“AN ANALYTICAL STUDY OF BY-PRODUCTS OF SUGAR INDUSTRY WITH REFERENCE TO KOLHAPUR DISTRICT (MAHASHTRA).”

A thesis submitted to

Tilak Maharashtra Vidyapeeth, Pune

For the Degree of Doctor of Philosophy (Ph. D.)

IN

MANAMAGEMENT

Under the faculty of Management

By

DAFALE BAJIRAV YASHVANT

Under the Guidance of

Dr. A. M. GURAV

January, 2015

CERTIFICATE

This is to certify that theses entitled **“An Analytical Study of By-products of Sugar Industry With Reference to Kolhapur District.(Maharashtra)”** Which is being submitted herewith for the award of the Degree of Vidyavachaspati (Ph.D.) in **Management** of Tilak Maharashtra Vidyapeeth, Pune is the result of original research work completed by **Shri. Bajirav Yashvant Dafale.** under my supervision and guidance. To the best of my knowledge and belief the work incorporated in this thesis has not formed the basis for the award of any Degree or similar title of this or any other University or examining body upon him.

Research Guide

Place : **(Dr. A. M. Gurav)**

Date :

DECLARATION

I hear by declare that the thesis entitled **“An Analytical Study of By-products of Sugar Industry With Reference to Kolhapur District. (Maharashtra)”** Completed and written by me has not previously formed the basis for the award of any degree or other similar title upon me of this or any other Vidyapeeth or examining body.

Dafale Bajirav Yashvant

Research Student

Place :

Date :

ACKNOWLEDGEMENT

It gives me great pleasure to submitted my Ph. D. Thesis entitled **"An Analytical Study of By-products of Sugar Industry With Reference to Kolhapur District.(Maharashtra)"** At Tikal Maharashtra University Pune. In pursuing my work I had great pleasure to associate with and privileged to work under the able guidance of Dr. A. M. Gurav Associate Professor, Department of Commerce and Management, Shivaji University, Kolhapur. This work is completed under his keen supervision. I have benefited with his valuable suggestions and continuous encouragement, without which it would not be possible to me to accomplish my endeavour. I take this opportunity to acknowledge my sincere feelings of gratitude and respect for his valuable help throughout this work. Words are inadequate to express my feelings for his stimulating suggestions and scholarly guidance.

It is my paramount duty to express my gratitude to words all those who are the source of inspiration and guidance to me. If we want to achieve something in life we must get the cooperation of many people. So I am thankful to all who have extended their co-operation directly or indirectly.

My special thanks to Hon. President Principle Abaykumar Salunkhe, Secretary Sou. Principal Subangi Gawade, Joint Secretary and Principal Dr. Ashok Karande Shri. Swmi Vevekand Shikshan Sanstha Kolhapur. My special thanks to the Principal, Dr. U. R. Manepatil, Akati Ramagond Patil Kany Mahavidylay, Ichalkranji. My successful completion of the thesis is due to their inspiration and co-operation. Hence I prefer to remain grateful to all of them forever.

I owe my sense of gratitude to the Hon. Chairman and Managing Director of Datta, Kumbhi, Gadingalj, Warana and Rajaram sugar factory and their all by-products units in charge and other administrative staff. I am also thankful to librarian Mr. Pathan Sir of Vasantdada Sugar Institute, Pune.

I am also thankful to Shri. Prakash Patil, Chief chemist of Kumbhi sugar factory, my best friend Managing Director, Shri Shankar Swami Ajinkaytara Shakari Textile Mill Satara, Shri. Vikramshigh Shinde of Bharati Sugar, Assit. Professor Amol Sonawale he his more help to in my research work to data feeding and analysis of data, Prof. T. B. Adsul and Assit. Prof. V. R. Suryawanshi help me to hypothesis

testing, Research student Shri Parshuram Devele sir, Assit. Professor P. Y. Salunkhe. Assit. Profesor Laxama Dodamani for all their extended well wishes for my success.

I would like to remain grateful forever to my dear father Shri.Yashvant Bhau Dafale and my mother late Sou. Akkatai Yashvant Dafale who inspired me to continue my education in spite of the adverse condition of poverty and hard work. The blessings of my teachers are always with me. How can I forget the co-operation given by my brother Sambhaji and mother in law Akkatai, brothers in laws Amit and Amar. I am thankful to all the members of my family consisting of my dear wife Sou. Megha Dafale, my son Tajes and Suyash. All these members played their roles ably and heartily.

I am also grateful to all those who have directly or indirectly extended their hearty co-operation in my march towards completion of my thesis for Ph.D. though it was not possible to include their names.

Shri. Bajirav Yeashvant Dafale

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LIST OF ABBREVIATIONS

1. TCD=Tone Crushing Per Day Capacity
2. Datta = Shri. Datta Sahakari Sakhar Karkhana Ltd. Datanagar, Taluka : Shirol.
3. Kumbhi = Kumbhi Kasari sahakari Sakhar Karkhana Ltd. Kuditre Taluka : Karveer.
4. Gadhinglaj = Appasaheb Nalwade Gadhinglaj Taluka: Sahakari Sakhar Karkhana Ltd. Harli, Taluka : Gadhinglaj.
5. Warana = Shree Tayasaheb Kore Warana Sahakari Sakhar Karkhana Ltd. Warananagar, Taluka: Panhala.
6. Rajaram = Shri. Chh. Rajaram sahakari Sakhar Karkhana Ltd. Kasaba-Bawada, Taluka : Karveer.
7. N. A. = Not Available
8. Av., Avg. = Average
9. S.D. = Standard Deviation
10. C. V. = Co-efficient of Variation
11. % = Percentage
12. Qty. Quantity
13. X = Mean or Average
14. M. T. = Metric Tone
15. Rs. = Rupees
16. V. S. I. = Vasantadada Sugar Institute
17. e. g. = For example
18. C. A. = Current Assets
19. C. L. = Current Liabilities
20. T. P. D. = Tones per day
21. CERC = Central Electricity Regulatory Commissions.
22. SERC = State Electricity Regulatory commissions.
23. MNRE = Ministry of New and Renewable Energy.
24. EA = Electricity Act.
25. STAI = The Sugar Technologists Association of India.

26. IMFL = Indian made Foreign Liquor.
27. CL = Country Liquor
28. COS = Commissioner of Sugar
29. BOOT = Build –Own –Operate – Transfer
30. AIDA=All India Distillery Association
31. EBP=ethanol blending programme(petrol)
32. POMC= Petroleum and Oil Marketing Companies
33. NOC= no-objection certificate

CHAPTER-I

THE ORGANIZATIONAL PROFILE

Chapter Design

This chapter explains a brief profile of the sample co-operative sugar factory and its organizational history and there by-products departments and sugar factory production performance.

1.1 Introduction:

Indian sugar industry is an important and big share in agriculture processing industry. It has very strong impact on our rural development and it provides successful rural development and it provides successful rural economy. In our country nearly 50 million farmers and equivalent labors are engaged in sugarcane cultivation. The Indian sugar industry currently has about 535 operational sugar mills, sugar output 251 lakh tons in the year of 2012-13.

The sugarcane is grown in 21 various States of India on 50 lakh hectare area. Out of total sugarcane production, 60-65% is utilized for production of white sugar and remaining is used for manufacture for gur, kandasari, seed and chewing purpose. Maharashtra, Uttar Pradesh, Tamil Nadu, Karnataka and Gujarat are the major sugar producer of the country with production share of 85%. There are wide fluctuations in production of sugarcane due to sugar cycle.

In other countries sugar is a byproduct, but in India sugar is the main product produced by sugar mills. India is producing large quantity of sugar because of our own needs, but now a days only sugar production is not profitable for sugar mills. Sugar industry needs to increase their capacity in by-products like alcohol, chemicals, paper, co-generation and ethanol etc.

1.2 The Study Area:

The present study is, "An Analytical Study of By-products of Sugar Industry With Reference To Kolhapur District.(Maharashtra)"

In order to understand the concepts of the study, It is imperative area of study which is Kolhapur District in Maharashtra and in India. A brief on the sugar industry, and its by-products, importance of study area is given below.

Sugarcane is grown widely in India. The sugar industry is the largest among the processing industries next only to cotton textile. There are total 535 operating

sugar factories in India in which 235 are co-operative sugar factories. Total sugar production as 251 lakh metric tons is in the year 2012-13. Such industries create more employment opportunities in the rural part of the country, where the sugar factories are usually located. Such industries improve the economic status of thousands of sugarcane growers and the overall financial viability of the sugar factories, thereby making the working of sugar factories much more successful.

With the gradual decline in price of sugar in India and increase in cost of production of sugar, the working of many sugar factories is not comfortable. This is therefore the right time to launch some by-product industry to make the sugar industry financially viable. Sugar industry may works as raw material supplier to many by-product industries. In India there are number of molasses based distillery units near about 400.

These distillery produced alcohol and ethanol can be used as fuel. Bagasse is used for power generation as well as paper production. The total ethanol producers are near about 143 projects and sugar mills having co-generation project 211. To make sugar industry profitable the industry is now planning to have various other industries which are oriented by the co-product of sugar industry.

Maharashtra is one of the major sugars producing State in the country that contributes are 30-35% of the total nation's sugar production. In the year of 2012-13 the total sugar production of State was 79.91 lakh tones. In Maharashtra 2012-2013 sugar crushing season 118 co-operative sugar factories and 51 private sugar factories has crushed the sugarcane. In Maharashtra By-products of sugar industry is also important. In Maharashtra total Distilleries Affiliated to Co-operative sugar industry for the year of 2011-12 was 67. These plants total Rectified Sprite production 4416.17lakh litters. In that year Ethanol production plant 33 and ethanol produced 608.18 lakh liters. Also Extra Neutral Alcohol production plant was 40 and produced ENA 728.26 lakh liter. Recently in Maharashtra co-generation project 21, total units produced power 417 M.W.

Kolhapur is one of the Historical Capital of Maharashtra. It is situated in the Southwest corner of Maharashtra in India. Kolhapur serves as the headquarters of the Kolhapur District. It is the 6th most industrialized city in Maharashtra. It's sugarcane industry contributes to over 5% of the sugarcane production in the country and account to a significant share of sugar factory and its by-products industries i.e. distillery, ethanol, co-generation plants and composting plants etc.

Table No.1.1 Number of Sugar Factories and By-Product Industries in Kolhapur District:-

Particulars	Co-operative	Private
Sugar Factories	17	04
Distillery Project	08	01
Ethanol Project	02	01
ENA Project	04	-
Co-generation	03	-

Source: Field work

The total numbers of sugar factories in Kolhapur District are 21 out of which 17 sugar factories are in co-operative sector researcher is selected 5 co-operative factories. It is also considered that of geographical location, area, size, age, crushing capacity, nature of production of by-products etc. The following co-operative sugar factories selected for research study.

1. **East:** Shri. Datta Sahakari Sakhar Karkhana Ltd. Datanagar, Taluka : Shirol.
2. **West:** Kumbhi Kasari sahakari Sakhar Karkhana Ltd. Kuditre Taluka : Karveer.
3. **South:** Appasaheb Nalwade Gadhinglaj Taluka: Sahakari Sakhar Karkhana Ltd. Harli, Taluka : Gadhingalaj.
4. **North:** Shree Tayasaheb Kore Warana Sahakari Sakhar Karkhana Ltd. Warananagar, Taluka: Panhala.
5. **Central:** Shri. Chh. Rajaram sahakari Sakhar Karkhana Ltd. Kasaba-Bawada, Taluka : Karveer.

1.3 Name and Address: Shri. Datta Sahakari Sak Ltd. Datanagar, Taluka : Shirol,and Organizational Profile.

Reg. No. of the factory	:	KPR/PRG(A)-1 Dated 9th June 1969
Industrial Licenses No.	:	IL/25/N-233/70/LC, Dated 9th June 1970
Multi State co-operative Law Reg. No.	:	L-11012 189-L & M Dated 9th March 1989
First/ Trial Crushing Season	:	1971-72
Age of the factory	:	42 Years
Initial capacity	:	1250 TCD.
Present Crushing Capacity	:	7000 TCD.

By-Products Units :

Distillery (Batch type Old Project)	:	Capacity 30,000 Liter Per Day
DGTD Reg. No.	:	DGTD/HQ/D/S-19/R-10056/C-31(I) NU/82, Dated 10th Sept. 1982
Modernization Distillery Plant	:	Capacity 60,000 Liter Per Day
License No.	:	2497/SIA/IMO/2000, Dated 19th Oct.2000
Ethanol Project	:	Capacity 30,000 Liter Per Day
License No.	:	LI:DYS/112000/44588/56/4 Dated 6th Aug.2001.
Co-generation Plant(old)	:	Capacity 11.5 M.W.
Project Started	:	1990-91
New Co-generation Plant (On BOOT Basis)	:	Capacity 36 M.W.
Project Started Under Construction	:	03rd July 2008
Actual Generation Started	:	Year 2011-12
Composting Fertilizer	:	As Working

The main speciality or highligts of sugar factory:

- **It is large scale plant and diversified activity unit in the co-operative sugar factory.**
- **Best Financial Management sugar factory.**
- **Most Innovative Factory in best practices in relation to cane development programme and by-products products.**
- **Higher Sugar Exporter sugar factory in India.**
- **Factory started co-generation project from 1990-91 First project in Maharashtra and under new policy of State Government Co-generation project 36 M.W. on BOOT basis are succefully started in the sugar factory.**

1.3.1 History:

Shri Datta Shetkari S.S.K. Ltd. was established by pioneer person as Late Shrimant V. S. Ghorpade Sarkar, Late. Shri. A.G.Kulkarni, Late. D. B. Yadave, and Late. Shri. Appasaheb alias S.R. Patil, Chaiman and MLA.

A preliminary meeting was therefore held at Kurundawad in Shirol Taluka on 31st December 1960 for organizing a sugar factory. After collecting requisite amount of share capital, an application for Industrial License was forwarded to the Government of India.

The persistent efforts put forth by the promoters of the proposed Shri.Data Shetkari Sahkari Sakhar Karakhana Ltd. Shirol, ultimately proved to be successful and the Government of India issued a Letter of Intent in the month of May, 1969. The Karkhan was registered under the Maharashtra Co-operative Socities Act On 9th June 1969. The crone stone of the factory was ceremonially laid on 3rd September 1969. The project was completed within just 14-months. In collection of requisite amount of share capital, the formation procedure was started with a initial crushing capacity of 1250 M.T. of sugar cane per day. The factory First trial season was 1971-72.

1.3.2 Location of the factory:

Shri Datta SSK Ltd. Dattanagar, Shirol situated at Eastern part of Kolhapur District. Shirol Taluka in Kolhapur District is gifted by the presence of natural irrigation potential on account of five rivers viz. Krishna, Panchganga, Warna, Doodhganga and Vedganga and very fertile land of alluvial type soil. Very eager to have a Sugar factory so as to ensure all round development and economic prosperity to the higher to poor and marginal farmers.

Photo No. : 1 Datta Administrative Building

Source : Field Work

1.3.3 Project Implementation:

The factory is situated in the industrially backward area of Kolhapur District near village Shirol. The project of 1250 TCD was implemented within a short span of

about 14-months and trial crushing season has been taken on the auspicious day of "VERSHA PRATIPADA" on 16th march 1972. Since the operational area extends in two States, and also this cooperative sugar factory is governed by the Multi State cooperative societies Act 2002. At present the factory crushing capacity is 7000 TCD.

1.3.4 Board of Directors and Management in Organization:

In this sugar factory Board of Directors is final Management authority who is elected from the share holder. Total numbers of Director are 22. After every five years elections are held and Chairman and Vice-Chairman are elected among the Board of Directors every year. Management Directors is responsible person to the Board of Directors and he is controlling activities of sugar factory. In the sugar factory Agriculture, Engineering, Manufacturing, Administration etc. are the various sub sections. The head of this department have to submit their department reports at the monthly meeting of Board of Directors.

1.3.5 Awards and Achievements:

1. Distillery in charge of the factory was awarded by "Best Distillery Manager" by Vasantadada Sugar Institute Pune in the year 2003-04.
2. In the year 2004-05 VSI, Pune has awarded Karkhana by "Best Financial Management Award."
3. Second Technical Efficiency award by National Federation of Co-operative Sugar factories Ltd. New Delhi in 2006-07.
4. Honble Managing Director Mr. M.V. Patil has been awarded as "Best Managing Director" by VSI Pune for his contribution to this factory for the year 2006-07.
5. In the year 2006-07 for Cane Development Award, Karkhana first prize in South Maharashtra Awarded by VSI, Pune.
6. In the year 2008-09 VSI, Pune has awarded Karkhana as "Most Innovative Factory."
7. For Best Cane Development and Its Management, factory awarded first prize by National Federation of Co-operative Sugar Factories Ltd. New Delhi in 2009-2010.
8. Tilak Maharashtra Vidyapeeth, Pune Awarded D. Lit. To the Honable Chirman Appasaheb alias S. R. Patil in the year 2011.
9. For Highest Sugar Export in India, awarded First rank by National Federation of Co-operative Sugar Factories Ltd. New Delhi in 2010-11.

10. Karkhana received two top Prizes from VSI, Pune on 5th January 2013 "Best Sugar Factory" for the year 2011-12 and "Best Financial Management" in the south region.
11. National Federation of Co-operative Sugar Factory Ltd, New Delhi has awarded the first place award categories "High Recovery Zone" in sugar extraction from sugarcane.

There are few other categories in which factory has received 40-plus other awards earlier. Some of those categories are best quality of sugar export, sugar development policy, best use of technology, best working directors, best chief agriculture officer, best chief engineer prize, best sugarcane development officer prize etc.

Table No.1.2 Showing number of villages including operational area.

Name of State	Name of District	Name of Toluca	No. of village
1	**2**	**3**	**4**
Maharashtra	Kolhapur	Shirol	50
Maharashtra	Kolhapur	Hatkanagle	32
Maharashtra	Kolhapur	Karveer	02
Maharashtra	Kolhapur	Kagal	03
Karnataka	Belgaum	Chikodi	21
Karnataka	Belgaum	Athani	07
Total			**115**

Source:-Annual Report of the factory (2012-13)

Table No.1.3 Showing number of member, shareholder and share capital

Particular	Number of Member	Number of shareholder	Share Capital Net paid up Rs.in Lakh.
1	**2**	**3**	**4**
Productive member- A Class	30269	47493	3982.72
Nominal member- B Class 1) (Personal	1855	1944	147.41
2) Cooperative society	88	124	10.49
Total	**32,212**	**49,661**	**4,140.60**

Source:-Annual Report of the factory (2012-13)

1.3.6 By-Products Units of the Sugar Factory:

1. Distillery Plant:

The sugar factory is closely associated with each other. Distillery has a little control over quality improvement of molasses. Karkhana was set up two plants of distilleries. Old plant of distillery batch type 30000 litter per day was set up 10th September 1982. Modernization distillery plant was set up 19th October 2000. These additional plants of 30,000 liters per day capacity based on continuous fermentation and multi pressure vacuum distillation technology has been installed and commissioned from 27th February 2002.

2. Ethanol Plant:

An ethanol plant of 30,000 Litters per day capacity based on Molecular Sieve Technology has been installed and successfully commissioned on 25th may 2002 the plant and machinery of ethanol plant has been supplied by M/S Praj Industries, Pune.

