in the South Pacific are now widely believed to be the natural home of sugarcane, sugar was first produced in India as early as 400 BC when the process had become generally known. Noel Deer mentions that the earliest datable
mention of sugarcane is 325 B C when it is recorded by Nearchus, the Greek recorder in Western India. In his words, "The production of sugar and syrup was known in India perhaps a few centuries before the Christian and certainly by 400 A D."

The Sugar as a sweetening agent was known to India since the times of Atharva - Veda the sacred book of Hindus which is said to be of the origin between 5000 and 1000 B C. The reference is relating to the Sugarcane which was used for making the Jaggery, a type of sugar. The references are also found regarding the sugarcane and sugar in the various other literature relating to the religion in this country.

Geographically in Indian subcontinent entirely lies to the South of Equator and hence the climatic conditions in this country are suitable for sugarcane cultivation in nearly all parts of the country. Efforts to manufacture sugar from sugarcane on commercial lines were made only at the beginning of the 20th century and the industry flourished in India during this century only.

Noel Deer, in his 'History of sugar' has brought out a very interesting story about the disease which was said to be very mysterious and which ruined the sugarcane crop almost throughout the world. The disease was so deadly that the crop was almost on the verge of extinction. It was thought that the days of sugarcane cultivation were to come to an end. A batch of scientists who undertook the tour of the world to find out if any variety of cane which had not suffered, was available in Saran district in Bihar State in India. This was to
their surprise that not a stalk of the Sugarcane was attacked by the disease that was found to be deadly elsewhere\textsuperscript{21}. The scientific multiplication and breeding of the sugarcane undertaken by those scientists from the variety which they found in Saran district, resulted in evolving many new varieties of sugarcane. Bihar in India therefore can be said as the progenitor of hundreds of sugarcane varieties which are now grown in the world. Then at the world collection centre, Cannanore (Kerala) which supports the sugarcane breeding work at sugarcane Breeding Institute at Coimbatore. Various other sugarcane research institutes including Regional Sugarcane Research Centre at Karnal in Haryana State and Indian Institute of Sugarcane Research, Lucknow have gone a long way in maximising production of sugarcane in this country through their research and development work.

Lord Curzon, the Viceroy of India established the Sugarcane Research Centre for carrying out the research on breeding, varietal, manural and cultural at Pusa, in Bihar in 1905\textsuperscript{22}. This is the biggest centre for sugarcane research in the world today with many subcentres in the country doing research on sugarcane for evolving varieties suitable to different parts of the country and also for evolving modern techniques for maximisation of sugarcane production suitable for different parts of the country. The established in 1912 which has done pioneering work in evolving exotic, disease resistant varieties suitable for whole India including Maharashtra state. The varieties evolved at this research institute are known as "Co-varieties". This institution has
developed the international reputation which can be seen from the fact that many varieties evolved at this station are successfully cultivated in 17 other countries large number of parent varieties of sugarcane are maintained

1.1. SELECTED REVIEW OF LITERATURE

Industrial Sector in India has been widely researched. Most of the industries especially the agro-based industries have received much attention of the researchers. Sugar Industry is a commercially dominant one among them. And, it has been subjected to repeated research though their aspects of study were changing from time to time, the problems of the sugar industry were manyfold such as problems of finance, availability of raw material, problems relating to efficiency, problems relating to labour and life.

Studies by Committees and Commissions^23

In the past several commissions and committees were setup to study one or more aspects of the sugar industry by the Government of India and some State Governments.

For the first time, the problems of the Indian Sugar Industry were examined by the Tariff Board in 1931. Were government referred to it the case for granting protection to the Industry. In 1937, the Tariff Board was asked to enquire into the quantum of protection to be given to the sugar industry during the period from 1st April, 1938 to 31st March, 1946. In 1947, the Tariff Board
was requested to make a summary investigation into the claim of the sugar industry for further protection.