3. Co-generation :

This Co-operative Sugar Factory to go in for co-generation and produce extra power which will be supplied to State Electricity Board so as to overcome the short supply of power to some extent. Factory started co-generation project from 1990-91, the capacity of this project 11.5 M.W. In that project factory uses 8 M.W. electricity own and 3.M.W. Electricity Providing to the MSEB grid from 2003-2004 season. A minimum return from the Co-generation is Rs.3.00 to 3.50 Cores per season.

The Management of factory considered present scenario of electricity and decided to go in co-generation project of 36 M.W. The project under construction on BOOT Basis with masers Urge Anker Nithi Trust Government of Maharashtra and will be completed before ensuring crushing season i.e. 2010-2011.

4. Composting Department:

The factory management has established a separate Environmental Management cell to look after all the related issues of pollution control. It has a task to look after the effluent treatment of sugar factory and distillery. The distillery effluent is one of the most polluted items. The factory management has adopted composting technique for the treatment and disposed of spent wash.

Press mud, Bagasse and Ash are mixed in definite proportion with the spent wash and aerated for about 21 days to get good quality of compost. The ready compost is distributed to the member farmers at a rate of Rs.125 per ton. The compost is good in Humus content and bacterial content. The application of compost has

helped to improve the yield of compost has helped to improve the yield of crop along with soil quality.

1.3.7 Other Development SCHEM:

- **Horticulture development Scheme:**

In the year 1982 management of factory started Horticulture development scheme due to increase in the number of trees it had help in Environmental Balancing and also created a source of income to the factory.

Table No.1.4 Showing Trees Types and Number of Trees Supply

Sr. No.	Types of Trees	No. of Trees Supply
1	Coconut	5995
2	Betel nut	955
3	Mango	271
4	Saputo	63
5	Guava	319
6	Pomegranate	15
7	Drumstick	32
8	Forest Trees	11950
Total		**24050**

Source: Annual report 2012-2013

- **Socio Economic Activities:**

The aim and object of the co-operative Sugar Factory is to secure social justice and impart modern technology in agricultural operations. Our co-operative Industrial complex has undertaken various socio-economic activities for improving the economic conditions and standard of living of the villagers in the area of operation of our factory as under –

1. The cultivator members are encouraged to construct Gobar Gas Plants of various capacities and are provided with a subsidy amount equal to the Village cottage Industries Commission. The subsidy ratio is based on installed capacity.
2. The management of the sugar factory with a view to procure sizeable sugarcane and to provide subsidiary work to the agriculturist members has implemented Datta Oos VAHATUK YOJANA. Through this scheme the sugar factory has distributed trucks, tractors, and trailers and bullock carts.

3. The factory has also established a Workers Co-operative Credit Society. This society is functioning very smoothly by rendering to the extent of Rs.1.00 Lakh.
4. The management of the Karkhana has taken the initiative to establish a consumer co-operative stores viz: Shree Datta Shetkari Shakari Grakhak Sanstha Ltd. Dattanagar with a view to have a big consumer departmental stores to make available required consumable items such as cloths, readymade cloths, food-grains, utensils electrical items, sewing machines, bicycles etc. at reasonable prices.

- **MEDICAL CENTER :**

As a part of its social obligation, the management of the factory has established a Medical Center in the premises of the factory with modern building and equipped with all instruments and facilities to render the medical needs not only to its workers and staff but also to the population residing in the surrounding of this complex. The prime object of this venture is to extend the medical facilities to the weaker section at nominal charges, at present the medical Center is having four well qualified doctors with vast experience in the line. Medical Center has X-ray machine, Physiotherapy Section well-equipped operation theater. Karakhana has Heart Specialist, Orthro specialist, E.N.T. Specialist, Dentist on honorary basis. Eye checkup and operations, all type of body checkup, family planning programs are conducted by the medical center, Medical center is totally implemented by financial support by our cane growers.

- **Industrial Training Center:**

Considering the fast growth of small and large scale industries in the nearby towns, the management has started Government recognized Industrial Training Center, incorporating trades viz. 1) Fitter 2) Mechanic Motor Vehicle 3) Electrician 4) Mechanic Agriculture Machinery 5) Information Technology and Electronic System 6) Computer Operating and Programming Assistant, which will facilitate the participant trainees the job surety as also they can have individual workshop of the subject matter.

- **Data Polytechnic College:**

Management has started polytechnic college from academic year 2010-2011. The Polytechnic is recognized by AICTE, New Delhi and Director of Technical Education Govt. of Maharashtra. It has five faculties Viz. 1) Mechanical Engineering 2) Civil Engineering 3) Electrical Engineering 4) Electronic and Telecommunication 5) Computer Engineering.

- **Late Dattajirao Kadam Kamgar Kalyan Manadal and Labour Welfare :**

Management of the factory is always trying to give the job to the people in the area of operation. Relations between employees and management are very harmonious due to the harmonious relations development of Industrial complex is achieved. Late Dattajirao Kadam Kamgar Kalyan Manadal and Labour Welfare Dattanagar implement various schemes for workers families. Workers and family members can receive up to Rs. 10,000/- Medical Aid. It major operation has taken place. Mandal has Gymbasium, Akhada, Library, Balwadi. Also Recreation Hall is constructed for various functions. Beside these facilities, factory provides 50% Medical expenditures for the employees suffering from Heart Diseases, Paralysis, Cancer a pawed leave up to 6 months. Mandal has started its activities through Gymnasium, Akhada and athletics. It is proud to mention here that some our players of our mandal are rating at the top of District, State and National level.

- **Sugarcane Development Activity:**

Shree Datta S.S.K. Ltd. Shirol has set up a separate wing of cane Development in 1987.Tthe cane development activities within the area of operation. For the saved work we have appointed qualified 79 Agri Personnel.

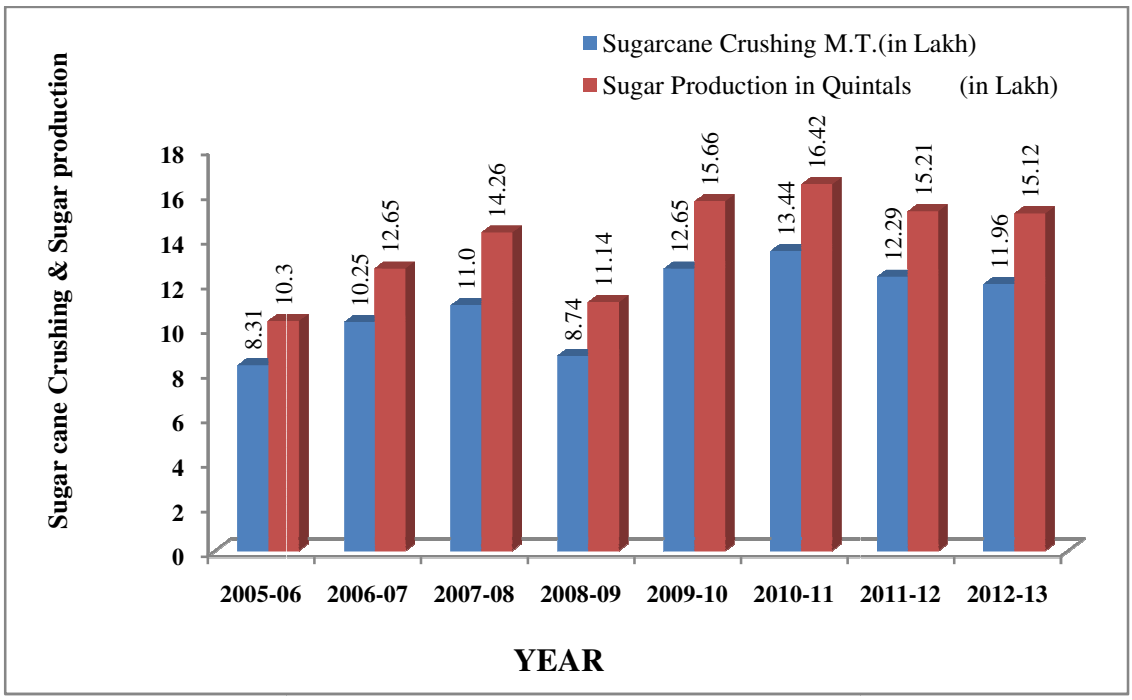
The various cane development activities implemented by the factory are as Soil Testing Laboratory, Proper Tillage Operation, Green Manu ring, Supply of Sugarcane Seed Material, Supply of Chemical Fertilizers, and Supply of Bio-Fertilizers, Supply of Organic Manure.

Table No.1.5 Showing Datta sugar factory production performance

Year	Crushing capacity TCD	Crushing days	Sugarcane Crushing M.T.(in Lakh)	Sugar Production in Quintals (in Lakh)	Sugar Recovery %
1	**2**	**3**	**4**	**5**	**6**
2005-06	7000	111	8.31	10.3	12.4
2006-07	7000	138	10.25	12.65	12.32
2007-08	7000	148	11.0	14.26	12.95
2008-09	7000	115	8.74	11.14	12.73
2009-10	7000	170	12.65	15.66	12.37
2010-11	7000	182	13.44	16.42	12.21
2011-12	7000	164	12.29	15.21	12.37
2012-13	7000	156	11.96	15.12	12.63
Total		**1184**	**88.64**	**110.76**	**99.98**
Mean		**148.00**	**11.08**	**13.85**	**12.50**
S.D.		**25.41**	**1.86**	**2.23**	**0.25**
C.V.		**17.17**	**16.75**	**16.13**	**1.99**

Source: Annual report 2012-2013 and field work

Graph No.1.1 shows sugarcane crushing M.T. in lakh and sugar production in quintals.



The duration at season largely depends on availability of cane. The table no. 1.5 shows that the mean value of crushing days during this eight years 148.00 days. The duration of crushing days during these eight years ranged between 111 days as minimum during the year 2005-06 and 182 days as maximum during the year 2010-2011. For economic working of any mill the duration of the crushing season should be around 160 days. The high C.V. value (17.17) indicates more flections in the length of season during study period.

It is observed from the table no.1.5 the mean value of cane crushed during this eight years is 11.08 lakh tones. The quantity of cane crushed ranged between 8.31 lakh tones during 2005-06 and 13.44 lakh tones maximum during the 2010-11 season. The C.V. (16.75) value indicate more fluctuation in the quantity of the cane crushed during this period.

The mean value of the sugar production by this sugar factory during the study period comes to 13.85 lakh quintals. The sugar production ranged between 10.30 lakh quintals as minimum during 2005-06 and 16.42 lakh quintals as maximum during the year 2010-11. The high C.V. value (16.13) indicate more variation in the quantity of sugar produced during this period.

The table no.1.5 also shows the mean value of the sugar recovery percentage comes to 12.50 percent. This sugar factory operates in the high sugar recovery zone of the Maharashtra state. During 2011-12 season, the state average sugar recovery 11.66 percentage. But the mean value of this sugar factory sugar recovery 12.50 percent. The lower C.V. (1.99) value indicates there was more uniformity in the sugar recovery percentage during this period.

1.4 Name And Address: Kumbhi Kasari Sahakari Sakhar Karkhana Ltd. Kuditre, Tal-Karveer and Organizational Profile

Reg. No. of the factory	:	G/-282 / 20-06-1960
First/ Trial Crushing Season	:	1963-64
Age of the factory	:	51 Years
Initial capacity	:	1000 TCD.
Present Crushing Capacity	:	3000 TCD.
Clarification process used	:	Double sulpuitation for white sugar
Sugar production grades	:	M-30, s-30, SS-31

By-Products Units:

Distilleries Department

Establishment Year	:	1992
First Season	:	1993
Installed Capacity	:	30,000 Liters Per Day
Alcohol Production	:	Rectified Sprit, special denatured Sprit, Ordinary Denatured spirit and Fusil Oil

New Plant of ENA

Establishment Year	:	2011-12 (Under Construction)
Bio-composting Plant	:	Used press mud + Culture + Spent wash = Compost
Co-generation Plant	:	19.5 M.W. (Under Constriction 2012-2013)

The main speciality or highligts of sugar factory:

- **It is mediam scale plant in the co-operative sugar factory.**
- **Higher Sugarcane recovery zone area.**
- **Factory started co-generation project and extra nutral alcohol project from the year 2013-14, apply the new policy in sugar factory.**
- **Because of co-generation project factory capacity increased 3000 TCD to 5000 TCD.**

1.4.1 History:

Kumbi Kasari Sahakari sakhar Karkhana Ltd. Kuditre is located 14 kms to the west of Kolhapur city. Bhogawati, Tulsi, Kumbhi, and Kasari rivers surround the factory on all sides, so this surrounding area is full of water for 12 months. Due to this the sugarcane crop is produced in abundance in this region. In fact in this region there was really extreme need of sugar factory in those days.

Under the versatile, polite and firm leadership of Mr. D.C. Narke, Mr. S.B. Khade, Mr. B.B. Patil (Koge) and Mr. Y.R. Atigare (Koge) and colleagues made a proposal for co-operative sugar factory in the year 1954. The licence was obtained in 1960, under the registration No. G- 282- 1960. For this factory 70% of the machinery had been taken by M/S Textile Machinery corporation Ltd. Calcutta and 30% import. This factory started production in 1963.

At that time of the registration the permission was given to only 1000 M.T. cane crushing a day of standard. In view of increasing cane availability, the factory was expanded to 1750 M.T. a day in 1977. In 1979 the management to another expansion application to the central Government for permission of 3500 M.T. per day but the permission was issued 3000 M.T. a day in 1980. In the current year 2012-13 establishment of cogeneration plant of 17.5 M. W. and plant moderations is in final stage because the coming season per day crushing will be increased up to 5000 TCD.

1.4.2 Location:

Kumbhi Kasari sahakari Sakhar Karkahana Ltd. has been located about 14 Kms. to the west of Kolhapur city. All sides of the factory the river Bhogawati, Tulshi, Kumbhi and Kasari water shed area is surrounded. Because of these rivers soil become fertile in this area. Due to this fertility sugarcane is main crop.

Photo No. 2 : Kumbhi Administrative Building

Source : Field Work

Table No.1.6 showing No. of Villages, No. of Members, No. of Shareholders, Total Sugarcane M.T. supply of the factory.

Name of Taluka	No. of Villages	No. of Members	No. of Shareholders	No. of M.T. Sugarcane Supply
1	2	3	4	4
Karveer	42	14,001	14,581	3,12,752
Panahala	59	7,649	8,097	7,79,372
Gaganbawada	06	733	770	37,009
Radanagari	01	711	720	11,273
Shauwadi	01	561	596	15,692
Out area but Maharashtra	-	-	-	28,001
Total	**109**	**23,655**	**24,764**	**5,84,099**

Source: Annual report (2012-2013)

At present the factory has ‘A’ and ‘B’ class shareholders. The sugarcane grower farmers from area of operation of factory are considered as ‘A’ class shareholders. The per share value share is Rs.10, 000/-. The total number of ‘A’ class shareholders up to 31st Marsh 2013 is 24,764 shares and subscribed amount Rs.2172.51 lakh and ‘B’ class shareholders is 395 shares subscribed amount Rs.33.02 lakh and shares deposit Rs.1.69 lakh, total amount of subscribed capital is Rs.2207.22 lakh.

1.4.3 Objectives of the Factory:

The main objective of factory is to offer maximum profit to farmers for their agricultural production by adopting high technology in agriculture and this sugar factory is run under co-operative principles and objectives which are provided in tie by-laws.

- Promoting shareholders to become self dependent, reluctant and co-operative among themselves.
- To publish the advanced agricultural practices among shareholders to publish.
- Production of fertilizers, agricultural implements or their supply, promotion for agricultural training to shareholders.
- To start by-product industries for development and benefit of organization.
- To develop irrigation schemes, agricultural development schemes, agro industries schemes.
- To construct and maintain roads for sugarcane transportation with the help of Zillah Perished and State Government.
- To meet the cultural, educational and overall development of members, Workers and peoples under area of operation.

1.4.4 Awards and Prizes:

Kumbhi Kasari S.S.K. has good reputation in Kolhapur district as well as in the Maharashtra. The factory good performance in respect of crushing, sugar recovery, production, plant utilization etc. this sugar factory has been awarded following different awards.

- National Level: 1st Rank of Higher sugar recovery from National Federation of Co-operative sugar factories, New Delhi in the year 1990-91-92.
- State Level: 3rd Rank for utilizing Higher Technical Efficiency in south Maharashtra zone from VSI, Pune. In the year 1992-93

- State Level :- 2nd Rank for utilizing Efficiency in south Maharashtra Zone from VSI, Pune in the year 2000-01
- Second Prize from VSI, Pune for Best Technical Efficiency in the year 2000-01 on state level.
- Third Prize from VSI Pune, for overall best Technical efficiency in 2004-05 on state level.

1.4.5 Organization Chart:

1. Board of Directors:

Kumbhi Kasari S.S.K. is a co-operative organization and as per cooperative rules Board of Directors is final, management authorities who are elected from shareholders of class 'A' and 'B'. After every five years elections are held and chairman and vice-chairman are elected among the Board of Directors every Year. Total numbers Directors are 24 and one is managing directors, one Regional Depute Directors of state and two are Workers Representative.

2. Management In Organization :

Managing Directors is responsible person to the Board of Directors and he is controlling activities of the sugar factory. In the sugar factory various department worked i.e. agriculture, engineering, Manufacturing, administration, account, Civil, Store, watch and Ward, vehicle and Garage, Godown, Labor and Welfare, Medical, Sanitation and Distillery.

1.4.6 By Product department:

1. Distillery Plant :

A major portion of the molasses produced in India is used for the production of alcohol from molasses by fermentation. This sugar factory started these own distillery of 30,000 liters per day capacity in 1993. Distilleries and sugar factory are closely associated with each other; distilleries have little control over quality improvement of molasses. By adopting proper techniques both at the sugar factory and distillery level, much can be done to improve the molasses quality for increased alcohol production. Distillery used alcohol the production of special denature sprit (SDS). Ordinary Denature Sprit and Fusil Oil.

2. Compost Fertilizer Plant :

Composting has comes to be accepted as one of the good solution to the problem of distillery effluent treatment. Scientifically operated bio-composting can

result in to zero effluent discharge. The factory stated composting plant at Satarede village near to factory side. These plant using distillery spent wash and press mud cake has to carry out in surface windows with the help of an aero tiller machine for spraying, mixing, turning and aerating of compost material. Addition of special blend of cultures or cow dung provides bacterial culture required for composting. The finished product can be sold to farmers and substantial amount of income can be generated.

3. Co-Generation Plant (Project):

Recently factory management has taken a decision of starting co-generation plant. The capacity of the co-generation plant would be 17.5M.W. with modern technology. The entire design has been sent through VSI, Pune to the sugar Commissioner for approval. Post approval of design loan from N.C.D.C. has been approved. 5% self investment, 5%b State government to fund, 40% from Sugar Development fund (SDF) and remaining from National Co-operative Development Corporation (NCDC) will provide.

Project expected total cost is approximately Rs. 136 crores. Out of this amount Rs.21 cores tax amount will be refunded by government. Therefore the net cost of the project is Rs. 115 corers, 96 corers is as estimated cost of the co-generation plant and remaining amount will be kept for modernization of sugar factory to increase capacity to 5,000 TCD.