Further enquiry was conducted in 1948, as a result of which the Tariff Board recommended, inter alia, the continuance of the then existing protection for a further period of two years ending 31st March, 1951. In July 1949, the Government of India asked the Tariff Board to conduct a fuller enquiry into the sugar industry's claim for protection after 31st March, 1950. Before the protection granted to the sugar Industry was withdrawn, the Government of India, appointed in July 1949, a Technical Sugarcane Committee under the Chairmanship of T. Vijayaraghavacharya to enquire into the cost of production of sugarcane, to review the progress of cane research and development and to suggest ways and means for achieving quicker results in increasing the yield of sugarcane per acre and the sugar content of cane with a view of reducing the cost of sugar.

In 1950, a sugar enquiry committee (Ganga Nath Committee) was appointed by the Government of India to enquire into such aspects of the sugar crisis of 1949 which were not fully covered by the Tariff Board enquiry of 1949. An Expert Committee was appointed under the Chairmanship of B V Narayana Swamy Naidu to prepare schedules for determining the cost of manufacture of Sugar. Another Expert Committee was constituted in 1955 under the Chairmanship of P A. Gopala Krishnan which suggested certain
amendments to the cost schedules, prepared by the Expert Committee of 1951 and recommended that the amended all-India schedule might be used until such time as regional schedules were ready. The Tariff Commission was asked by the Government of India in 1958 for the first time to enquire into the cost structure of and fair price payable to the Sugar Industry. In October 1960 the Tariff Commission was again required to go into the question of revision of the price linking formula for sharing sugar price between sugar factories and cane growers. In June 1963, the Government of India appointed a committee on Rehabilitation and Modernisation of Sugar Factories in India under the Chairmanship of S.N. Gundu Rao to examine the problems of the old and uneconomic units in the Sugar Industry. The Sugar Enquiry Commission (known as the Sen Commission) was set up in 1964 and it submitted its report in 1965. Its term of reference were: (a) The determination of the price, and the system of distribution of sugar, and (b) the policy regarding licensing of new sugar factories and the expansion of existing sugar factories.

In 1968, the Government requested the Tariff Commission to conduct a fresh examination of the cost structure for Sugar Industry and the preparation of new cost schedules to determine the fair price payable to the Industry. The Commission submitted its report in 1969. For the third time the Tariff Commission was requested in 1972 to make a fresh study of the problem and its report was submitted in 1973.

The Sugar Industry Enquiry Commission (known as Bhargava Commission) was set up in 1970 to study the working of the sugar industry in the context of the demand for nationalisation of sugar undertakings in certain
areas. Its terms of reference were (1) to study the working of the Sugar Industry in all its aspects, with particular reference to its performance during the last ten years and the conditions of the plant and machinery in different sugar mills, (2) to identify the inadequacies in the performance of the sugar industry and the causes thereof, (3) to study in detail the causes for the existence of a large number of sick sugar mills, (4) to study the progress and the working of sugar mills in the Co-operative sector, (5) to make suggestions in the light of such studies, for a rational and efficient organisation of the Sugar Industry in different parts of the country, in order to improve its working and performance and suggest measures for the solving the problem of sick sugar mills, in the context of the demand for nationalisation of the Sugar Industry, (6) to study the relationship between sugarcane suppliers and the owners of the sugar mills, with particular reference to the supply of cane and the payment of cane price and to make suggestions for improvement in the present laws and practices in this regard, (7) to study the problem of large fluctuations in sugar cane production and its processing into gur, Khandasari and sugar and to make suggestions for securing stable conditions with a view to achieving a balanced development in these fields, and (8) in the light of the foregoing studies, to suggest a blueprint for the development of the sugar and allied industries over a period of next ten to fifteen years. The term of reference were very wide and comprehensive and covered, for the first time, all the important aspects of the Sugar Industry. The Commission submitted its report in 1974.

In 1975, a Committee on economic viability of new sugar factories under the Chairmanship of S.V. Sampath was set up to consider the relief which
could be given to the newly licensed sugar factories in the context of a steep rise in the costs, particularly of plant and machinery during the last two years.

Except the Sugar Industry Enquiry Commission Report 1974, all other studies were partial in nature pertaining to certain specified aspects of the Sugar Industry.