1.4.6 Other Development scheme:

1. Sugarcane Development Scheme:

The factory has a agricultural development department office local name called as “Shetakari Office” a separate department. This department provides necessary technical assistance to the sugarcane farmers and helps them by way of providing suitable guidance when necessary and also provides –

1. Supply of fertilizers and micronutrients as based dose for planting on subsidies rate.
2. Distribution of good quality of seeds on subsidized rate.
3. Supply of good insecticides pesticides as well as bullock drown implements.
4. Supply of spraying material
5. Supply of Krishivator (Small Tractor) to the farmers.
6. Introduction of new verities of sugarcane like co-86032, co-92005.The sugar factory provides subside to sugarcane shareholder @ of Rs.10 per ton.

2. Road construction and Development :

Co-operative sugar factory have contributed towards development by way of providing the necessary infrastructure. The Kumbhi Kasari S.S.k. was played an important role in the field of construction and repairs of roads in the operation area.

3. Bio-Gas scheme:

The factory has introduced a Bio-gas scheme to their members with the help of the central Government on the basis of subsidies grant. 225 units @ Rs. 2500 each total amounted Rs. 5, 62,500 these subsidies were provided from factory in the year 2012-13.

4. Social Responsibility :

The sugar factory has been taking several steps for the development of area in and around its area of operation as its obligation to the society. It actually supports and encourages academic, sports, cultural and religious activities under this program it runs a school, hospital, a gymnasium, a cultural hall and also a Kusti (Wrestling hall) Sankool.

5. Kumbhi Kasari Pratishthan (Trust) :

In 1993, a trust was established and registered in the name of Kumbhi Kasari Pratishthan. Which is in line with the factory in a view to uplift the social, economical, cultural level of the people in and around the functional area of the factory. The trust aims at imparting education and providing necessary helps to small and medium size entrepreneurs. The trust has extended its hand to individuals and organizations it has started a spate independent institute for sports, education and arts. Accordingly it has stated secondary school 'Kumbhi Kasari Vidyaniketan' with the constant of the Maharashtra Government from 1st July 2002.

The trust believes that words of the sugarcane growers, members, factory staff members and poor and needy farmers should get quality and state of the art education at factory site at reasonable cost. The trust aims at providing residential accommodation, financial assistance for education, educational scholarships, awards, free ships along with school to all students irrespective of their cast and religion.

6. Shetkari Sanskrutic Bhavan (Cultural Hall):

Factory has its own cultural hall for farmers. This hall is utilized for various cultural programs, marriages and religious functions. The hall is proved to be very convenient and economical for people in and around the functional area of factory.

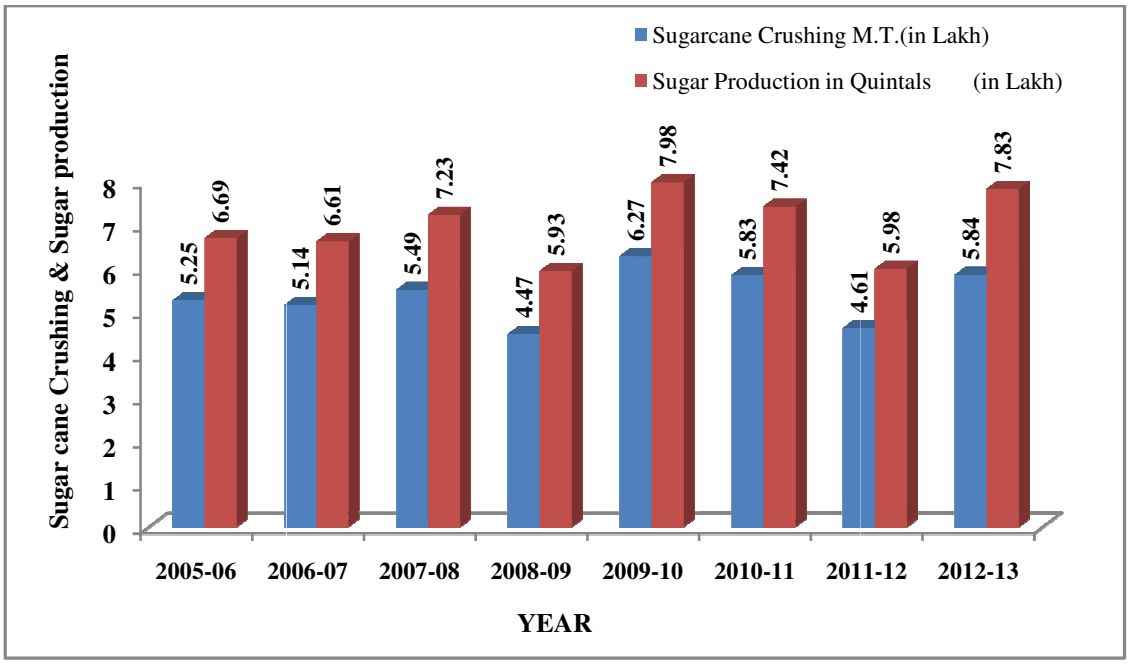
Every year wrestling competitions is organized by wrestlers in functional area of the factory, on a factory site. Encouraged sportsmen by providing them financial support and coaching to participate in various state and national level tournaments.

Table No.1.7 Showing Kumbhi sugar factory production performance.

Year	Crushing Capacity TCD	Crushing days	Sugarcane Crushing M.T.(in Lakh)	Sugar Production in Quintals (in Lakh)	Sugar Recovery %
1	2	3	4	5	6
2005-06	3000	147	5.25	6.69	12.74
2006-07	3000	135	5.14	6.61	12.88
2007-08	3000	145	5.49	7.23	13.16
2008-09	3000	117	4.47	5.93	12.96
2009-10	3000	179	6.27	7.98	12.73
2010-11	3000	159	5.83	7.42	12.74
2011-12	3000	128	4.61	5.98	12.98
2012-13	3000	138	5.84	7.83	13.43
Total		**1148**	**42.9**	**55.67**	**103.62**
Mean		**143.50**	**5.36**	**6.96**	**12.95**
S.D.		**19.12**	**0.62**	**0.78**	**0.24**
C.V.		**13.33**	**11.61**	**11.26**	**1.88**

Source: Annual report 2012-2013and field work

Graph No.1.2 shows Kumbhi sugar factory production performance.



The duration of season largely depends on availability of cane. The table no1.7 shows the mean value of crushing days 143.50. The duration of crushing season ranged between 117days as minimum during the year 2008-09 and 179 days as maximum during the year 2009-10. The high C.V.(13.33) value indicate more fluctuations in the length of season during this period.

Effective and efficient working of any sugar factory depends on a large extent of the abundant supply of quality sugarcane. The table no.1.7 depicts ups and downs in the quality of cane crushed during the study period. In the study period mean value of cane crushed 5.36 lakh tones. During the eight years the quality of cane crushed ranged between 4.47 lakh tones in 2008-09 as minimum and 6.27 lakh tones in 2009-10 as maximum. The high C.V. (11.61) indicates there was more variations in the quantity of the cane.

The mean value of the sugar production by this factory during the study period comes to 6.96 lakh quintals. The sugar production ranged between 5.93 lakh quintals as minimum during 2008-09 and 7.98 lakh quintals as maximum during the year 2009-10. The high C.V. (11.26) value indicates more variations in the quantity of sugar production during this period.

This sugar factory operates in the high sugar recovery zone of the Maharashtra state. During 2011-12 season , the state average sugar recovery 11.66 percentage. But the mean value of this sugar factory, is 12.95 percent. The lower C.V. (1.88) value indicates there was more uniformity in the sugar recovery percentage during this period.

1.5 Name And Address : Appasaheb Nalawade Gadhinglaj Taluka Shakari Sakhar Ltd. Harali, Tal:- Gadhinglaj, and Organizational Profile

Reg. No. of the factory	:	KPR/PRG(A)-6(s) dated 12.02.1971
Industrial license No.	:	I.L.S -61/1974 dated. 27.02.1974
First/ Trial Crushing Season	:	1978-79
Age of the factory	:	34 Years
Initial capacity	:	1250 TCD
Present Crushing Capacity	:	2000 TCD
Sugar production grades	:	M-30, S-30,
Clarification process used	:	Double sulpuitation

Distilleries Department Establishment Year	:	24.03.1986
First Season	:	31.03.1987
Installed Capacity	:	25,000 Liters Per Day
Alcohol Production	:	Rectified Sprit, special denatured Sprit, Ordinary Denatured sprit and Fusil Oil
Bio-composting Plant	:	Used press mud + Culture + Spent wash = Compost

The main speciality or highligts of sugar factory:

- **It is small scale plant in the co-operative sugar factory.**
- **It is financial crises sugar factory.**

1.5.1 History:

Appasaheb Nalwade Gadhinglaj Taluka Sahakari Sakhar Karkhana Ltd. Harli has been located about 7 Kms. to south of Gadhinglaj city and from Kolhapur 85 Kms to the south. Late Appsaheb Nalwade, Late Kaka Shahapurkar and colleagues made a proposal for the co-operative sugar factory in the year 1969. And the license was obtained in 1971 under the Registration No. KPR/PRG (A)-6(s) dated 12.02.1971 and Industrial Licenses No. I.L.S -61/1974 dated. 27.02. 1974.At the time of registration the permission was given to only 1250 M.T. cane crushing per day of standard.

1.5.2 Location:

The sugar factory is located about 7 kms to south of Gadhinglaj city near Harli Budruk. The area of operation of this factory 89 villages in Gadhinglaj and 12 in Ajara Taluka. In view of increasing sugarcane availability the factory was expanded to 2000 M.T. a day in 1987. At present the factory has ‘A’ and ‘B’ class shareholders. The sugarcane growers’ farmers from area of operation of the factory are considered as ‘A’ class shareholders. The cooperative credit societies are considered as ‘B’ class shareholders. The value per share Rs. 5000/- each.

Photo No. 3: Gadhinglaj Factory Building

Source: Annual Report

Table No.1.8 Numbers of members and shareholders and subscribed and paid up capital

Particulars	No.of. Members	No. Of. Shareholders	Subscribed and paid up capital Rs. In lakh
1	**2**	**3**	**4**
Sugarcane Produced Members	24,289	24,574	1904.00
Co-operative Members	191	257	30.05
Total	24,480	24,831	1934.05

Source: Annual report 2012-13

1.5.3 Board of Directors:

Appasaheb Nalwade Gadhinglaj Taluka S.S. K. is a co-operative organization and as working co-operative rules. Board of directors is final management authority who are elected from shareholders of 'A' and 'B' class. Total numbers of directors is 22. After every five year elections are held and chairman and vice-chairman are elected among the Board of directors every year.

1.5.4 Management in Organization:

Managing Directors is responsible person to the Board of Directors and he is controlling activities of sugar factory. In the sugar factory Agriculture, Engineering, Manufacturing, Administration and head of the section is a managing the activities of that section.

1.5.5 Awards:

The sugar factory unit has been awarded following different awards:

National Level: National productivity council New Delhi awarded in 1988-89, second prize in Technical performance of the sugar factory

State Level: 3rd Rank for Utilizing higher technical efficiency from VSI, Pune in the year 1990-91. And 2nd Rank for utilizing higher technical efficiency from VSI, Pune in the year 1995-96.

1.5.6 By-Product Department:

1. **Distillery plant Erection :**

In 1984 Government of Maharashtra approved the distillery plant. From 1987 distillery plant was brought in force, daily production capacity is 25,000 liters. In the year 2011-12 The distillery plant was actually working 120 days and production of Rectified sprite 40. 23 lakh liters and average recovery is 280.02 liters per M.T. of molasses.

2. **Compost Fertilizer Plant :**

By using distillery waste and press mud as raw material has started a compost fertilizer plant on factory site. The factory sales the fertilizers to their members at reasonable prices in cash or in credit facility. In the year 2011-12, to production of the compost fertilizers 7308 M.T.

1.5.7 Other Development scheme:

1. **Bio-Gas Scheme :**

The sugar factory has introduced a Bio-Gas scheme to their members with the help of the Government on basis of subsidies grant. In the year 2010-11, 143 Bio-gas plant were constructed in this regions. The factory gives Rs. 2000 per plant as subsidy to the farmers.

2. Rajashri Shahu Memorial Hospital :

The factory has stated Hospital to provide service to poor farmers and workers at cheap rates. All workers are provided free check up camp. There are various modern facilities to serve the cane growers and reasonable rates. The hospital provided X-ray machines, laboratory, ECG machine etc. and many operations facility available in the hospital i.e. family planning operation, appendix operation etc.

3. Workers Welfare programme :

In any organization, human resources is the most important in the development of the organization. The factory taking workers Accident Insurance policy. Also the workers of factory library facility also provided and loan facility provided to the workers their needs of T.V. and Motor cycle, Housing Loan etc.

4. Sugarcane development scheme:

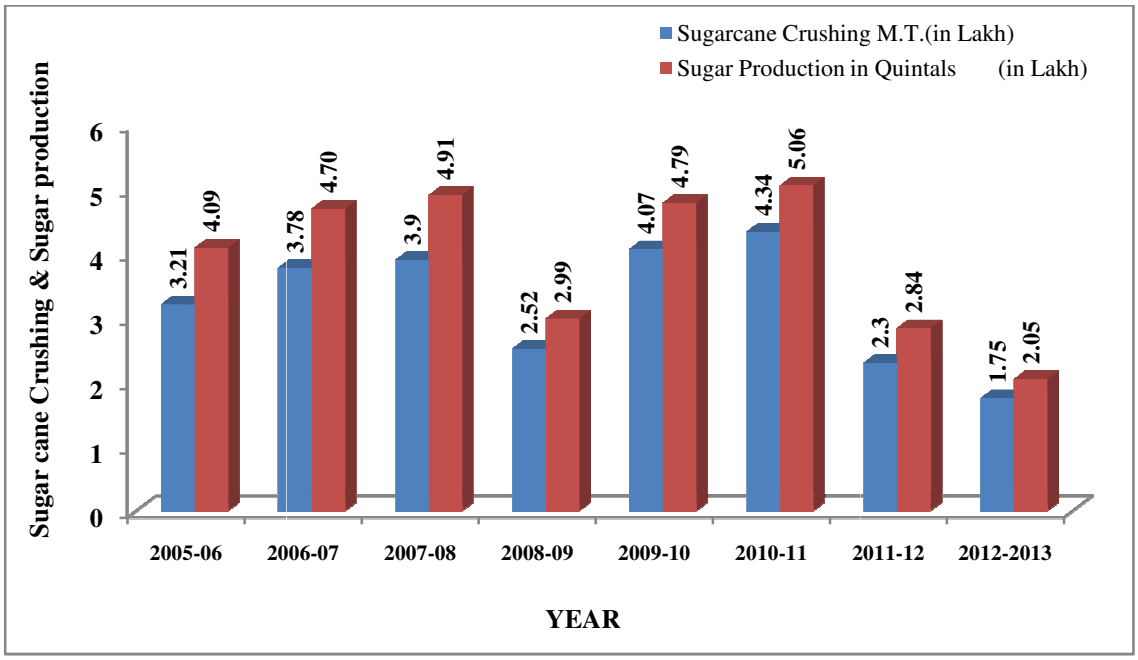
The stated sugarcane development scheme to the famers. This department provides necessary technical assistance to the sugarcane farmers and help them by way of providing suitable guidance whenever necessary

Table No.1.9 Showing Gadhingalaj sugar factory production performance

Year	Crushing capacity TCD	Crushing days	Sugarcane Crushing M.T.(in Lakh)	Sugar Production in Quintals (in Lakh)	Sugar Recovery %
1	**2**	**3**	**4**	**5**	**6**
2005-06	2000	136	3.21	4.09	12.4
2006-07	2000	166	3.78	4.70	12.13
2007-08	2000	170	3.9	4.91	12.5
2008-09	2000	108	2.52	2.99	11.8
2009-10	2000	161	4.07	4.79	11.75
2010-11	2000	176	4.34	5.06	11.66
2011-12	2000	129	2.3	2.84	12.33
2012-13	2000	99	1.75	2.05	11.81
Total		**1145**	**25.87**	**31.43**	**96.38**
Mean		**143.13**	**3.23**	**3.93**	**12.05**
S.D.		**29.46**	**0.94**	**1.15**	**0.33**
C.V.		**20.59**	**29.22**	**29.18**	**2.76**

Source: Annual report 2012-2013and field work

Graph no.1.3 shows sugarcane crushing and sugar production:



The duration of season largely depends on availability of cane. The table no.1.7 shows the mean value of crushing days 143.13. The duration of crushing season ranged between 99 days as minimum during the year 2012-13 and 176 days as maximum during the year 2010-11. The high C.V. (20.59) value indicate more fluctuations in the length of season during this period.

In the study period mean value of cane crushed 3.23 lakh metric tons. During the seven years the quantity of cane crushed ranged between 1.75 lakh tones in 2012-13 as minimum and 4.34 lakh tones in 2010-11 as maximum. The high C.V. (29.22) indicates there was more variations in the quantity of the cane crushed .

The mean value of the sugar production by this factory during the study period comes to 3.93 lakh quintals. The sugar production ranged between 2.05 lakh quintals as minimum during 2012-13 and 5.06 lakh quintals as maximum during the year 2010-11. The high C.V. (29.18) value indicates more variations in the quantity of sugar production during this period.

This sugar factory operates in the high sugar recovery zone of the Maharashtra state. During 2011-12 season , the state average sugar recovery 11.66 percentage. But the mean value of this sugar factory, is 12.05 percent. The lower C.V. (2.76) value indicates there was more uniformity in the sugar recovery percentage during this period.

1.6 Name And Address: Shri.Tatyasaheb Kore Warna Sahakari Sakhar Karkhana Limited, Waranagar, Tal.-Panhal, and Organizational Profile

Reg. No. of the factory	:	G-271, Dated 27th September 1955 under the Maharashtra co-operative societies Act,1960
Industrial Licenses No.	:	Govt. of India under, no.L. 25 N.215-69 LC dated 11-9-1959
First/ Trial Crushing Season	:	1959-60
Age of the factory	:	53 Years
Initial capacity	:	100 TCD.
Present Crushing Capacity	:	7500 TCD.

By-Products Units:

Bagasse based Pulp-paper Mill establishment	:	In the year 1983
Capacity	:	20 Metric Tons per day production of white cream wove paper of 45,60 gram mage.
Distillery (Batch type Old Project)	:	Capacity 30,000 Liter Per Day
Establishment	:	In the year 1983
Expansion and Modernization Distillery Plant	:	Capacity 60,000 Liter Per Day
License No.	:	2497/SIA/IMO/2000,Dated 19th Oct.2000
Ethanol Project	:	Capacity 30,000 Liter Per Day
Extra Neutral Alcohol	:	Capacity 55,000 Liter Per Day
New Co-generation Plant (On BOOT Basis)	:	Capacity 36 M.W.
Project Started Under Construction	:	03rd July 2008
Actual Generation Started	:	Year 2011-12
Composting Fertilizer	:	As Working

The main speciality or highligts of sugar factory:

- **It is large scale plant and diversified activity unit in the co-operative sugar factory.**
- **Best Financial Management sugar factory.**
- **Most Innovative Factory in best practices in relation to cane development programme and by-products products.**
- **Award for maximum exportrt of sugar in India.**
- **ISO-9001:2008 Certification from M/s TUV Management Service Gumbh, Unternehmensgruppe TUV Suddeutshlan. Warana sugar factory is only sugar factory who has achieved this certificate in first number and first attempt in the cooperative sugar sector of Asia.**

"Warananagar was fortunate in having the leadership of the Late Tatyasaheb Kore, a great visionary, who was always very kneeing on two aspects 1) whatever constructive work taken in hand must finally prove to be better than the best and 2) the common man must be the main beneficiary."

1.6.1 Historical Aspect:

Warana Valley owes its revolutionary socio-economic development to its Leader and founder of Warana Sahakari Sakhar Karakhana Ltd. Late. V. A. alias Tatyasaheb Kore , exactly 55 years back, Warna Valley was barren and hilly track, notorious for dacoit only. Under unavoidable circumstances, a common man could dare to enter the region.

Prior to the establishment of Warna Co-operative, the cane farmers in the area were producing Jiggery and were at mercy of the market rates for their produce. Many times, these rates used to be at the rock bottom making it uneconomical to produce Jiggery eventually compiling the farmers to burn down their standing cane. The Late Tatyasaheb Kore also had once setting up of WSC (Warana Sugar Co-operative) the farmers were saved from the vagaries of the said marked rates.

The word Warna is taken from the name of the river, a tributary of Krishna, which flows west to East forming the boundary of the district of Kolhapur and Sangli. The area of operation of Warana Sugar Co-operatives comprises 70 villages which are located on both the side of the river. With Warna factory on the scene, there was a sea change in the situation in the very short span and virtually a new life began for the villagers of the basin.

1.6.2 Location:

Shri. Tatyasaheb Kore Warana Sahakari Sakhar Karakhana Lt. Wrarnanagar , North from Kolhapur 33 Km. Wrana is the name of river and on the bank Warna River, Wrananagar popularly known .Wrana is the co-operative group of sugar factory, dairy, banking, agro processing unit, Bazzer, Micro and small scale women industries, educational institutions, medical and engineering institutions.

Photo No. 4 Warana Factory Administrative Building

Source: Annual Report

1.6.3 The sugar factory:

This dark picture is totally changed due to only vision of our totally changed due to only vision of our great Leader Late Shri Tatyasaheb Kore, Karkhana got industrial license from Government of India Under No. L. 25 N. 15-69 LC dated 11 September 1959. The Warana society was registered on 27th September 1955 under the Maharashtra Co-operative Societies Act, 1960

The Warana Sugar co-operative was not engaged in just to manufacture the sugarcane allied products and to earn profit concern for the benefit of cane cultivators, but a nucleus of all round development of rural area of operation through its cooperative organization and to help for increasing economic growth of rural population, leading towards integrated Rural Development of India, in real sense.

Initially this sugar factory was started with 1000 TCD crushing capacity during 1959-60. Because of increased sugarcane production time to time the karkhana

expansion programme seven times implemented. Last expansion capacity increased from 5000 TCD to 7500 TCD in 2003-04.

Shri Tatyasheb Kore Warana Sahakari Sakhar Karkhana Ltd. is founded by Late Tayasaheb Kore and was leading the same since its inception to his demise in 1994. Thereafter, his name was incorporated in the title of the organization. The Warana Complex comprises several cooperatives, trusts etc.

Table no:1.10 Showing numbers of members, shareholders and share capital

Particular	Number of members	Number of shareholders	Share Capital Rs. In Lakh.
1	**2**	**3**	**4**
Productive member '**A**'-Class	20006	21,864	2043.75
Nominal member-'**B'-** Class			
Personal-	6	8	0.40
Cooperative society-	73	107	10.70
Total	**20,085**	**21,979**	**2054.85**

Source:-Annual Report 2012-13

The area of operation of karkhana is spread in Two Districts i.e. Kolhapur (Panahala-19 villages, Hataknagale-26 villages, Karveer-5 villages) and Sangli district (Shirala-7 villages, Walawa-23 villages) total villages including in that area is 80 villages and out of Maharashtra 267 villages in the year 2012-13.

1.6.4 Various Awards and Achievements:

1. Late Vasantdada Patil Award for best sugar factory in Maharashtra having revolving trophy and cash prize of Rs.25000 for the season 2005-06 from VSI, Manjari (Bk)
2. 2005-06:-"Oos Bhushan Puraskar" awarded to our member Mr. Chandrakant S. Patil, At Post-Ambap in South Zone by VSI, Pune for the highest yield of 224.43 metric tons/hater during the season 2005-06.
3. Efficiency award " Award for maximum export of sugar" in India to the sugar factory for the season 2006-07 from National Federation of Co-operative Sugar Factories Ltd. New Delhi.
4. "Best Financial Management Award" in the South Zone of Maharashtra for the season 2006-07 from VSI, Manjari (Bk).

5. "Best Cooperative Society" Award given on 7th March 2008 by District Deputy Registrar Cooperative Societies , Kolhapur on the eve of cooperative movement Centenary.
6. Efficiency Award " Award for maximum export of sugar" in India to the sugar factory for the season 2007-08 from National Federation of Co-operative Sugar Factories Ltd. New Delhi.
7. First Award in 38th Flower Show and competition organized by Garden Club, Kolhapur to the sugar factory for Shetkari office garden in the category " Gardens (Societies and Public) medium and another on is for Tatyasaheb Kore Smruti Van (Warananagar) in the category "Garden" (sugar factories) small.
8. "Oos Bhushan Puraskar" awarded to factory member Mr. Balasaheb S. Jadhav, At Plost-Yelur, Taluka- Walwa, Dist-Sangli in South Zone by VSI, Pune for the highest yield of 86032 pre seasonal variety 325.590 M.T./ha. During the season 2008-09.
9. Ward and Memento from Industry Ministry, Government of Maharashtra for Excellent work done in Maximum Sugar Export during the year 2007-08 and 2008-09.
10. Warana Complex Best Executive Award to Shree. Vasantrao Shivling Chanvan (Managing Director) its sugar factory at the auspicious hands of his Excellency Bharat Ratna Dr. APJ Abdul Kalam, Former Prisident of India on eve of Golden Jubilee Celebrations of the sugar factory.
11. ISO-9001:2008 Certification from M/s TUV Management Service Gumbh, Unternehmensgruppe TUV Suddeutshlan. Warana sugar factory is only sugar factory who has achieved this certificate in first number and first attempt in the cooperative sugar sector of Asia.
12. National Federation of Co-operative Sugar Factories Ltd. New Delhi.has awarded the "Maximum Sugar Export" in the season 2011-12.

1.6.5 By-products Units:

1. Bagasse based pulp and paper mill:

For getting benefits from by-products karakhana has installed bagasse based pulp and paper mill in 1983 with capacity of 20 metric tons per day production of white cream wove paper of 45,60 gram mage. Now karakhana has installed and commissioned 8 TPD Sodium Lignosulphonate Unit. Sodium Lignosulphonate is

produced from black liquor of sugar factory with some other chemicals. This chemical is used in cement and paint Industries like oil and natural gas corporation and leather industry.

2. Distillery Plant:

In the year 1989 factory has installed and started Distillery plant to utilize the by-product molasses with 30000 lit. Per day capacity producing Industrial Alcohol and Rectified spirit. Now the karkhana has modernization and increased the capacity of distillery up to 60000 lit. Per day.

3. Bio-composting plant:

The factory distillery effluent is one of the most polluted item. The factory management has adopted composting technique for the treatment and disposal of spent waste, press mud, bagasse and other culture are mixed in definite proportion with the spent wash and aerated for about 21-days to get good quality of compost. The ready compost is distributed to the member farmers at a reasonable rate.

Composting is a biological process in which the organic matter is degraded under controlled condition. It involves microbial degradation of organic matter leading to complete mineralization. The Warana distillery applied Bio-Earth composting process. In this process press cake is arranged in windrows of 6^{th} fit high and 14 fit wide at the base. Boiler ash and if available bagasse are also mixed. Spraying of the effluent on the windrows is carried out a specific interval. Another special feature of this system is the use of an equipment known as Aero tiller. This machine traverses windrows thoroughly aerating and agitating the composting mixture and grinding and shredding lumps to a uniform size. Bio-Earth composting include the contains nitrogen, phosphorus and less calcium. Because of Bio-Earth composting advantages to the farmers in surrounding area. Bio-Earth composting increasing soil resistance, soil fertility and productivity capacity. Also this method many advantages to the sugar factory i.e. zero pollution, high product value, and quick payback, dry bag gable product, easy to handle and transport.

4. Warana Cogeneration Project (Projected):

44 M.W. capacity bagasse based cogeneration power plant in construction on factory site. This plant has been prepared for implementation on Build, Own, Operate, and Transfer (BOOT) principles and will be transferred back to Warana sugar factory after 7 to 8 years. The Government of Maharashtra provides Urjankur Nidhi (Fund) a scheme under Urjankur Trust.

1.6.6 Other Development Project in Warana complex:

1.The Warana Dairy:

The other major economic activity is that of the Warana Dairy which is registered as a cooperative society established in the year 1968. It daily collects about five lakh liters of milk and annual sales have now surpassed Rs.600 corer. It sells milk and various milk products and also exports the same.Warana is the largest selling brand of Shrikhand in our country. The dairy also produced skimmed milk and ghee. Cadbury gets some of their products manufactured here.

2.The Warana Bazar:

The Warana Bazar is the first super bazaar in the rural India. Registered as Shree Warana Vibaga Sahaklari Grahak Mandal Lit. The Warana bazaar started its operations in 1978. It has now two big departmental stores, 55 branches, and three franchisee. With 550 employees this year the annual sales are likely to cross Rs. 125 crore. This consumer cooperative has proved to be a grand success because of several innovative ideas put into action. Customer gets goods cheaper at the wararn Bazar than anywhere else. The consumer cooperative movement in these States gets active help from the warana bazaar.

3.Warana Sahakari Bank Ltd.:

Established in 1966, the Warana Sahakari Bank Ltd. is a primary cooperative bank with 25 branches now mostly in the rural area. This bank is playing a pivotal role in the overall development of Warana area by creating the banking mind to mobilize deposit and advancing loans to its customers. The deposits with this bank have now reached 500 corer.

4.Educational activities:

All the educational activities in Warananager from KG to PG are managed by Warana Vibhag Shikshan Mandel in its 100 acre sprawling campus. After Warana sugar factory came into operation the Late Tatyasaheb Kore realized that the immediate need of the area of operation is a college and so even before the primary and secondary educational facilities were set up at Warananager also the college was established . Now the campus of the Shikshan Mandal comprises schools and colleges

teaching Arts, Science, Commerce and Engineering, Technology, Pharmacy and also Sainik School.

5. Warana Bhagini Mandal:

Warana Bhagini Mandal registered as a trust provides gainful employment to hundreds of ladies in various trades. A notable programme undertaken by this trust is providing training to girls who have failed to their SSC examination. The Waran Bhagini Mandal gives them training of a very short duration in several trades enabling them to become self employed and making them confident of face the life.

6. Irrigation Schemes:

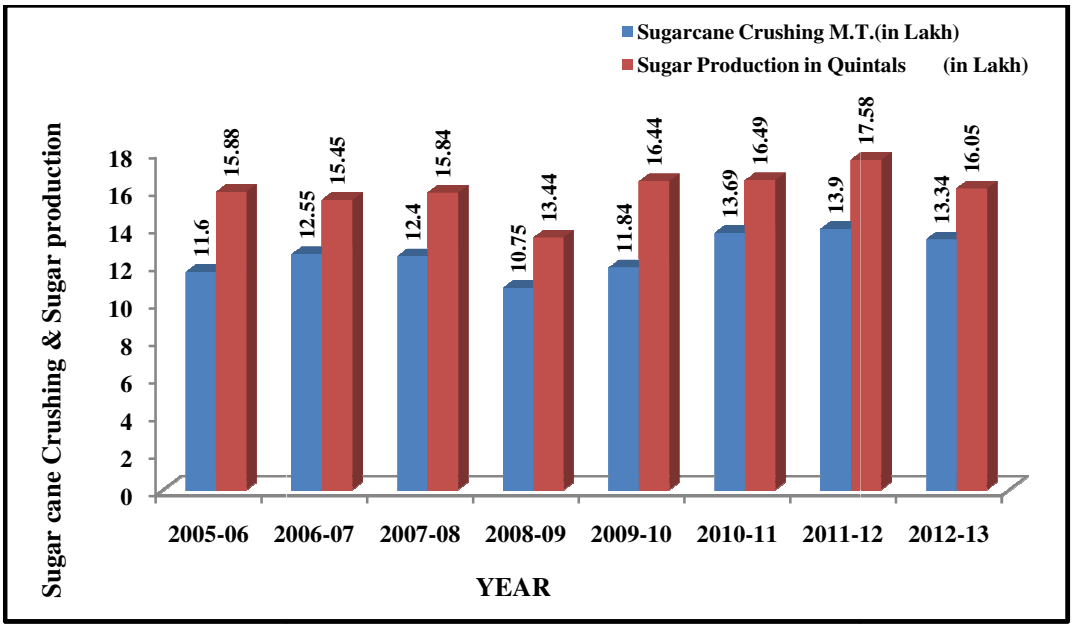
Various new irrigation schemes started in the area of operation under the management of sugar factory and increased the sugarcane production about three lakh sugarcane Per year and thus saved the transportation costs in corer of rupees.

Table No.1.11 Showing Warana sugar factory Production Performance

Year	Crushing capacity TCD	Crushing days	Sugarcane Crushing M.T.(in Lakh)	Sugar Production in Quintals (in Lakh)	Sugar Recovery %
1	**2**	**3**	**4**	**5**	**6**
2005-06	5000	149	11.6	15.88	12.62
2006-07	7500	158	12.55	15.45	12.26
2007-08	7500	170	12.4	15.84	12.7
2008-09	7500	137	10.75	13.44	12.2
2009-10	7500	169	11.84	16.44	12.35
2010-11	7500	193	13.69	16.49	11.94
2011-12	7500	169	13.9	17.58	12.65
2012-13	7500	161	13.34	16.05	12.01
Total		**1306**	**100.11**	**127.17**	**98.73**
Mean		**163.25**	**12.51**	**15.90**	**12.34**
S.D.		**16.57**	**1.10**	**1.18**	**0.29**
C.V.		**10.15**	**8.75**	**7.42**	**2.37**

Source: Annual report 2012-2013and field work

Graph No.1.4 Shows sugarcane crushing and sugar production



The table no.1.4 shows that the duration of crushing days ranged between 137 days as minimum during the year 2008-09 and 193 days as maximum during the year 2010-11. The mean value of the crushing days as 163.25 it was compared expected norms 160 number of crushing days of the State it show that these factory completed the expected norms. The high C.V. (10.15) value indicates more fluctuations in the duration of the crushing days.

It is observed from the table no.1.4 the mean value of sugarcane crushing during this study period is 12.51 lakh metric tons. The quantity of sugarcane crushed ranged between 10.75 Lakh metric tons during the year 2008-09 and 13.90 lakh metric tons during the year 2011-12. The C.V.(8.75) value indicate more fluctuations in the quantity of the cane crushed during this period.

The mean value of the sugar production by this sugar factory during the study period comes to 15.90 lakh quintals. The sugar production ranged between 13.44 lakh quintals as minimum during the year 2008-09 and 17.58 lakh quintals as maximum during the year 2011-12. The high C.V. (7.42) value indicate more variation in the quantity of sugar produced during this period.

The table no.1.4 also shows the mean value of sugar recovery percentage comes to 12.34 percent. This sugar factory operates in the high sugar recovery Zone of the Maharashtra State. During the year 2011-12 season the State average sugar

recovery 11.66 percent. But the mean value of this sugar factory sugar recovery 12.34 percent, it was more than State average. The lower C.V.(2.37) value indicates there was more uniformity in the sugar recovery percentage during this period.

1.7 Name and Address of the factory: Shree Chha. Rajaram Sahakari Sakhar Karkhana Ltd. Kasaba Bavada , Tal-Karveer, and Organizational Profile

Registered No : KPR/KVR/PRG/A (2)(S)1983-84dated-11thAprial1984

First crushing season : 1985-86.

Age of the factory : 26

Initial capacity : 2200 TCD.

Present crushing capacity : 2200 TCD.

The main speciality or highlights of the sugar factory:

- **It is small scale plant in the co-operative sugar factory.**
- **It is not started any other by-products units.**
- **Firs example in Maharashtra Joint Stock sugar factory was converted into a fully fledged cooperative sugar factory under the cooperative management.**

1.7.1 Brief history:

The Kolhapur Sugar Mills Pvt. Ltd. was established in 1932-33. In the year 1973 sugar undertaking of the company was separated and renamed as "The Kolhapur Cane sugar Works Ltd."The Kolhapur Cane sugar works ltd. defaulted payment of cane price of the season 1982-83 to the tune of Rs. 2.51 corers and deposit with interest from 1978-79. The total dues amounted to around Rs.7.00 corers. The management of the company was reluctant to pay the dues of cane growers.

1.7.2 Location:

Shri. Chha. Rajaram Sahakari Sakhar Karkhana Ltd., Kasaba Bawada location on 7 Kms.North from Kolhapur city. Kolhapur is gifted by the presence of Natural irrigation potential on account of Panchganga River due to this the sugarcane crop is produced in abundance in this region. Because of in this region there was really extreme need of sugar factory in those days.

Photo No. 5: Rajaram Factory Building

Source: Annual Report

1.7.3 Uskari Shetkari Sanghathana :(Sugarcane Farmers Organization)

The Uskari Shetakari Sanghathana under the leadership of Shri. Bhagawanrao Pawar agitated with the management of the company, for getting arrears of cane payment and deposit. With the keen interest and help rendered by the Government of Maharashtra and the relentless efforts of the Sanghathana .The ownership of Sugar factory was handed over to the Cooperative sugar factory Shri Chha. Rajaram Sahakari Sakhari Karkhana Ltd. formed by the Sanghathana in lieu of the cane dues. Thus the Joint Stock sugar factory was converted into a fully fledged cooperative sugar factory under the cooperative management.

1.7.4 About the factory:

The assess the value of the Kolhapur Cane sugar Works Ltd. the valuation committee was appointed by the Government of Maharashtra under the Chairmanship of the Director of Sugar, Maharashtra State. The valuation committee had valued the entire unit at Rs.6.66 corers

Shri. Chha. Rajaram Sahakari Sakhar Karkhana Ltd. was registered on 11th April 1984. An agreement was executed between the Kolhapur Cane sugar Works Ltd. and Shri. Chha. Rajaram Sahakari Sakhar Karkhana Ltd, 31st October 1986 to

the effect that the latter had taken full responsibility of payment of all dues the former had to pay to the cane growers.

Regarding the liabilities of cane price dues which are accepted by the karkhana. We have paid all the dues in the month of March 1987. The liabilities of the deposits are also paid for Four years. The total amount of payment amounted to Rs.450 lakhs. The above mentioned amount is paid by taking medium term loan from the Maharashtra State Cooperative Bank Ltd.

This is a unique case of its kind in our Country i.e. conversion of a sick Joint Stock sugar factory onto a cooperative sugar factory to pay all the cane arrears to all the cane growers and revive their aspirations, majority of whom are small and marginal cane growers.

1.7.5 Modernization and Rehabilitation:

The machineries assembled before 50 to 60 years and working till today seem to be changed in the factory. It has become essentials to change the machineries. That is why the management has undertaken the task of reassembling of the machinery in the factory. For this purpose some machineries and tools are being purchased. This programme Kohapur District Cooperative Bank has provided Rs.138 Lakh for five years on the basis medium term loan in the year 2008-09. Some of the amount is repaid by the factory.

The cogeneration plant was sectioned by the members of the factory in the annual general meeting. The factory management cogeneration plant design has been sent thru V.S.I. to Commissioner of Sugar for the approval.