Reserve Bank of India (1961)\textsuperscript{24} conducted a study at the national level on the **Profits in relation to the assets of the companies in the sugar Industry** during the period 1955-59. This study revealed that the profitability of the companies increases with the size of assets.

N R Inamdar (1965)\textsuperscript{25} in his study, *Government and Co-operative Sugar Factories*, brought out the potential and practical difficulties in the way of development of Sugar Industry and the policy of government towards the Industry. The role of State Cooperative Bank and Industrial Finance Cooperatives, and the efforts of the State Government for the development of the Co-operative Sugar Factories have been discussed in this study.

G S Kamath (1965)\textsuperscript{26} has examined the **Management of Co-operative Enterprises with special reference to Co-operatives in Maharashtra**. He has studied the problems relating to finance, raw-material, personal of Co-operative Sugar Factories. He concluded that if co-operative sugar factories are managed properly, they can play important role in rural development.

A Gosh (1965)\textsuperscript{27} made a sophisticated analysis on Cement Industry. He studied the growth of the Industry and felt that Inter-regional exchange becomes more prominent and raises many problems for which long term and short term analysis becomes very useful to avoid wastes and bottlenecks.
S.L. Shirodkar (1967)\textsuperscript{28}, in his study, \textit{The Co-operative movement in Kolhapur district} he found that the Co-operative Sugar Factories have provided stability to the agricultural income by reasonable and guaranteed price, which has also regulated an increase in sugar cane production. These Co-operative Sugar Factories provide various inputs to the agriculturists. He suggested that the Co-operative Sugar Factories should be established in backward areas so that the backward area can get a chance of its all-round development since the cooperative sugar factories play the role of agencies for rural development. In this work, the impact of Co-operative Sugar Factories on agriculture of the Kolhapur district has been analysed by the author. The problems relating to organisation, finance, raw material availability have not been dealt with.

\textbf{N.G. Bapat (1973)}\textsuperscript{29} studied the economic development of Ahmednagar district for a period of 1880 to 1960. He produced his work in 1968. He has given the brief history of development of Sugar Industry in Ahmednagar district. The role of Sugar Industry in the development of the rural areas and the problems of the sugar factories have not been dealt by him.

\textbf{Mrs. Vimala Raghawachari (1973)}\textsuperscript{30} worked on \textit{The State and the Indian Sugar Industry} she has studied the role of the state in the development of Sugar Industry in India from 1956 to 1970. The study relates to the policy of the state which regard to licensing and location of the sugar factories, financing the sugar industry and controls of the state on sugar industry. The prospects of the sugar insutry have been discussed by the author. The importance of Co-operative sugar factories has also been studied.
A seminar volume titled "Management of Sugar Industry" 1975 published by Management Development Institute covered the areas like Sugarcane development and problems of Sugar Industry.

Management Development Institute (1975) has published a seminar volume titled "Management of Sugar Industry". The volume covered the areas like sugarcane development and problems of Sugar Industry.

V. Malayadri (1975) in his work on 'Socio economic impact of Sugar Factories' has brought out that the 'Sense of consciousness among people at all the levels has been effected due to Co-operative Sugar factories. He has considered the impact of cooperative factories on the pattern of Sugar Cane cultivation. The effect of the sugar factory on Irrigation facilities, mobilisation of rural savings, employment of rural area, labour welfare and growth of rural area has also been studied by Shri Malayadri. The reasons of sickness and the poor performance of many of the factories has, however, not been studied.

In 1975 the State Government of Maharashtra has appointed a Committee under the chairmanship of Shri Balasaheb Vikhe Patil a M P and the Veteran Cooperator from Maharashtra. This Committee also studied the problems of inadequate supply of sugarcane to sugar factories and made certain recommendations to the state government.

The Government of India appointed a Committee to study the problems relating to inadequate supply of sugarcane to sugar factories in Maharashtra.
in 1975 under the Chairmanship of Shri S V Sampath. The Committee recommended measures for cane development, proper zoning for sugarcane area and some directives in assuring licenses to new units.