Table No.1.12 showing number of member and number of shareholder

Particulars	**Number of Member**	**Number of shareholders**	**Subscribed Share capital in Rs.**
1	**2**	**3**	**4**
'A' Class productive	15,700	17,396	12,41,29,467
'B' Class cooperative	136	272	11,76,000
Govt. of Maharashtra	1	11500	-
Total	**14862**	**28223**	**12,53,05,467**

Source: Annual Report:-2012-13

1.7.6 Sugarcane development scheme:

The various cane development activities implemented by the factory for the benefit of farmers. In this scheme supply of sugarcane seeds, chemical fertilizers, bio-fertilizers, organic manure, at consenal rate is as follows.

Particulars	**Distributed amounted to members Rs.**
Sugar cane seeds	17,19,483
Chemical fertilizers	54,89,396
Bio fertilizers	4,51,044
Total	**76,59,893**

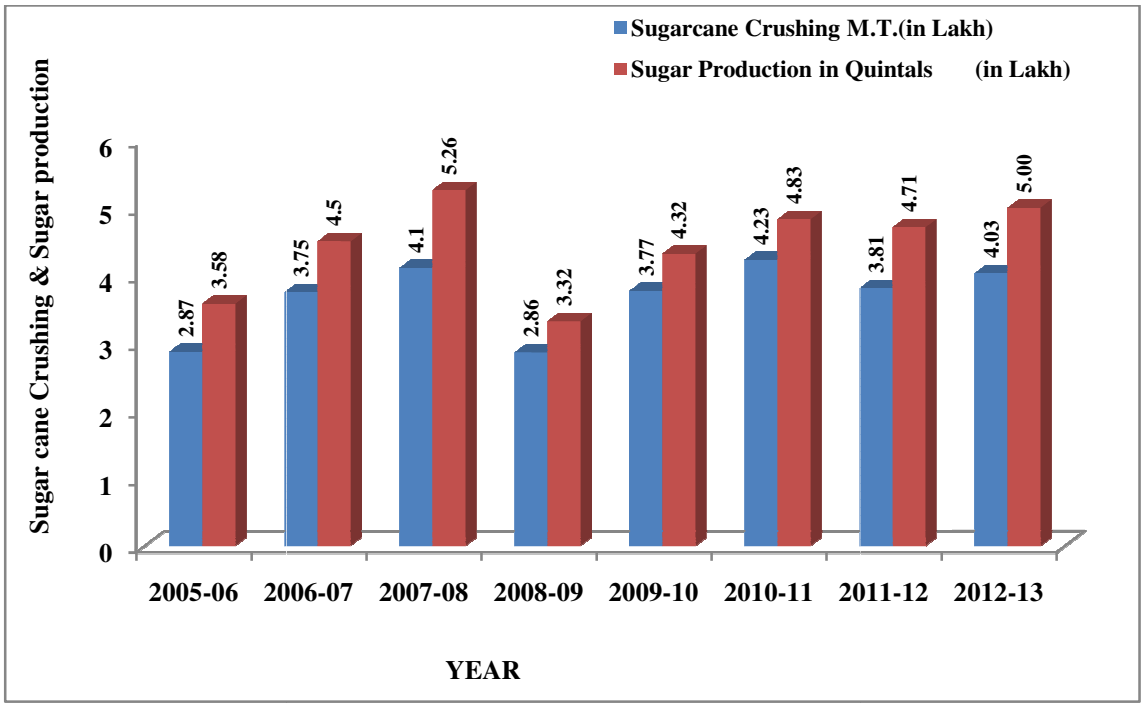
Source: Annual Report:-2012-13

Table No.1.13 showing Rajaram sugar factory Production Performance

Year	**Crushing capacity TCD**	**Crushing days**	**Sugarcane Crushing M.T.(in Lakh)**	**Sugar Production in Quintals (in Lakh)**	**Sugar Recovery %**
1	**2**	**3**	**4**	**5**	**6**
2005-06	2200	97	2.87	3.58	12.47
2006-07	2200	126	3.75	4.5	12.01
2007-08	2200	147	4.1	5.26	12.79
2008-09	2200	99	2.86	3.32	11.6
2009-10	2200	160	3.77	4.32	11.5
2010-11	2200	163	4.23	4.83	11.47
2011-12	2200	141	3.81	4.71	11.65
2012-13	2200	131	4.03	5.00	12.39
Total		**1064**	**29.43**	**35.52**	**95.88**
Mean		**133.00**	**3.68**	**4.44**	**11.99**
S.D.		**25.05**	**0.53**	**0.68**	**0.51**
C.V.		**18.84**	**14.41**	**15.28**	**4.24**

Source: Annual Report:-2012-13and field work

Graph no.1.5 showing sugarcane crushing and sugar production



The duration of season largely depends on availability of cane. The table no.1.9 shows the mean value of crushing days 133. The duration of crushing season ranged between 97 days as minimum during the year 2005-06 and 163 days as maximum during the year 2010-11. The high C.V. (18.84) value indicate more fluctuations in the length of season during this period.

In the study period mean value of cane crushed 3.68 lakh Metric tons. During the seven years the quantity of cane crushed ranged between 2.86 lakh tones in 2008-09 as minimum and 4.23 lakh tones in 2010-11 as maximum. The high C.V. (14.41) indicates there was more variations in the quantity of the cane crushed .

The mean value of the sugar production by this factory during the study period comes to 4.44 lakh quintals. The sugar production ranged between 3.32 lakh quintals as minimum during 2008-09 and 5.26lakh quintals as maximum during the year 2007-08. The high C.V. (15.28) value indicates more variations in the quantity of sugar production during this period.

This sugar factory operates in the high sugar recovery zone of the Maharashtra state. During 2011-12 season, the state average sugar recovery 11.66 percentage. But the mean value of this sugar factory is 11.94 percent. The lower C.V. (4.36) value indicates there was more uniformity in the sugar recovery percentage during this period.

1.8. Conclusion:

It is concluded from the sample sugar factories studied the production performance of sugar factory in last eight years. In that production performance analysis shows sugarcane crushing, duration of season, sugar production and sugar recovery of cane. It shows sugarcane crushing, duration of season and sugar production is always wide fluctuation. These fluctuations are due to variations in the area under sugarcane, climatic conditions, water availability during the crop growth period. The duration of season largely depends on availability of cane. For economic working of any factory the duration of the crushing season should be around 160 days. The Warana sugar factory is the highest average the duration (163-days) of crusing season and Datta sugar factory second rank in sample sugar factory in relation to duration of crushing season. The Warana sugar factory is the highest average sugarcane crushing (12.51 lakh M. T.) and the highest average sugar production (15.51 lakh in quintals) in all the sample units in the study period. Sugar recovery is the most vital economic indicator of any sugar factory. The sugar recovery mainly depends on the quality of cane which also includes types of cane varieties their maturity at the time of harvest and total sugar losses during processing. The highest average recovery (12.95%) in the Kumbhi sugar factory and all the sample sugar factory average recovery near about (12%) in the study period. During the study period all the sample sugar factory the continuous crushing of cane through out crushing period is one the important factors to achieve optimum technical performance.

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CHAPTER- II

Theoretical Background

Chapter Design

This chapter deals with theoretical background of sugarcane industries and its brief history. Also the concept of sugarcane by-products and present scenario sugar industry and by-products and also the concepts of functional areas like production, finance, marketing and H.R releated to the sugar industry.

2.0 Introduction:

Importance of Sugar Industry in the world economy is very well known and hardly needs any emphasis. Sugar is important ingredient of human diet and its consumption is directly proportional to the life style and economy of that country. Above ninety countries in the world produce sugar from sugarcane. Brazil emerged as the largest producer of sugar in world to be used raw material for the production of not only sugar but also alcohol from sugarcane.

In other countries sugar is a by- product. But in India's sugar is the main product produced by sugar mills. India is producing a large quantity of sugar because of our own needs, but now a days only sugar production is not profitable for sugar mills. Sugar industry needs to increase their capacity in by-product like alcohol, co-generation, ethanol etc.

Sugar is available in nature in the different parts of a plant, such as roots, stems, leaves, fruits, flowers and as sap. But, commercial sugar is produced from sugarcane in the tropical countries and sugar beet in the countries with temperate climate. There are two raw-materials of sugar i.e. sugarcane and sugar beet.

2.1 Sugar Beet:

Sugar beet (botanically known as Beta Vulgarize L) is like carrot in shape with a white skin and white pulp inside. Sugar beet is quite different from garden beet. Which is purple color and used as a vegetable. A normal beet root weight about 1 to 2 kegs, and grows below the ground with leafy foliage above the ground. Sugar beet crop requires a fairly cool climate, mean temperature being 20^0 c with good rain fall of irrigation during the growing period, accomparcied by bright sun shine, which

helps the growth of the roots considerably. Sugar beet is mainly growth in Europe, Russia, Ukraine, China, Japan, U.S.A., Chile etc.

2.2 Sugarcane:

Sugarcane is a type of giant grass belonging to the family, botanically known as 'Saccharum' a generic name of sugarcane. One of the cultivated species of 'Saccharum' is known as 'Saceharum Officinarum'. The wild form of the sugar cane belongs to the family, botanically known as 'Saccharum Spontaneum' The cultivated wild varieties of sugarcane have played a very important role in the evolution of new commercial varieties of sugarcane, now grown by hybridization and selection techniques.

2.2.1 History of Sugarcane:

Published literature in many countries say without any contradiction that sugarcane was born in India, thousands of years ago. According to Dr.G.Muller, floricultural, linguistic and historical researches jointly lead to the conclusion that India was the original home of sugarcane. Noel Deerr and Quintus indicated that sugarcane was probably native of India, were it was known as early as the Hindu period. From ancient times sugarcane was reported to be growing in South China. In Java(Indonesia) the cultivation of sugarcane was reported by a Chinese traveler Fa Hian in A.D. 424 sugarcane is reported to have travelled westwards to Arabia, and along the Mediterranean to Spain in A.D.755.

According to Von Lippmann, the year wise introduction of sugarcane different countries is as follows.

Table No.2.1 Geographical Distribution of Sugar Cane OR History of Sugarcane

Year	Occurrence or Country of Cultivation
About 327 B.C.	First introduction of sugarcane into Europe, after the campaign of Alexander the Great.
250 B.C.	Chaina
1 A.D.	Malay Archipelago
634 A.D.	Egypt
680 A.D.	Syria
700 A.D.	Cyprus
714 A.D.	Spain
827 A.D.	Sicily

900 A.D.	Tyrus, Tripolis etc.
1100 A.D.	Zanzibar
1420 A.D.	Madeira
1480 A.D.	Canary Islands, St. Thomas etc.
1493 A.D.	San Domingo
1502 A.D.	Brazil
1520 A.D.	Mexico
1533 A.D.	Peru
1620 A.D.	Argentina
1641 A.D.	Barbados
1673 A.D.	Louisiana
1712 A.D.	Mauritius
1788 A.D.	Australia

Source: P.J. Manohar Rao (1997)- Industrial Utilization of Sugar Cane and its co-products.(Page No.6)

2.2.2 Geographical Distribution of Sugarcane:

Sugarcane growing countries of the world are lying between the latitude 36.7^0 North and 31.0^0 South of the equator extending from tropical to sub-tropical zones. In India sugarcane is cultivated all over the country from latitude 8^0 N to 33^0 N, except cold hilly areas like Kashmir valley, Himachal Pradesh and Arunachal Pradesh. There are two distinct sugarcane growing belts (tropical and subtropical) in the country which are characterized by market difference in climatic and agricultural conditions. The tropical sugarcane belt comprises of Maharashtra, Gujarat, Arunachal Pradesh, Tamil Nadu, Karnataka, Orissa and Kerala. The sub-tropical belt consists of Uttar Pradesh, Bihar, and Punjab, Haryana, Rajasthan, West Bengal, Assam and part of Madhya Pradesh.

2.2.3 Composition of Sugar Cane:

Sugarcane, with its high fiber and carbohydrate content constitutes an important renewable source of energy. During its long growth period of 10 to 16 months this plant converts good amount of solar energy into sugar and cellulose and is considered to be one of the most energy efficient crops in that the energy provided by the biomass of fully grown cane is four times the energy input during the crop cultivation. Sugarcane sets are planted in soil and the plant develops growth in the

course of its life cycle, during which it converts water and CO_2 from atmosphere into carbohydrates in the presence of sunshine a phenomenon termed as photosynthesis. The chemical composition of sugarcane varies widely depending on many factors. The average figures in are given below.

Table No. 2.2 Shows Composition of sugarcane

Composition	**% in Sugarcane**
Water	75
Solids	25
Fiber	13
Soluble solids	12
Sugar	10.5
Sucrose	9.8
Invert sugar	0.7
Non-sugar	1.5
Organic non-sugar	0.8
Nitrogenous substance	0.2
Proteins	0.06
Amino-acids	0.14
Nitrogen-free substances	0.1
Carboxylic acids	0.03
Starch, wax, fats,	0.02
Unidentified substances	0.5
Mineral matter	0.7

Source:- P.J. Manohar Rao, India (1997)- Industrial Utilization of sugarcane and its co-products. (Page no.13)

2.3 Status of the World cane sugar industry:

The total crystal sugar manufactured in the world is over 110 million tons per annum, out of which the cane sugar accounts for 60-65% of the production, the remaining being the share of the beet sugar industry located mostly in Europe, U.S.A. and some cold regions of the global. The cane sugar industry is widely dispersed in different regions of the world like India, Australia, South America, Africa, U.S.A. and many parts of Asia, enjoying tropical warm climate. The types of sugar produced into four categories as under.

2.3.1 Raw Sugar: In many sugar producing areas raw sugar of 98.99 purity is produced from cane, which is sent to refineries or exported. This sugar being unsuitable for direct consumption is later converted into refined sugar of very high purity.

2.3.2 Refined Sugar: White and sparkling in appearance the refined sugar is of 99.9% purity and is used directly for human consumption, besides a small proportion for pharmaceutical and chemical industries.

2.3.3 Raw Sugar factories cum refineries: In these factories producing raw sugar from sugarcane, small refining units are installed for processing the raw sugar and manufacture of refined sugar.

2.3.4 Plantation white sugar factories: In India and some of the developing countries white sugar is manufactured from cane for direct consumption employing more complicated techniques in clarification of juice and also in crystallization of sugar. The sugar produced is of 99.8% purity and contains slightly higher amount of impurities than the refined sugar.

Importance of sugar Industry in the world economy is very well known and hardly needs and emphasis. Sugar is important ingredient of human diet and its consumption is directly proportional to the life style and economy of that country. Therefore in many countries there is drive for producing enough sugarcane for internal consumption. In most countries the sugar industry has been insulated from impact of happening in the international sugar market so that global prices do not affect producers and consumers. These regulatory phenomena have impacted production import and export of sugar and growth of sugar industry worldwide.

Table No.2.3 Trends in world sugar production. (Million tons)

Sr. No.	Particulars	2009-10	2010-11	2011-12	2012-13
1	Sugar production from sugarcane	119.21	133.64	136.67	139.92
2	Sugar production from sugar beet	34.52	32.03	37.88	37.18
3	Total world sugar production	153.73	165.67	174.55	177.18
4	India's Sugar Production	20.55	26.45	28.50	25.14
5	Indians contribution to world Sugar Production (%)	13.36	15.96	16.33	14.18

Source: F.O. Licht's World Sugar Balance-2013/14 Date: 1/11/2013

Table No. 2.4 World Sugar Balance (October-September) (Lakh tones, raw value)

Sugar	Year			
	2009-10	**2010-11**	**2011-12**	**2012-13**
1	**2**	**3**	**4**	**5**
Opening stock	629.35	597.09	621.09	683.36
Production	1590.11	1649.32	1759.25	1774.0
Imports	604.92	580.83	564.45	631.90
Consumption	1600.11	1599.69	1648.49	1715.0
Exports	627.18	606.46	607.04	661.20
Ending stocks	597.09	621.09	689.26	767.46
+/- Production	72.19	59.21	109.93	81.30
+/- Percent	4.16	3.72	6.67	4.64
+/- consumption	0.70	-0.42	48.80	45.00
+/- Percent	0.04	-0.03	3.05	2.69
Stock % consumption	37.32	38.83	41.81	44.59

Source: F.O. Lichts World sugar Balance - 2012/13 Date-1.11.2012.and 1/11/2013 And 1st Sugarcane Agriculture and Sugar Technology "Bharati Sugar"

There was rise in global sugar production consecutively in last two seasons 2010-11 and 2011-12 with 1649.32 and 1759.25 lakh tones (raw value) showing a rise of 59.21 and 109.93 lakh tones as compared to that of 2009-10 respectively. The main contribution this increased sugar production were Thailand, India, Phillippines and Australia. World consumption of sugar was 1648.49 lakh tones. During 2011-12 Seasons, there was sugar production of 110.76 lakh tones (raw value) more than requirement of global demand. The stock to consumption ratio was 41.81% in 2011-12 and there was rise in sugar production by 6.67% over the previous season.

2.4 Development of the Indian sugar industry in pre-independence period:

Before the year 1900 there were no sugar factories in India to produce crystal sugar from sugarcane, but there were few refineries set up by British companies to refine cane jiggery and palm jiggery into crystal sugar. The first vacuum pan sugar factory for producing crystal sugar from sugarcane was established in Uttar Pradesh in 1903. The industry expanded slowly until 1932. By 1931-32 there were only 31 sugar factories in India having small crushing capacity and most of them were located

in Uttar Pradesh and Bihar. The total sugar production in India was only 1.6 lakh tones per annum. Therefore, sugar had to be imported into India from other countries for several years. The Tariff Board appointed by the Government of India recommended for grant of fiscal protection to the Indian industry in 1932 to develop and stabilize the sugar production in India. This protection was by way of imposing a heavy Custom Duty on the sugar imported into India from other countries thereby enabling the Indian sugar Industry to complete favorably with the imported sugar. As a result of the protection there was a sudden spurt in the establishment of new sugar factories in India by 1940-41. The number of factories rose to 148 and sugar production reached 11.1 lakh tones annually. Thus import of sugar from other countries gradually declined.

Table No.2.5 Shows Area under Sugarcane, Yield cane tone per hector and production of sugarcane Pre-independence period.

Year	Area under sugarcane (000hectare)	Yield of cane tones per hector	Production of sugarcane (000 hector)
1	2	3	4
1930-31	1176	30.9	36354
1934-35	1485	37.9	56218
1940-41	1617	32.1	51918
1944-45	1435	34.5	49558
1945-46	1299	36.4	47273
1946-47	1428	35.4	50568

Source:-Indian Sugar, December 2012

Table No.2.6 show progress of Sugar industry Pre-independence Period

Year	No. of factories in operation	Total cane crushed (000 tones)	Recovery of sugarcane	Total sugar Production (000 tones)	Average duration Days
1	2	3	4	5	6
1930-31	29	1339	8.96	120	---
1934-35	128	6655	8.69	578	104
1940-41	148	11,492	9.70	1113	113
1944-45	141	9386	10.22	958	96
1945-46	145	9369	10.08	945	92
1946-47	137	9140	9.82	903	92

Source: "Indian Sugar" December 2012.

2.4.1 Development of the Indian sugar industry in Post-independence period:

India got freedom in the year 1947 and adopted mixed economy system. After independence the congress part laid down and adopted a socialistic pattern of society. Indian Government started planned economic growth which them initiated five year plan was started in the year 1951. In 1951-52 the sugar production was reduced to 15.2 lakhs tones. The government provided incentives by raising the maximum price of sugarcane and maximum price of sugar. The result was a rise in output.