N.S Jain (1976) selected Yeshwant Shankari Sakhar Karkhana Ltd, Theur, Tahuka Haveli from Pune district from Maharashtra State and studied, "Regional Economic Planning in a Sugar Factory Area". He concluded with the findings that the area has not been developed with due consideration of the requirements of the modern technique of regional planning and the needs of the region. He tried to identify the functions which the local planning agencies should reform and the functions which should be assigned to organisation like a cooperative sugar factory in the process of regional planning. He studied the impact of cooperative sugar factory on irrigation facilities, agricultural development, employment in rural area at the micro level.

Made and Chen (1977) have covered only technical aspects on Sugar Cane and Sugar and their books "Cane Sugar Hand book".

SD Tupe (1980) In his study, 'Impact of Sugar Factories on the rural Economy - A case study' has studied in detail the impact of Sanjuvani Cooperative Sugar Factory in Ahmednagar district on agriculture, agriculturists, on the dives on agricultural labour, economic conditions of factory workers and spread effects of the sugar factory and overall economic change in rural area. He concluded with the findings that sugarcane being the cash crop, area under sugarcane has increased, the area under irrigation has
increased and likewise the change in the cropping pattern and methods of farming have changed. It is argued that the development of agriculture depends on major agro-based industries. The real income of the farmers has increased but the real income of the agricultural labourers has been decreased. It is concluded by the author that sugar factory in rural area has worked as a growth centre.

G Subramanyam (1982)\textsuperscript{39} conducted a study on the regional Efficiency of the Sugar Industry in India is studied in the selected regions Viz. Uttar Pradesh, Bihar, Tamil Nadu, Maharashtra and Andhra Pradesh. His findings indicated that the States Maharashtra, Tamil Nadu and Andhra Pradesh has shown relatively efficiency compared to Uttar Pradesh and Bihar.

In 1980 the Government of Maharashtra also appointed a committee under the chairmanship of Shri Gulabarao Patil, the veteran cooperator, to study the problems of sickness of cooperative sugar factories in Maharashtra. This Committee submitted its report on 1983 and made various recommendations to the Government to overcome the problem of sickness of the cooperative sugar factories in Maharashtra. The Committee had recommended that the State Government should give financial help to sick sugar factories in the form of exemption in the cane purchase tax and to take effective steps for cane development. The Committee identified the sick cooperative sugar factories from Maharashtra and the reasons of the sickness and made the recommendations to solve the problems of these factories\textsuperscript{40}.

The Committee which was appointed to make recommendation for the formulation of Zones for drawal of Sugarcane by sugar factories in Maharashtra in 1981, submitted its report in 1983. Besides, recommending
specific zones for the factories in the state, the committee recommended that sugar factories should undertake effective steps for sugarcane development to which State Government should provide necessary backing.

Badra Alam Iqbal (1985) has examined the Sugar Industry in Crisis study the major constraints in the way of growth and development, and suggests suitable measures for attaining, stability in Sugar Industry. He concluded with the remark that the sugar factories in India are financially very weak, due to lack of co-ordination between research and development.

Jaganatha Rao, E. (1985) has examined the performance of Sugar Industry in Andhra Pradesh and causes for the below average performance of certain factories in the state.

Balasubramanian (1985) in his article stated that sickness in Sugar Industry and causes for sickness such as Government Policies regarding fixation of Cane price, Inadequate availability of sugarcane mounting overheads on debt, service, obsolescence of technology and machinery increased overhead on labour and poor management capacity.

In Sastry's (1986) book "The Story of Sugar" the aspects like sugar, Cane Sugar Industry and cane cultivation, cane culture in other countries, manufacture of Sugar, production of other sweetening agents from Cane, Economics of Sugar Industry etc. are covered.
"Modernisation of Indian Sugar Industry" was a seminar volume and edited by Gehlawat's 1988. This volume deals with the areas of modernisation aspects and technical aspects of the Sugar Industry.


Srinivasan, S. (1988) tried to analyse the cost of Sugar Production with reference to cost of cane and profitability in his work.