With the re-emphasis in Industrial policy Resolution of 1956 for building up a large and growing co-operative sector, the Government of India started licensing of new sugar factories giving preferences for the establishment of sugarcane grower's co-operative factories. It is this preferential policy that is responsible for the existence of so many co-operative sugar factories in India.

Table No. 2.7 Area under Sugarcane and Production of sugarcane in last ten years.

Sr. No.	Year	Area under sugarcane ('000 hectare)	Production of Sugarcane (.000 tonnes)
1	2002-03	4520	287,383
2	2003-04	3938	233,862
3	2004-05	3662	237,088
4	2005-06	4201	281,172
5	2006-07	5151	355520
6	2007-08	5055	348188
7	2008-09	4415	2,85029
8	2009-10	4175	292302
9	2010-11	4886	342382
10	2011-12	5085	357667
11	2012-13	5064	338963
12	*2013-14	4921	341773

*Source: 'Co-operative Sugar' January – 2013: Vol. 44. No.5,and December-2013; Vol. 45, No.4 *Estimated figure*

At present, there are 535 sugar factories in the year 2012-13. In this season the country produced 251.00 lakh tones of white sugar. India is the second largest sugar producer in the world after Brazil and contributes 40-44% production share of Asia.

The sugarcane is grown in 21 various states of India on 50.00 lakh hectare area. Out of total sugar production, 60-65 is utilized for production of white sugar and remaining is used the manufacture of gur, Khan sari, seed and chewing purposes. Maharashtra, Uttar Pradesh, Tamil Nadu, Karnataka and Gujrat are the major sugar producer's state of the country with production share of 85%

Table No. 2.8 Performance Regarding Sugar factories in last ten year.

Year	No. of factories in operation	Average duration days	Total cane crushed (000 tonnes)	Total sugar production(000 tonnes)	Recovery of sugar (% cane)
1	2	3	4	5	6
2002-03	453	140	194,365	20145	10.36
2003-04	422	99	1,32511	13546	10.22
2004-05	400	97	1,24,772	12690	10.17
2005-06	455	125	1,88,672	19267	10.21
2006-07	504	173	2,79,295	28367	10.16
2007-08	516	149	2,49,906	26357	10.55
2008-09	489	87	1,449863	14539	10.03
2009-10	490	109	1,85,548	18912	10.19
2010-11	527	135	2,39,8.7	24394	10.17
2011-12	529	137	2,56975	26343	10.25
2012-13	535	127	2,50,598	25141	10.30
2013-14	-	-	-	23700	-

Source: 'Co-operative Sugar' January – 2013: Vol. 44. No.5
Pudhari Daily-8th October 201, Estimated figure-2013-14

Table No. 2.9 Molasses production and molasses percentage on cane crushed

Year	Molasses production (000 tone)	Molasses (% cane)
1	2	3
2002-03	8879	4.57
2003-04	5905	4.46
2004-05	5513	4.42
2005-06	8549	4.53
2006-07	13111	4.69
2007-08	11313	4.53
2008-09	6546	4.51
2009-10	8400	4.53
2010-11	10970	4.57
2011-12	11824	4.60
2012-13	11745	4.69

Source: 'Co-operative Sugar' January – 2013: Vol. 44. No.5

The above statement showing Area under sugarcane and production of sugarcane, factories in operation, average duration days, total cane crushed, total sugar produced, Molasses production and Recovery % cane. Highest sugarcane crushed 2,79,295 thousand tones and this year sugar produced 28,367 thousand tonnes in the year 2006-07. There was a wide variation sugar production in the range of 13,546 thousand tonnes to 28,367 thousand tones. The sugarcane crushed varied from 1, 32,511 thousand tonnes to 2, 79,295 thousand tones. National average sugar recovery remained in the range of 10.03% to 10.55% the table also shows production of molasses and molasses percentage in cane. Molasses production depend on sugarcane crushed because wide variation of molasses production in the range of 5,513 thousand tonnes to 13,111 thousand tones. Molasses percentage into sugarcane crushed in the range of 4.42% to 4.60% the main factor affecting the sugar production is the availability of raw material sugarcane for crushing. There are wide fluctuation in area and production of sugarcane in cyclic manner. These fluctuations are influenced by price of sugarcane and its products, return from competing crops, proper and timely marketing of cane and the weather conditions at the time of planting.

Table No.2.10 Indian Sugar Balance (October- Sept.) (Lakh tones)

(Production and consumption)

Sugar	2009-10	2010-11	2011-12	2012-13
1	2	3	4	5
Opening stock	32.26	49.83	60.41	69.94
Production	189.12	243.94	260.00	251.41
Imports	40.80	----	2.65	-------
Consumption	210.00	207.36	222.00	226.28
Exports	2.35	26.00	32.00	8.91
Ending stocks	49.83	60.41	69.06	30.00
+/- Production	43.73	54.82	16.06	-12.02
+/- Percent	30.08	28.99	6.58	-4.56
+/- Consumption	-20.00	-2.64	14.64	-6.28
+/- percent	-8.70	-1.26	7.06	2.85
Stock % consume	23.73	29.13	31.11	38.08

Source: Co-operative sugar –November 2013 No.3 Vol.-3

India is the second largest sugar producing country in the world after Brazil. The country's opening stock of sugar of the beginning of 2011-12 was 60.41 lakh tones and produced 260.00 lakh tones of white sugar, which was more by 16.06 lakh tones (6.58%) as compared to the previous season's production of 243.94 lakh tones. Now during season 2012-13 production of sugar India is 251 lakh tones and also estimated sugar production in the year 2013-14 were 237 lakh metric tons.

Table No. 2.11 Showing State-wise Number of Sugar Factories in Operation in India.

Sr. No	State	Number of Sugar Factories (2011-2012)				Number of Sugar Factories (2012-2013)			
		Public	Private	Co-operative	Total	Public	Private	Co-operative	Total
1	Andhra Pradesh	1	28	15	44	1	29	14	44
2	Assam	-	1	2	3	-	1	2	3
3	Bihar	15	13	-	28	15	13	-	28
4	Goa	-	-	3	03	-	-	1	1
5	Gujrat	-	2	23	25	-	2	23	25
6	Haryana	-	3	13	16	-	3	13	16
7	Karnataka	3	40	24	67	3	44	24	71
8	Kerala	-	1	1	2	-	1	1	2
9	Madhya Pradesh	2	11	5	18	2	12	5	19
10	Maharashtra	-	43	167	210	-	54	166	220
11	Orissa	-	4	4	8	-	4	4	8
12	Pondicherry	-	1	1	2	-	1	1	2
13	Punjab	-	8	16	24	-	8	16	24
14	Rajasthan	1	1	1	3	1	1	1	3
15	Tamil Nadu	3	27	16	46	3	27	16	46
16	Uttar Pradesh	33	96	28	157	33	97	28	158
17	UttaraKhand	2	4	4	10	2	4	4	10
18	West Bengal	1	2	-	3	1	2	-	3
19	Chhattisgarh	-	-	3	3	-	-	3	3
20	Nagaland	1	-	-	1	1	-	-	1
21	Dadar Nagar Haveli	-	-	1	1	-	1	1	1
Total		**62**	**286**	**326**	**674**	**62**	**279**	**325**	**666**

Source: Maharashtra Rajya Sahakari Sakhar Karkhana Sangh Ltd. Mumbai. Annual Reports (2012-13) P.41

Growth of cooperative Sector:

The cooperative sector of the sugar Industry in India has played a major role in the growth of India sugar Industry and has been solely responsible for transforming India from a deficit sugar producing country to a surplus sugar country.

After independence, the Govt. of India decided to industrialize the country building up a large and growing cooperative sector and accordingly the principle of cooperation was assigned an important role for the country's economic development of industries based on agriculture produce such as sugarcane. The Gov. of India gave preference to cooperative sector in licensing of new sugar factories. This policy continued till to deli censing of sugar industry in August 1998.

During recent years also co-operative sector has been increasing in importance in sugar industry. There are now cooperative sugar factories producing 108 Lakh tone (44.44%´) in the year 2010-11 and 103 lakh tones (39.16%) in the year 2011-12.

Table No. 2.12 Sugar Production in India in co-operative sector.

Sr. No.	Sugar Production (lakh tones)		All India Total (lakh tones)
	Cooperative sector in Maharashtra	Cooperative sector in India (lakh tones)	
1	2	3	4
2001-02	53.42	94.08	185.28
2002-03	58.94	101.64	201.45
2003-04	29.76	60.15	135.46
2004-05	20.40	46.53	126.91
2005-06	46.84	82.71	192.67
2006-07	83.56	129.86	283.28
2007-08	82.12	123.03	262.92
2008-09	45.80	65.63	145.39
2009-10	60.98	86.30	187.00
2010-11	74.97	108.55	243.00
2011-12	73.17	103.00	263.44
2012-13	58.06	92.89	251.41

(Source: Maharashtra Raje Sahakari sakhar Karkhana Sangh Ltd. Mumbai. (Annual Report 2011-12)

2.4.2 Sugarcane Industry in Maharashtra:

The Maharashtra State is located geographically in the world's most ideal belt for growing sugarcane it is known as tropical region. The other sugarcane areas located in this belt include countries like Australia, South Africa, Cuba, Mexico, Thailand, Brazil, Philippines. These other countries made start in sugarcane growing much earlier than the state of Maharashtra in early thirties only after water supply was assuredly made available by Government irrigation projects. The water has always been and in future also would be the limiting factor in the growth of sugarcane.

The first Cooperative sugar factory set-up Maharashtra was the Pravara cooperative Sugar Factory at Loni in Ahmednagar in the year 1950. Under the leadership of Padmashree Dr.Vikhe Patil and guidance of Prof. D.R.Gadgil, Dr. Vaikunthbhai Mehta and help of Maharashtra State Cooperative Sugar Factory, has set a pattern for other to follow. The successful experiment of sugar factory at Pravaranagar came as a shot in the arm and the Government announced in 1956 the industrial Policy Resolution, which included policy for encouragement to processing of agricultural commodities in the cooperative sector on priority basis. The private sector of sugar industry made pioneering work in sugarcane cultivation and the first sugar factory in Maharashtra. Belapur sugar and Allied Industry Limited was started in private sector in 1919. The industry grew rapidly with 12 factories producing sugar from cane in the state up to pre-independence period. The industry however made phenomenal growth in post independence period there as follows.

Table No. 2.13 Sugar Mills Growth in Maharashtra

Year	No. of Sugar Factory		Total
	Private	Co-operative	
1950-51	12	01	13
1960-61	13	14	27
1970-71	12	30	42
1980-81	11	67	78
1990-91	08	93	101
1999-2000	10	123	133
2010-11	40	167	207
2011-12	51	159	210
2012-13	59	152	211

Source: *1) 56th Annual Report (2011-12) of Maharashtra Raje Sahakrari Sakhar Karkhana Sangha Ltd.*

2) Daily Pudhari Dated 6th June 2012.

In the post independence period the number of cooperative sugar factories in the state increased (1950 to 1999-2000). In the 21st century increased private sugar factory in the state.

Sugar manufacturing has been growing of a massive pace since past few years and a glance of the latest statistics regarding sugar production reveals that Maharashtra is doing better than other State. The sugar Industry in Maharashtra is widely popular in the cooperative sector since farmers possess a share in the sugar mills. In 2011-12 sugar crushing season there were 214 sugar mills in Maharashtra out of 118 co-operative sugar factories and 51 private sugar factories completed their crushing season. Total operating 169 sugar mills produced 89.82 lakh tones of sugar in 2011-12 seasons by crushing 771.25 lakh tones of cane with an average sugar recovery of 11.66% and The average crushing period was of 157 days. Also In 2012-13 crushing season operating sugar mills 171 (cooperative 119 and private 52) produced 779.91 lakh tones of sugar and cane crushed 700.45 lakh tones of cane with an average sugar recovery of 11.43%.

Table No. 2.14 District wise number of installed sugar Factories in Maharashtra State

Sr. No.	Zone/ Districts	No. of Sugar Factory		
		Co-operative	Private	Total
I. South Maharashtra				
1.	Kolhapur	18	03	21
2.	Sangli	15	03	18
3.	Satara	08	O3	11
Total		**41**	**09**	**50**
II. Central Maharashtra				
4.	Pune	12	05	17
5.	Solapur	15	15	25
6.	Ahmednagar	16	06	22
7.	Nasik	05	03	08
Total		**48**	**29**	**77**

Table Contd….

III. North East Maharashtra				
A) Khandesh				
8.	Dhule	04	-	04
9.	Jalgaon	06	01	07
10.	Nandurbar	02	01	03
Total(A)		**12**	**02**	**14**
B)Marathwada:				
11.	Aurangabad	07	02	09
12.	Jalna	05	01	06
13.	Beed	07	01	08
14.	Parbhani	--	04	04
15.	Hingoli	03	--	03
16.	Nanded	07	--	07
17.	Osmanabad	08	06	14
18.	Latur	08	04	12
Total(B)		**45**	**18**	**63**
C) Vidarbha				
19.	Buldhana	01	03	04
20.	Yeotmal	03	01	04
21.	Akola	01	--	01
22.	Wasim	01	--	01
23.	Amaravati	03	01	04
24.	Wardha	01	01	02
25.	Nagpur	02	01	03
26.	Bhandara	--	02	02
Total (c)		**12**	**09**	**21**
III. North-East Total(A)+(B)+(c)		67	27	94
State Total(I+II+III)		**156**	**58**	**214**

Source :- Technical Performance of sugar Factories in Maharashtra (V.S.I.) (2012-13).

Table No. 2.15 Seasonal, Statistics of Sugar Factories in Maharashtra.

Sr. no.	Particulars	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
1	No. of Installed Sugar mills	187	188	193	195	199	209	214	225
2	Installed capacity(lakh TCD)	4.48	4.55	4.71	4.77	4.99	5.35	5.52	5.91
3	No. of Sugar Factories not in operation	45	25	19	48	57	42	42	54
4	No. of Sugar Factories in operation	142	163	174	147	142	167	172	171
5	Gross days	121	189	182	107	170	186	157	132
6	Sugarcane Crushed(lakh tones)	445.71	7987.83	762.27	400.27	613.90	802.15	771.25	700.45
7	Sugar produced (lakh tones)	51.97	91.00	90.74	45.79	70.66	90.54	89.82	79.91
8	Capacity Utilization	98.85	94.98	92.12	97.41	95.03	93.23	98.83	106.12
9	Recovery % cane	11.68	11.39	11.94	11.46	11.54	11.31	11.66	11.43
10	Share of state in Country's sugar Production(%)	26.98	32.16	34.41	31.50	37.61	37.12	34.55	31.78

Source:- Technical performance of sugar Factories in Maharashtra Season 2009-10 and 2008-09, Season 2010-11 and 2011-12.(VSI) and
Locksatta Dated 14 March2013, page no..4

Table No. 2.16 By-Products Production of Sugar Factories in Maharashtra State

Sr. no.	Particulars	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-13
1	Molasses lakh tones	13.80	33.31	30.87	15.88	24.21	32.83	34.55	28.36
2	Molasses % Cane	3.97	4.17	4.05	3.96	3.96	4.09	4.09	3.96
3	Bagasse Production (lakh M.T.)	130.54	237.57	225.47	115.63	183.86	232.94	222.50	----
4	Bagasse % Cane	29.29	29.74	29.58	28.89	29.95	29.04	28.85	28.89
5	Filter Cake Production (lakh M.T.)	--	--	--	14.52	21.78	27.66	26.77	---
6	Filter Cake % Cane	--	--	--	3.62	3.55	3.44	3.47	---

Source:- Technical performance of sugar Factories in Maharashtra Season 2009-10 and 2008-09, Season 2010-11 and 2011-12.(VSI)

Maharashtra is one of the major sugar producing state in the country and contribute around 25% to 37% to the nations sugar production last Eight years. (Year 2005-06 to 2011-12) The state produced 89.82 lakh tones of sugar during 2011-12 with marginal decrease of 0.77% (0.72 lakh tones) compared to the previous season's (2010-11) production of 90.54 lakh tones. The sugar produced in the year 2012-13 is 79.9 lakh tones is less by 11.03%(9.91 lakh tones) than the previous season production on 89.92.

The performance of sugar mills in the state for last Eight years is given in the table: 2.12. The number of installed sugar mills had increased from 187 to 225, however number of operating sugar mills remained in the range of 142 to 174. There was a wide variation in the state sugar production in the range of 45 to 90 lakh tones during eight seasons and with the lowest in 2008-09 (45.79 lakh tones) and the maximum of 90.74 lakh tones in2007-08. The main factor affecting the sugar production is the availability of raw material-sugarcane for crushing. The fluctuations in sugarcane production mainly depend on pattern of rainfall, incidence of disease and pests on crop, availability of quality seed material, irrigation facilities, and availability of fertilizers as per recommendation of doses, route management practices and Government's policy on sugarcane pricing. The sugarcane crushed in the state varied from 400.27 lakh tones to 802.15 lakh tones. State average sugar recovery remained

in the range of 11.19 to 11.94 and state achieved highest average sugar recovery in 2007-08 seasons (11.94%)

The table current year season 2012-13 up to 11st March 2013, in Maharashtra State operating sugar factories 168 and sugarcane crushed 629.11 lakh M.T. and sugar produced 70.44 lakh M.T. and that period sugar recovery 11.19%.

2.4.3 Sugar Industries in Kolhapur District:

Kolhapur is a historic city which was known as South Kashia in ancient times. On the map of India pilgrimage city occupy significant place for being abode of Goddess Mahalaxmi. Kolhapur city is also the administrative place of the district Located on national highway (NH4) connecting Pune with Bangalore city has any tourist attractions.

Kolhapur is part of famous sugarcane belt area of Maharashtra. Also Kolhapur District is the measure producer of sugar in Maharashtra since many years. The district grows rich sugar countered sugarcane and in full exploited by the farmers so that district has distinctive position on the sugar map of India. Maharashtra produces about of the total sugar production of the country and the Kolhapur district contributed to this production of the State. In the year 2011-12 there are 21 sugar factories in Kolhapur District of these 17 factories in co-operative sector and 4 sugar factories in Private sector.

Table No.2.17 Production performance Sugar factories in Kolhapur Districts. Statement showing cane crushed, Sugar Production, Sugar Recovery.