S. Uma et al., (1988) paper "Operational Efficiency of Co-operative Spinning Mills in Tamil Nadu" discussed the profitability of a concern can be measured by two ways. One is by evaluating the financial performance and the other is by evaluating the operational performance. These two measures are put into use by calculating relevant ratios. In this paper of the evaluation of the operational performance has been attempted with the help of profit and loss Account of the Mills. The analysis of the operational efficiency of spinning mills reveals the dismal picture of the performance of the spinning mills in Co-operative sector in Tamil Nadu.

Jaganatham, A examined in his paper about the regulation of cane supply to the factory, harvesting and transportation of cane from field. He emphasizes the need of cane crushed within 24 hours after harvesting for better recovery and also stated different methods of transportation of cane.
Oomen (1989) deals in his book "Cane Sugar Factory Operations and Management" with the aspects like process controls, modern milling of Sugarcane steam utilisation and hints for good management and other technical studies.

Chakravarthy's (1989) in his keynote address presented the history of Sugarcane in India and stressed the need for modernisation of Sugar manufacturing process.


P. Jaganadha Rao (1990) carried out a study to evaluate A study on the operational Efficiency of the Nizam Sugar Factory. He revealed that the major factories responsible for the poor financial performance are low capacity utilisation in sufficient sugar recovery, and low operational efficiency.

Rangaswami, G. (1990) analysed the problems of cane growers and diversification of large percentage of sugarcane to the 'Khandasari and 'Gur' manufacturing units due to unfair price fixed by the central and State Governments. He also examined the issues like inadequate financial investment for older factories to take up modernisation and inadequate supply of cane, resulting in less number of crushing days in a year.
R S Deshpande, et al, (1992) in their investigation on State Co-operative Interface: A study of Sugar Co-operative in Maharashtra attempted an analysis of the State Co-operative interactions in Sugar Industries in Maharashtra. They opine that the Sugar Co-operatives in Maharashtra are rooted in the political structure of the state. According to them among, the various sources of political process, the Sugar Co-operatives emerged as the strongest force in directing the political process.

P R Sivasankar et al, (1998) paper, Is private sector dominating the sugar industry in Andhra Pradesh? discussed the performance of Private Sector Sugar Industry in Andhra Pradesh. He enlightened the fact that though the Co-operative sector grow significantly in terms of number of factories, the Private Sector has shown a better performance and dominance in terms of cane crushed, capacity utilisation, production of sugar and its recovery rate.

1.2. STATEMENT OF THE PROBLEM

The Sugar Industry has a greater significance in agriculture and Industrial shapers besides being a contributory factory to the rural people in several dimensions in India. Sugar Industry is one of the largest Industries with a weightage of 3.5 percent of the general Index of Industrial Production and about 10 percent in the consumer non-durable goods index.

The number of sugar factories in India is increased from 29 in 1930 to 420 in 1998. There are 250 factories in Co-operative sector, 120 in private...
sector and 50 in public sector in 1998. The Industry caters to more than 3.79 million sugarcane growers who receive about Rs 22,000 crores annually for the supply of cane. The annual contribution to the central and state exchequer of the industry is estimated at over Rs 600 crores. It provides employment to over 5 35 lakh workers in addition to generating sizeable employment in ancillary industries.

Sugar Industry requires low investment, when compared with other large industrial units. In 1983, the project cost on an average was Rs 9 crores per factory of 1,250 TCD (Tonnes of Cane Crushed Per Day). At present, it is estimated at Rs 50 crores per factory of 2,500 TCD.

There are so many problems facing by the Sugar Industry in India in general. Firstly, Sugar Industries Crushing capacity is low. Sugarcane is not utilised in time. Secondly, high yielding Sugarcane seeds are not supplied to farmers in time. Thirdly, old technology and absolute machinery are still used. Fourthly, under utilisation of capacity. Fifth, Incentive system as far as sugarcane growers are concerned is not effective. Sixth, In particular, Political Interference in Co-operative sectors is more. Seventh, the efficiency of administration, machinery, labourers are not satisfactory. Eighth, The Sugar Industry, Inspite of its lower Investment, facing a crisis due to several factors like raw material shortages, low capacity utilisation and poor financial management practices. Financial Management which has a greater role in toning up the overall management of an enterprise has not been professionalised in Sugar Industry. As a result the Sugar Industry is facing the problems of low profitability and low rate of return on capital invested. This
results in its inability to raise sufficient funds to meet its immediate obligations as well as to fulfil the purpose of the expansion and modernisation of the Industry. The net effect of all these deficiencies is the decrease in the utilisation capacity and value of share in the market. Besides it, operational ability at farm and factory level is to be observed very much, for improving productivity and production.

1.3. NEED FOR THE STUDY

Indian Sugar Industry is affected by a variety of problems such as inadequate utilisation of capacity, lack of finance for rehabilitation and modernisation, insufficient working capital, shortage of raw materials, high production cost and low profitability. During the last few decades several sugar factories were closed in India.

This can be attributed to lack of proper financial management. In view of the 1991 year liberalisation policy adopted by the Government of India, efficient financial management is indispensable for the modernisation and expansion of Sugar Industry to meet the world competition. There are many studies on Sugar Industry. Nevertheless, a comprehensive empirical study covering all the three sectors of Andhra Pradesh by an independent researcher will also serve the purpose of providing feedback to the organisations on their performance. Keeping this idea in view, the key factor of operational efficiency was missed in their studies which is designed in this study.
It is found that very few studies were conducted on the national and state level. As the science and technology is in transition, the factors of production are also changing very fastly. The degree of operational efficiency is in changing from time to time. The following select and specific objectives are taken for examining the efficiency in this industry.

1.4 OBJECTIVES

The study has the following objectives:

1. To study the role played by private as well as Co-operative Sectors in the development of sugar industry in (Chittoor District in particular) and Andhra Pradesh in general.

2. To study and analyse the administrative policy of sugar Industry.

3. To assess cost and benefit of the sugar industry.

4. To study and analyse the factors responsible for variations in operational efficiency among them, and

5. In the light of the above, to suggest some important measures/policies to enhance operational efficiency.

1.5 HYPOTHESES

The study has the following specific hypothesis:

1. Operational efficiency in respect of private sugar factories is better than that of Co-operative sugar factories.

2. Efficient management determines operational efficiency.
The location of the factory, current technology have an impact on operational efficiency, and Low financial performance because of low operational efficiency has adverse impact on farmers

1.6 METHODOLOGY

The study relies mainly on Secondary data. The study period for this research work covers from 1991 to 1998. The required data for the study is collected from various sources. Both official and Non-official (i.e., AP State Federation of Co-operative Sugar Industries Limited, Head Office of the Nizam Sugar Factories and office of Directorate of Sugar and Commissioner of Sugarcane at Hyderabad, Kothari Sugars and Chemical Limited at Madras and Vaikunth Mehta National Co-operative Management at Pune). Relevant Statistical information on many aspects Sugar Industry is collected from official records and publications of all governmental and Non-governmental Organisations associated with working of this Industry.

Thus, the information collected directly from the factory was dovetailed with the information collected from Private, government and Semi-government agencies connected with the Sugar Industry.

1.6.0 Selection of District

Chittoor being a part of Rayalaseema is major producer of sugarcane in Andhra Pradesh. It produced nearly 19% of total production in Andhra Pradesh in 1996-97. So it ranks second in production of sugarcane, production in the State after East West Godavari.

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Total area where Sugarcane is grown in this district was 49,178
Hectares in 1997-98. Which constitutes 28% of total area of sugarcane
cultivated in Andhra Pradesh. As such this district is purposively selected for
the present study.

1.6.1 Selection of Sugar factories for Study

For a in depth comparative study of operational efficiency and other
aspects of Sugar Industry in Chittoor District, two Sugar Units one from Co-
operative unit and one from private unit are selected on the basis of their size
and crushing capacity per day, recovery rate and capacity utilisation.