Sr. No.	Name of the factory	Year	Crushing capacity M.T.	Cane crushed (LakhM.T.)	Sugar Production Lakh Quintals	Sugar Recovery %
1	Ajara Shetakari., Gavse, Tal. Ajara	2010-11	2500	4.07	5.30	13.01
		2011-12	2500	3.50	4.52	12.96
		2012-13	2500	3.30	4.18	12.66
2	Appasaheb Nalawade, Harali Tal. Gadhinglj	2010-11	2000	4.34	5.06	11.66
		2011-12	2000	2.31	2.84	12.34
		2012-13	2000	1.75	2.05	11.81
3	Shri. Bhogawati, Shahunagar Parite, Tal.karveer.	2010-11	4000	5.36	6.95	12.94
		2011-12	4000	4.59	5.85	12.70
		2012-13	4000	4.93	6.51	13.20
4	Shri. Chhatrapati Rajaram Bavada, Tal. Karveer	2010-11	2200	4.46	5.12	11.47
		2011-12	2200	3.81	4.71	12.35
		2012-13	2200	4.03	5.00	12.33

5	Shri. Chhatrapati Shahu. Kagal, Tal. Kagal	2010-11	3500	6.98	8.68	12.41
		2011-12	3500	5.95	7.36	12.92
		2012-13	3500	7.21	9.34	12.95
6	Pad.D.Y.Patil. Asalaj. Tal.Gaganbawada	2010-11	2500	4.05	5.04	12.45
		2011-12	2500	3.61	4.46	12.36
		2012-13	2500	4.39	5.59	12.72
7	Shree Datta shetkari, Shirol, Tal.Shirol	2010-11	7000	13.45	15.93	12.21
		2011-12	7000	10.56	13.07	12.45
		2012-13	7000	11.88	14.94	12.57
8	Daulat Shetkari. Halkarni, Tal.Chandgad	2010-11	3500	3.18	3.86	12.10
		2011-12	3500	----	----	------
		2012-13	3500	-----	----	-------
9	Shree Dudhaganga Vedganga, Bidri, Tal. Kagal	2010-11	4500	6.57	8.75	13.32
		2011-12	4500	4.22	5.65	13.43
		2012-13	4500	5.64	7.67	12.60
10	Deshbhakta Ratnappana Kumbhar Ganganagar, Ichalkaranji (Ranuka)	2010-11	5000	5.85	6.82	11.64
		2011-12	5000	5.32	6.45	12.21
		2012-13	5000	6.22	7.70	12.37
11	Shri Gurudatta Sugar Ltd. Taklwa-di, Tal.Shiro l(Private)	2010-11	2500	6.80	8.69	12.78
		2011-12	2500	5.64	7.30	13.04
		2012-13	2500	5.70	7.63	13.38
12	Hemaras Tecnology Ltd. Chanahatte, Chandgad (private)	2010-11	2500	2.10	2.22	10.60
		2011-12	2500	3.21	3.98	12.48
		2012-13	2500	4.17	5.25	12.58
13	Indira Gandhi (cease) Shree Arumuga Sugars. Pvt., Tambale, Tal. Bhudargad	2010-11	2500	2.81	3.27	11.64
		2011-12	2500	1.89	2.26	12.01
		2012-13	2500	1.02	1.24	12.20
14.	Jawahar Shetkari, Hupari Tal-Hatkanagale	2010-11	7500	15.39	18.50	12.01
		2011-12	7500	12.20	14.96	12.35
		2012-13	7500	13.45	16.61	12.35
15	Kumbhi Kasari., Kuditre Tal-Karveer	2010-11	3000	5.83	7.43	12.74
		2011-12	3000	4.60	6.00	12.98
		2012-13	3000	5.83	7.68	13.17
16	Nalawade sugar mills Mualuge, chandagade.(private)	2010-11	2500	2.26	2.69	11.92
		2011-12	2500	1.30	1.66	13.01
		2012-13	2500	2.15	2.70	12.57
17	Sadashivrao Mandlik, Hamidwada , Tal.Kagal.	2010-11	2500	5.11	6.54	12.76
		2011-12	2500	4.07	5.17	12.78
		2012-13	2500	4.99	6.47	12.96
18	Sharad Sahakari., Narande, Tal. Hatkanagle	2010-11	2500	6.28	7.66	12.19
		2011-12	2500	5.20	6.67	12.98
		2012-13	2500	5.58	7.15	12.72

19	Shri Tatyasaheb Kore Warananagar, Tal. Panhala	2010-11 2011-12 2012-13	7500 7500 7500	13.69 13.71 13.31	16.35 17.21 15.92	11.94 12.70 11.96
20	Shree Dutta Asurale porle, Tal. Panhala Took(Dalmia Sugar Industries) (private)	2010-11 2011-12 2012-13	2500 2500 2500	3.54 2.94 3.44	4.47 3.78 4.68	12.63 12.83 13.60
21	Udaysingrao Gaikwad, Sonwade. Bambawade Tal. Sahuwadi. (Lease Visvasarao Naik)	2010-11 2011-12 2012-13	2500 2500 2500	3.02 3.05 1.48	3.62 3.72 1.48	12.00 12.26 10.00
Total		**2010-11** **2011-12** **2012-13**	**75.700** **72,700** **72,700**	**126.03** **101.24** **110.55**	**152.95** **127.70** **139.87**	**12.91** **12.71** **12.65**

Source: Annual Report of the factory

2.5 Sugarcane and its By-Products

"Sugar is concentrated sunshine, it is instant energy."

"Small" may be rarely 'beautiful when dealing with sugarcane by products, the simpler operations are often the more profitable."

Sugar is not only to taste but is also capable of giving instant energy to the human system. It is thus a palatable and vital article of food. A workman's breakfast must contain a lump of Gur (jiggery) before he starts his daily toil. Sugar confections are a boon for the children. As a sweetening agent its use is universal. Sweets and confections are every one's delights. The morning cup of tea must contains a spoonful of sugar.

Availability of sugar at the cheapest possible cost is therefore indispensable for the health, vigor and vitality of the human being. To cheapen the cost of sugar, development of by-product and ancillary industries is the sine qua non for the prosperity of the sugar industry.

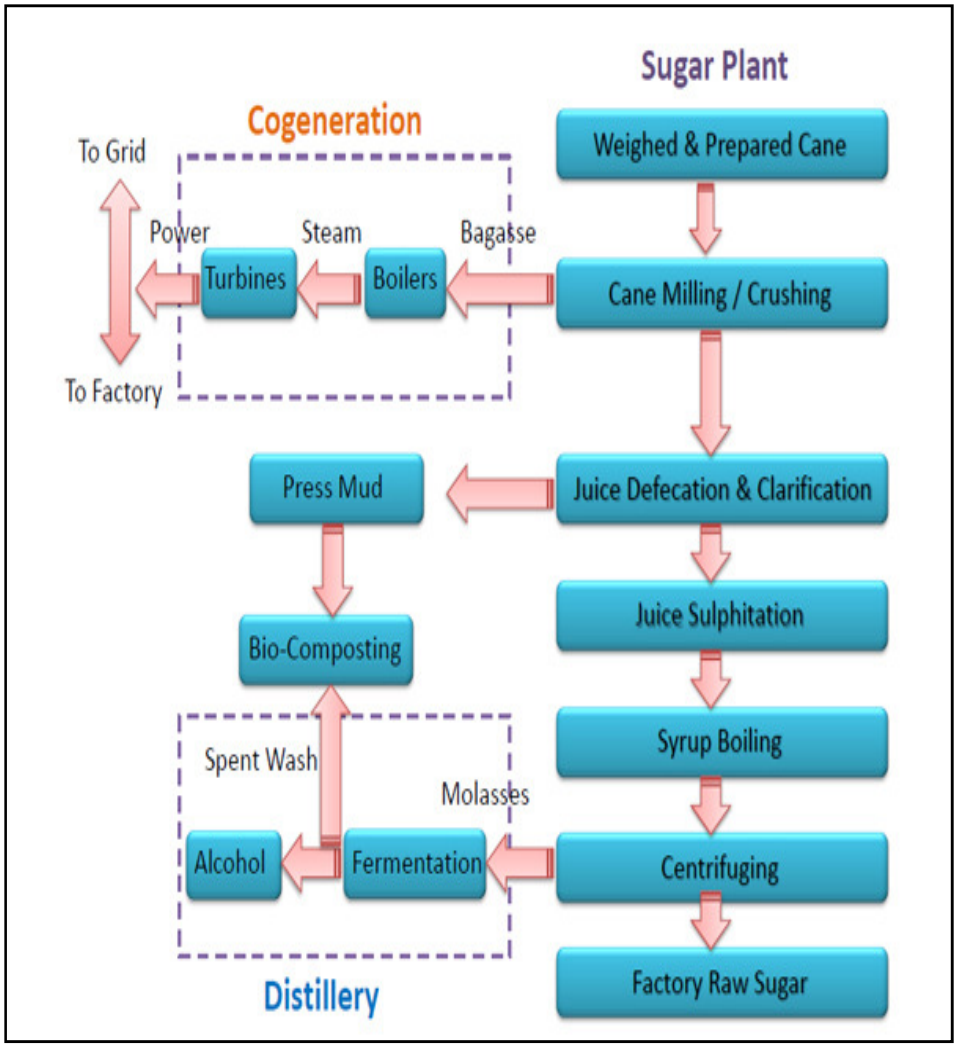
In the context of the development of rural areas where the sugar factories are invariable situated. It is all the more urgent and essential the by-products of the cane sugar industry are usefully and profitably utilized. It by diversification the profitability of the "Sugar cane – Sugar factory – By product industry complex." Can be increased, the primary producer of sugarcane will also benefit and in times of adversity in any sector of such an integrated agro complex, the loss could be absorbed without much dent on the viability of the whole complex.

By-products of the sugarcane industry:

Sugarcane is considered to be the best synthesizer of solar energy into biomass, like sugar, cellulose, lignin and pentose's, all of which can be converted onto value-added products by adopting suitable technologies. Energy experts throughout the world have realized that sugarcane and its derivatives are renewable sources of energy as sugarcane is grown, year after year. The main by products of the sugarcane industry are as follows.

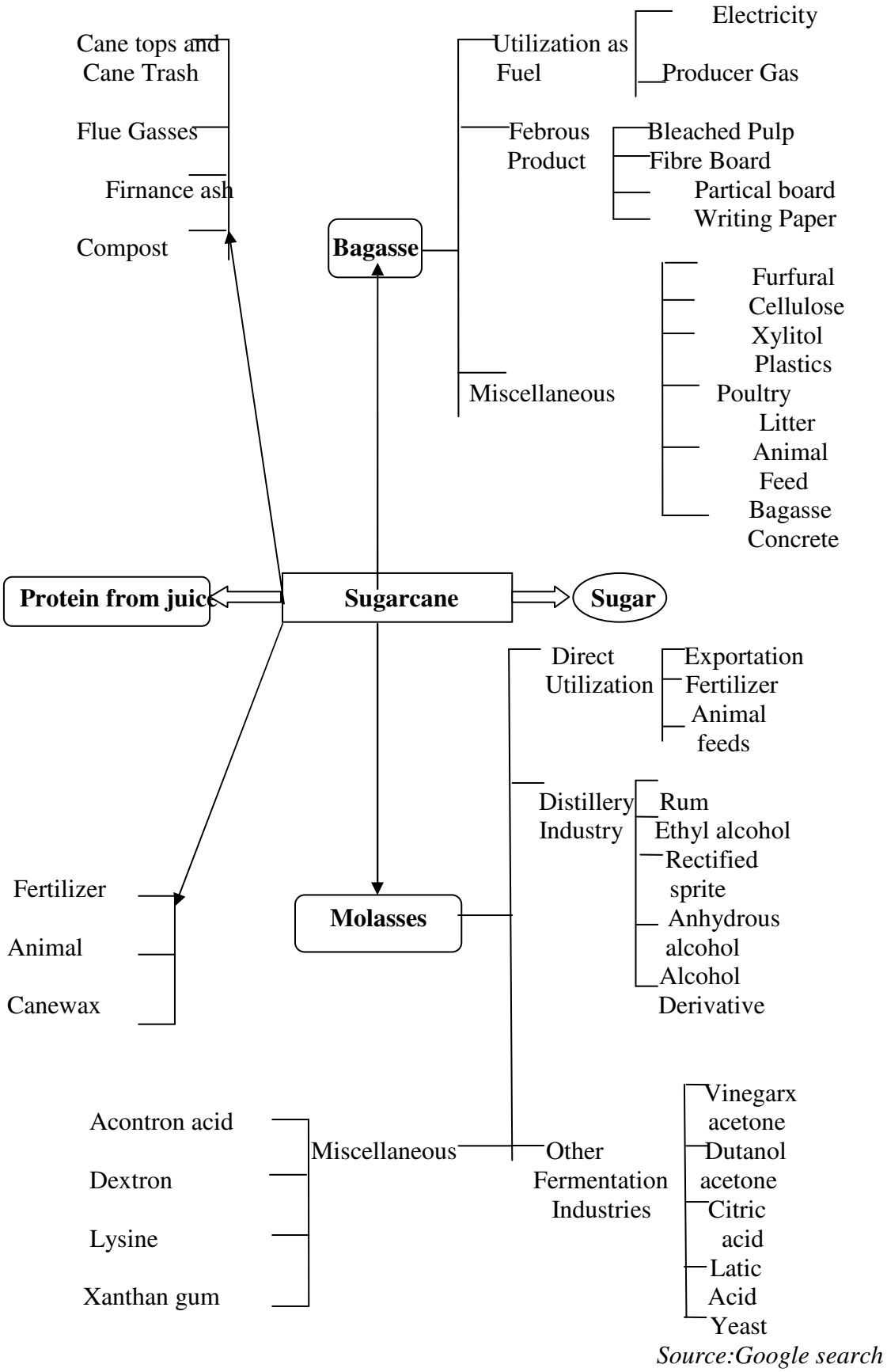
- **By-products of the sugarcane farm of field**
- **By-products of sugar manufacture, namely bagasse, molasses, filter cake or press mud**.

Digram No.2.1 : Flow chart of sugar factories



Source: Google search

Diagram no.2.2: shows By-products of the sugarcane industry



Source:Google search

2.5.1 By-products of the sugarcane farm:

When the sugarcane crop is harvested the sugarcane tops are removed and the steams are cleaned of their leaves (trash) most of which are dry. The production of tops and trash 25-35% on the weight of cane in the field.

- **Sugarcane Tops:**

Sugarcane tops from a valuable for the cattle. As cattle fodder in India is in perennial shortage the harvesters and the cane growers utilize the cane tops as folder for their farm cattle. As long as the Indian agricultural community depends upon the bullock and the cow for its agricultural operations and for its milk supply, the cane tops would continue to be used directly as a fodder.

- **Cane Trash:**

The leaves removed from the cane stalk dry up and remain on the field till the field is required for the next crop. The quantity of this trash is quite considerable in volume. Quite a few uses are being made of the trash material. It is utilized for thatching purposes for the huts of seasonal labor as camp-fire-fuel on wintry nights and for preparing compost. Another use of this trash is to cover the land between two rows of cane with a layer of trash so as to prevent weeds from coming up This is called "Trash Mulching" Trash being a cellulosic material, attempts have been made to produce biogas from it by anaerobic digestion were by methane gas is obtained for lighting and fuel purposes and digested residue serves as a valuable compost.

2.5.2 By-products of sugar manufacture OR Factory by-product:

The processes of sugar manufacture from sugarcane generate the main byproducts of the sugar Industry are Bagasse, Molasses and Filter press cake.

Though theoretically hundreds of products can be produced from the by-products of the sugar industry, in actual practice the production of only a few products is commercially possible and financially viable almost all the sugarcane producing countries in the world have realized that though the production of sugar from sugarcane is unquestionably the most paying proposition, it is better to produce many products by diversification and utilizing the by-products of the sugar industry instead of depending on just one product i.e. sugar. This would lead to reducing the dependence on the earnings of sugar, whose price is widely fluctuating and at the same time result in converting the by-product of the sugar industry into value-added products thereby improving the economics of sugar production and making available

sugar to the masses of reasonable prices. The some important by-products of the sugar industry are explained in the following.

2.5.3 By-Products of Bagasses:

Bagasses are the fibrous residue left over after sugarcane is crushed in the sugar factories to extract its juice content. After crushing of sugarcane in sugar mills and extraction of juice from prepared cane by milling discarded fibrous residual matter of cane with come to about 28% to 32% by weight of cane, called bagasses. Bagasse is obtained as sugarcane residue. It contains around 50%moisture and 2% sugar and a balance is fibrous material. Bagasse is very commonly used as fuel in boilers in the sugar mills for production of steam as well as electrical power i.e. co-generation. The steam is used in the processing of sugarcane to sugar. The sugarcane bagasse is around 28-32% on sugarcane basis and its composition is as under.

Table No.2.18 Composition of Sugarcane bagasse.

Moisture % Bagasse	48 to 51 %
Fiber % Bagasse	45 to 71%
Pol % Bagasse	1.5 to 2.5%
Brix % Bagasse	2.7 to 4.0 %
Ash % Bagasse	2.5 to 3.0 %
Caloric value at 50% moisture	1800 Kilo cal 1 kg
Calorific value Dry	4600 kilo cal 1 kg

Source: Google search.

Note: In all the above cases, the composition and value may differ on the basis of area. Soil type, sugarcane variety, milling / process used and water conditions etc.

The approximate composition of bone dry bagasse is cellulose (45%), Pentosans (24%), Legrun (20%), sugar (5%) and minerals (1.1%). The cellulose content of bagasse makes it a valuable raw material for all cellulose based industries like paper, rayon etc. the pent sans contents of bagasse makes it a valuable raw material in the manufacture of furfural. The lignin content of bagasse has not been used commercially so for but, it holds a big promise.

2.5.3 A) Ways and Means of Sparing Bagasse:

From the very inception of the sugar industry in different countries bagasse is traditionally used as captive fuel in the sugar factory boilers. Though some critics point out that this not a wise practice as it amounts to burning of valuable cellulose,

still, the sugar industry experts in many countries consider this as a wise practice due to the following reasons:

- Sugar industry, being a seasonal industry and dealing with highly perishable raw materials, like juice, syrup, massecuites, molasses etc. it should not have any stoppages on account of non-supply of fuels and hence it is safe to depend on the captive fuel, bagasse rather than depending on uncertain supplies of oil, coal fuel, wood etc. these fuels are also very expensive in some countries and their supply position is quite undependable.
- Any stoppage of a sugar factory for want of extraneous fuel supplies is likely to create lot of problems, apart from resulting in loss sugar production and efficiency.
- Bagasse had no alternative use all these days, as the pulping technology had not been developed in the earlier year. As a result, even if some sugar factories saved bagasse its disposal created a big problem.
- Bagasse, being a cellulosic material, passed fire hazard problem and hence there was a need to burn it at the place of its generation, i.e. sugar factories, instead of transporting this loose material with low bulk density to distant places, there by incurring heavy transport charges, and burn it.
- Due to these problems, all the sugar factories in the world were lavishly burning bagasse without talking any measures to have bagasse. But in the recent years as many countries the sugar factories are making efforts to save some bagasse even after using it as captive fuel. There are only two methods of sparing bagasse from the sugar factories.
- By producing energy conservation measures in the sugar factories and reducing steam consumption and consequently the consumption of bagasse as fuel, to save bagasse.
- By substituting bagasse with alternate fuels in the sugar factory boilers and sparing the entire bagasse.

2.5.3 B) Bagasse Based Industries:

When adequate quantities of bagasse are available bagasse cane be used the following bagasse based industries.

1. Pulp and Paper from Bagasse:

The main task in the manufacture of paper from any of the fibrous raw materials is to separate the cellulosie fibres from lignin and other organics and treat the cellulosil fibres suitable to yield a haigh grade pulp required for the manufacture of paper.

As a raw materials for paper, because offers the advantages essay collection other sugar factories paper has good printiability, bagasse pulp requires less refining power, Paper has good bursting strength. Bagasse contains about 30 percent pith and 5 percent non-fibrous epidermis. Pith has no fibre structure and therefore its presence would require a considerably higher consumption of chemicals it would make the bleaching more difficult and make the material slimy as well as reduce the strength of the paper and by showing down drainage on the paper machine allow only relatively low speeds of the paper machines. Therefore the separation and more or less complete removal of pith and epidermis from the raw bagasse is absolutely necessary for the production of better quality paper. Depicted bagasse therefore is an excellent raw material for the production of all types of high grade paper. It can be easily processed into semi-pulp or bleached pulp by known pulping processes.