1.6.2 Concepts used

So as to study the operational efficiency and other aspects relating to it
of sugar factories, the some of the important tools to be used are

a) Operational Efficiency

Ratio of the actual Industry efficiency compared with the operational
efficiency of an Ideally designed and managed system using the same
Industrial (technical) methods and facilities. Low Operation efficiency
Indicated management or system design problems or both.

b) Efficiency

Ratio of useful work done by a machine to the actual work done on it is
known as efficiency.
The efficiency = useful work/total work = output / Input

c) **Capacity utilisation**  This is the ratio between the sugar cane crushed during the season to the installed crushing capacity expressed in terms of percentage

d) **Recovery Percentage of Sugar**  This is the ratio of the total quality of Sugar produced and the total quantity sugarcane crushed expressed in terms of percentage, in a sugar factory

e) **Paid-up Capital/Output ratio**  This is an important indicator of efficiency if this ratio declines year after year that indicates improving performance

f) **Profitability**

g) **By-productivity utilisation**

h) **Sugar Extraction ratio**  This is ratio of Sugar extracted from the total sugar content in the sugarcane express in percentage

1. Reduced Mill extraction
2. Reduced over all extraction

i) **Cost of production per quintal of sugar**

j) **Total sugar losses percentage cane**

k) **Crushing rate for Gross season day**  This is calculated by taking into consideration the gross season (days) of each year and the total cane crushed during the season

l) **Average crushing rate for 24 hours operation** . This is expressed as a percentage of daily cane crushing capacity of the factory

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1.7 Tools for analysis

Linear/Compound growth rates are calculated to know the trend value of area under sugarcane cultivation, production of sugarcane, sugarcane crushed and production of sugar over the study period. The linear growth rates are calculated from the following regression equation

\[ Y = a + bt \]

Where \( Y \) is the indexed trend variable, \( 'a' \) is the regression constant, \( 'b' \) is the linear growth rate in percentage and \( 't' \) is the time period.

The compound growth rates is given by \((\text{antilog } b - 1) \times 100\) where \( 'b' \) is taken from exponential function

\[ Y = ab^t \]

The significance of both linear and compound growth rates are tested by using student's 't' test.

Multiple regression analysis was used to indentify the relative importance of different determinants of cost of sugar per quintal and their effect on the cost of production and consequently on the profitability of the Units.

The two way Analysis of variance is used to know whether two is any significant difference between two sectors in the matters of members of days worked, employment generated, production of sugar and by products.

Besides, the simple tools like percentages, averages, mean and coefficient of variation were used at appropriate places.
1.8 CHAPTERISATION

The study has been divided into seven chapters. The first chapter contains the review of literature and methodology. The second chapter presents problems and prospects of the sugar industry in India. The third chapter introduces the structure and growth of the sugar industry in Andhra Pradesh. The fourth chapter deals with the development of the sugar industry in the study area. The fifth chapter explains the organisation and administration of the sugar industry. The sixth chapter analyses the operational efficiency of the sugar industry in the study area. The last chapter focusses on summary of findings.
REFERENCE

1 The introduction of the sugarcane plant to the North-American mainland cane with the occupation of Florida by the British. At about the same time the French brought it to Louisiana from where it spread to the other American colonies. By the middle of the eighteenth century sugar had replaced tobacco as the leading export from the New World.

2 GEORGE C. ABBOTT, 1990

Organization and structure of production, p 61

3 These issues are more fully discussed in M A Trube and R L W Alpine, *Economics of Scale in Sugarcane Manufacturing in Less Developed Countries*, Discussion paper No 2, David Livingstone Institute of Overseas Development Studies, University of Strathclyde, Glasgow, 1982, and Gavin Chadwick 'Determining the optimum locations and sizes of Sugarcane Processing Plants', in *Sugar: AZUCAR* November 1983, pp 31-5

4 Government of India *Eighth five year plan*, 1992-97, volume II p 120

5 Government of India *Hand Book of Indian Agriculture "Sugarcane and Sugar"*, P 391

6 Asvalayana Grhya Sutra, 11, 7, Kausika Sutra, 23

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