2. Manufacture of Fiber-board and Particle-board from Bagasse:

The production of particle board from bagasse is well-proven technology but it has to compete with plywood and fiber board. Due to acute shortage of forest wood, which is normally used for the manufacture of Particle Board and fiber boards, most of the wood based board plant throughout the world is facing douser. Because of many countries have established bagasse based particle board and fiber board plants and are working them successfully. In India a beginning has been made very recently. The first particle board's plant based on bagasse has been established in U.P. They are purchasing surplus bagasse from the neighboring sugar factories. The cooperation sugar industry in the state of Maharashtra is taking a leading part in this direction also. During the recent years considerable progress has been made in India to use bagasse for the manufacture of particle board also.

3. Furfural from Bagasse:

Furfural is colorless, inflammable, volatile, aromatic liquid produced from a number of plant materials containing pent sans in case of bagasse, 90 percent being xylem. In practice about 25 tones of mill-run bagasse are required to produce one tone of furfural.

Furfural has many industrial uses, one of them being as selective solvent for the refining of lubricating oils and another as an intermediate in the production of nylon 6-6 and resins used for molding powders. Furfural on hydrogenation yields furfural alcohol which can produce inexpensive, heat-stable and corrosion-resistant resins. Furfural alcohol is also used in the pharmaceutical, fungicide, insecticide and solvent fields.

4. Co-generation of Surplus Electric Power Using Bagasse:

Bagasse is very commonly used as fuels in boilers in the sugar Mills for production of steam as well electric power i.e. Cogeneration. The steam is used in the processing of sugarcane to sugar. It is used in prime movers and also in steam Turbines for production of Electrical Power for running electrical motors and other power requirements. The surplus power from sugar industry is sold to State Electricity Boards in its GRID for distribution.

The term "Co-generation" means the combined production of electric power and useful heat by the sequential use of energy from a common source of fuel. The Government of India and state Electricity Boards to accept the idea of co-generation of Electric Power by the private parites on similar lines as in the other countries.

In India sugar mills have always cogenerated steam and electricity using bagasse produced during crushing. Before the 1970.5 steam generation pressure /temperature and boiler / turbine efficiencies were low while steam requirement for the process were high and hence the mills were neither self sufficient in their steam requirements on in electricity. Over the years more efficient boilers / turbines and higher pressure steam generation were adopted and by 1990's the mills started to not only become self sufficient in steam and electricity, they even had some surplus bagasse.

5. Bagasse Ash:

Bagasse is normally as fuel in the sugar factory boilers. Like any other fuel, bagasse also contains ash which gets collected in the sugar factory boiler furnaces. Bagasse ash contains mainly inorganic salts, which are the nutrients taken by the sugar cane plant from the soil and from the chemical fertilizers applied to the crop. Bagasse ash ahs all the main ingredients are already present in intimate chemical composition. The ash is easy to grid.

6. Miscellaneous Uses of Bagasse:

- Manufacture of Corrugated Boards and Boxes from bagasse.
- Manufacture of Dissolving pulp (Rayon Grade) from bagasse.
- Production of Methane Gas and producer gas
- Manufacture of Molded bagasse products.
- Manufacture of cattle feeds from bagasse.

2.5.4 By-Products Molasses:

Molasses is another important byproduct of the sugar industry. Molasses is a dark brown viscous liquid obtained by centrifuging the massecuite as By-product of sugar while processing sugarcane sugar. It contains nearly 45% un crystallized fermentable sugar and some sucrose. It is used in the manufacture of ethyl alcohol, Indian made foreign liquor, as a table syrup and food flavoring. It is also used as feed for farm animals and in the manufacture of several processed tobaccos. Although molasses used for the production of ethanol, citric acid, yeast etc. Alcohol is manufactured from molasses by fermentation process is distilleries. The final molasses which accounts for around 3 to 4.5 on quantity of sugarcane crushed.

Table No. 2.19 Composition of Molasses.

Water content	20 to 22 %
Bricks	90 to 95 %
Sucrose	25 to 30 %
Reducing Sugar	20 to 25 %
Total invertible Sugar	50 to 55 %
Ash	10 to 12 %
In Organic mater	2 to 3%

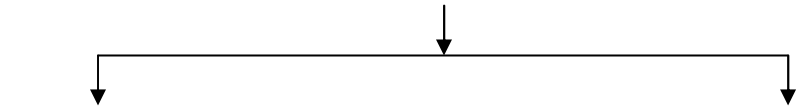
Source: Google search

Note: In all above cases the composition differs on the basis of area, sugarcane variety, milling processing methods, soil and water condition etc.

Molasses can be converted into many value-added products by application of modern technologies. Though hundreds of products can be made theoretically, in actual practice the production only a few product is commercially viable and hence commercial scale plants are working in different countries to produce only these products.

Diagram 2.3 shows the products that can be produced from molasses are shown below:

MOLASSES



Ethyl alcohol	Bakers Yeast
Liquid Carbon dioxide	Torula Yeast
Solid Carbon dioxide	Protein Molasses
Fusel oil	L- Lysine
	Acetone Butanol
Acetal dehyde	Citric Acid
Acetic Acid	Lactic Acid
Acetic anhydride	Glutami Acid
n- Butyl Alcohol	Itanomic Acid
Ethylene	Aconitic Acid
Poly ethylene	Furnari Acid
Pol Uniy Chloride	Mali Acid
Ethyl Benzene	Butyric Acid
Styrene	Propinonic Acid
Poly styrene	Gluconic Acid
Mono Ethylene Glycol	Oxalic Acid
Uinyl Acetate Monomer	Butylene Glycol
Diethyl Either	Glycerol
Ethyl chloride	Dextran
Chloroform	Xanthan Gum
Ethyl Acetate	Live stock feeds.
Acetone	
Rum	
Whisky	
Brandy	
Gin, Vodka	

Source: Manohar Rao P.J. "Industrial Utilization of Sugar cane and Its Co-products.

2.5.4 A. Molasses Based Industries:

1. Alcohol Production from Molasses:(Distillery Industry)

Very viscous material generating during washing of sugar crystals is called molasses. The generation of molasses from one ton of cane crushed varies from 3.5% to 4.5% and sometimes more. It contains glucose, fructose and fructose sugars which take part in the production of alcohol. Blackstrap molasses, commonly called molasses being the raw material for production of alcohol, its composition is of great significance to the alcohol industry and maturity of cane, climatic and soil conditions, fertilizing practices, extent of milling, nature of clarification procedures and processing and storage conditions. Even wherever the distilleries and sugar factories are closely associated with each other, distilleries have little control over quality improvement of molasses.

The establishment of work in which distilling of spirits (alcohol) is carried on is known as distillery. The main operations in distillery are

- Fermentation
- Distillation

In India, molasses is primarily utilized for the production of ethyl alcohol. Ethyl alcohol or Alcohol is normally. Manufactured as rectified spirit are industrial alcohol which contains 96% percent alcohol by volume or 95% percent alcohol by weight 50 to 60 percent of the total alcohol production goes chemical conversion. About 20 percent is utilized for potable purpose i.e. country liquor.

Rectified spirit can be suitable dehydrated by isotropic distillation to obtain absolute alcohol. Industrial alcohol is sold in three forms.

- Ordinary Denatured spirit. (ODS)
- Specially Denatured spirit. (SDS)
- Rectified spirit and Absolute alcohol.
- Fuel oil.

India's points of view the number of molasses based distillery units about 400 and the molasses based installed Capacity +5.0 bin lit. Molasses alcohol used for Industrial and fuel purpose.

2. Ethanol: Ethanol is also made out of sugarcane molasses in other countries and is being mixed with petrol to the extent 25% since long but in India, now the Government has also decided to manufacture Ethanol out of sugarcane molasses and

mix with it with petrol to the extent of 5% and save foreign exchange on one hand and save precious conventional energy source of petrol one other hand. This wills also reduced environmental pollution. Now ethanol is also being manufactured cane juice.

3. Use of Molasses for cattle and animal feed:

In countries like U.S.A., Canada, South American countries etc Where beef cattle is of great importance, molasses is abundantly used in the cattle feeds. They have proved that the animal weight cane be increased by about one kg every day by using molasses in the feeds. The first attempts to manufacture cattle feed from molasses in India were made at the National Sugar Institute Kanpur. A product called 'Bago Molasses' was made by mixing molasses and dry bagaallo in proportition of 1:1 by weight feeding trials, however showed that only defecation molasses is most suitable for the purpose. Cattle feeds prepared from sulphitition and carbonation molasses caused purging in the Cattle unless common salt was also given to them.

4. Use of Molasses for citric Acid and Lactic Acid etc. And other Acids:

Citric acid is usually produced in the monohydrate form ($C_6 H_8 O_7 H_2 O$)the crystals of which are colorless and odorless, with a sour taste readily efflorescent in dry air. The acid is now mainly produced from molasses by the mycological process using certain strains of Aspergilla Niger as the micro-organism. The process has been working with beet molasses abroad although efforts are now being made in India to produce it from cane molasses. Citric acid is one of the most versatile of the industrial organic acids, finding increasing uses in the food and beverage industries. Since there is no potential threat from any "synthetic" citric acid appears warranted in the large cane producing countries were molasses is available at a fairly low soft drinks.

Lactic acid is a colorless odorless, syrupy liquid, miscible in all proportions with water, alcohol and ether. Lactic acid is used for the declaiming of hides and bating and plumping of leathers. It is used in the dyeing of silk, and as a mordant in the printing of woolens. The small quantity of lactic acid and lactates produced in India for pharmaceutical purposes are based in sugar.

5. Molasses for the Production of Lysine:

Lysine is one of the essential acids which are the building blocks of protein and are vitally important components of all living organisms. Amino acids for protein for motion can be directly obtained by living organism from the proteins in their diets,

some organisms from nitrogenous and other chemicals contained in their food supplies.

L-lysine is considered as the most important amino acid due to its nutritional contribution in human diets, as well as in animal feeds, especially in swine and poultry feeds. Lysine is also used in the pharmaceuticals. Supplementation of wheat cased foods with lysine improves the protein quality.

6. Oxalic Acid:

It is simplest of the dibasic acid. The product is commercially available as the dehydrate HOOC.COOH.$2H_2O$.

There are several process are the manufacturing of Oxalic acid from raw material like wood waste, carbo-hydrates and sodium format. For producing it from sugar or molasses nitric acid has to be used as the oxidizing agent.

Oxalic acid is also produced as a by-product when citric acid is produced from carbohydrates by fermentation. Oxalic acid as used in laundries in stain clearing solutions, in the textile industry for dry stripping of wool. Degumming of silk, printing of cotton, for cleaning and dycing of fabrics and for bleaching plant fibres

7. Maleic Acid – (And Fumaric acid)

Maleic acid is produced from glucose or molasses by fermentation with strains of Rhizopus Nigerian and R. Japonieus.

Furmaric acid is prepared from maleic acid by is omerisati on using amine, heavy method salts, etc. as catalysts' at 40-60^0c in a 10-20 percent hydrochloric acid solution.

8. Itaconic Acid:

It is crystalline acid and can be regarded as an alpha substituted acrylic acid.Itaconic acid can be produced by the fermentation of molasses with the fungus Aspergilla itaconicus. It can also be obtained by the decomposition of aconitic acid .

Itaconic acid finds important applications as a co monomer in latex polymers, were relatively low concentrations improved adhesion for various uses e.g. for paper coating blinders.

9. Butyric Acid: $CH_3 CH_2 COOH$.

n- Butyric $_{acid}$ is a water white liquid soluble in water alcohol ether and most other organic solvents. Butyric acid can be produced industrially in conjunction with lactic acid by the fermentation of start and saccharine materials like molasses, by certain micro organism; such is Clostridium butyric and C Kluyveri.

Butyric acid and its derivatives are used in the preparation of esters for use as flavoring agents. Its compounds and derivatives find numerous applications in the leather and pharmaceuticals industries.

10. Prop ionic Acid:

It is water –white liquid having a sharp, vinegar- like odor. The acid is normally manufactured by the Oxon process from ethylene and carbon monoxide or by the oxidation of hydrocarbons. The acid has limited industrial applications. The acid or its anhydride is used in the production of cellulose propionate or cellulose-acetate-propionate for plastic and fibers.

11. Vinegar :(Is made from wine)

Molasses can be directly converted into vinegar by the action of bacteria such as my co derma ace fit but since the product would be highly colored and impure the better method is to ferment molasses into alcohol and then convert distilled alcohol into vinegar.

12. Alcohol Acid:

Aconite acid is present in molasses and has physiological effects to those of citric from which it can be produced by dehydration.

13. Glutamic Acid:

Its sodium salt Mono-sodium Glutamate (MSG) is a white crystalline powder. It is very solulole in water. MSG brings and or accentuates the flavor of various food products and its concentration used in salted foods.

2.5.4 B) Miscellaneous Use of Molasses:

- **Use as a Fertilizer:**

Molasses contains substantial amounts of potassium and small quantities of nitrogen and phosphate. It used as a fertilizer, these three constituents world naturally prove beneficial to the crop. It is however, believed that even the organic matter improves the soil and proves useful to the crop. Molasses generally contains 7.5% Potassium, salts 0.5%, and 0.2% nitrogen.

- **Molasses for Road Surfacing :**

The use of sugar and sugary materials like jiggery to increase the strength of mortar has been on age-long practice in India. On account of its sugar content molasses has been suggested for use as a road surfacing material.

- **Use of Molasses as Boiler:**

As molasses contains about 70% of organic substance, many attempts have been made to use it as boiler fuel. The calorifi valve of molasses containing 9.28 percent ash and 19.4 percent moisture was found to be 3057 kcal per Kilo. Calculated to 100 parts of dry organic matter. It comes to 4084 Kcal/kg. dry organic matter. It is therefore about eqnat to 80 percent of that cane fiber.

In India brooks designed a furnace which successfully burnt molasses. Now that molasses has found wide utilization as a raw material for rectified spirit production it is no longer permitted to be used in boiler furnaces.

- **Molasses for curing of Tobacco:**

Tobacco leaves are usually dried in the sun and later in cured in an oven under controlled temperature before they are processed into cigarettes and various other local products in different countries. Research workers have discovered that when tobacco leaves are topped in a solution on any carbohydrate and cured in an oven under controlled condition, the leaves attain a golden color, which is very valuable for the manufacture of high class cigarettes. Of all the carbohydrates, they found that molasses is most suitable for this purpose.

- **Mixing of Molasses with Hakka Tobacco:**

Tobacco after suitable processing is used as "Hakka Tobacco" which is kept in a small burning pot and smoked with the help of a long pipe. This kind of Tobacco is mixed with small quantity of molasses to make the tobacco burn slowly and emit a particular flavor.

- **Use of Molasses in Foundries:**

In foundries before pouring the molten iron into the mould, the moulds are made into a particular desired shape, making use of sand mixed with sodium silicate or some other binding material available in different areas. Molasses is good binding agent for sand in making the moulds. So in many foundries, molasses is used as binding material to be mixed with sand making moulds.

- **Molasses for Briquetting :**

Molasses with its sticky nature is very useful as a binder for many powdery substances. For instance when raw dust, agri-cultural residues (like rice husk, neanut husk, cut straw) coal dust, lignite powder are to be burnt as fuel, they can be mixed with molasses and extruded in the form of briquettes of pellets. By this the dust from

these material is avoided and the briquettes material has better burning characteristics. As molasses is also combustible it is advantageous to use molasses as a binder.

- **Molasses for Human consumption:**

In different countries, molasses is used for human consumption in different ways. For instance in India and its neighboring countries molasses is used to give a thin coating around peanuts, cashew nuts, coconut grating, fluffed rice, different kinds of nuts, and fluffed cereals to make them more palatable. Molasses is used in many medicinal preparations in different countries like, iron, calcium, potassium, sodium, phosphorus etc. its use of various edible purpose has been advocated in many countries by dieticians.

2.5.5 Press mud OR Filter Cake:

Press mud is obtained in sugar factories to a tune of 3.2% to 4% of the weight of sugarcane crushed. About 5.2 million tones of Press mud is produced in our country every year. Press mud contains sizable quantity of macro and micro nutrients, besides 20-25% of organic carbon Press mud is used as manure by sugarcane farmers.

The amount of filter mud varies from country to country, from mill to mill and even within the same mill and from field to field. The multiple factors involved include systems of clarification, extraction, cane variety, degree of mechanization.

Filter mud has not been put to industrial use its disposal as a solid waste of the sugar mills is necessary. In most countries, it is spread on the field.

Very recently in order to get rid of Distillery effluent, spent wash, which is very toxic and very high on BOD and COD contains is being utilized by spraying and mixing it with press mud . This treatment enriches the press mud in its nutritional values and makes one of the best Organic manure. The organic manure made out of press mud maintains Soil health, sustains sugarcane and sugar production, improves soils physical properties, retains soil moisture and reduce the erosions hazards. Application of enriched press mud, either alone or in conjunction with Bio fertilizers recorded higher sugarcane yield and sugar recovery. This has also mitigated the need to treat the distillery effluent and save money spent for its treatment.

Table No. 2.20 Composition of Sugarcane Press Mud

Nutrients	Fresh Press Mud	Press mud enriched with Distillery spent Wash
Organic Carbon	20-25%	50-55%
Nitrogen	0.90-1.25	2.0-2.5%
Phosphorus	2.50-3.00%	2.0-2.6%
Potassium	1.00-1.5%	1.5-1.8%
Calcium	11.00%	3.0-4.0%
Magnesium	1.65%	0.8-1.5%
Sulphur	0.23%	1.2-1.7%
Copper	52ppm	Trace
Zinc	69ppm	Trace
Manganese	898ppm	Trace
Iron	2000ppm	0.03-0.05%
Moisfure	70%	50-55%
Boron	Trace	Trace

Source:Google search

Note: in all the above cases, the valued percent differ from area to area, mill to mill, process used, variety of cane, soil and water conditions etc.

2.5.5 A) Uses of filter Cake:

1. Use of filter cake As fertilizer:

The filter cake obtained in the sugar factories is carried in trucks to an open area, where it is dumped and sometimes spread for quick sun drying. Otherwise, due to the sugar and organic matter content, the press cake dumps emit an obnoxious odor, can sing environmental pollution. In almost all the cane sugar producing countries, the dried filter cake is given away to the sugar cane growers free of cost, ex-factory basis. The sugar cane growers transport the filter cake of their own cost to their cane fields and spread it in the fields before plunging the fields. Very encouraging results have been reported from different countries on the nutritive value of sugar cane filter cake for cane crop.

2. Use of filter cake for the manufacture of cane wax:

Waxes are being used since time immemorial in many countries for various purpose. The use of wax for the manufacture of candles models and as coating

material is known since. In nature, different kinds of waxes are available i.e. Minerals, Vegetable, Animal of cane.

The processing of sugar cane in the sugar factory by milling, clarification of cane juice and filtration etc. a part of the wax and fat in sugar cane goes with the bagasse and is burnt in the boilers. The balance of wax and fat enter the sugar cane juice and during clarification of cane juice, major portion of the wax and fats are pre imputed and are present in the filter cake. Thus filter cake the main raw material for the production wax.

3. Use of Filter cake for the production of Bio-Gas:

Research work conducted by the scientists Nunez and Leal silva at the Cuban research Institute with fresh filter cake was better than that of stored filter cake with 10%soilds and at 37%. The addition of pita and lime favoured the bio-gas production. These finding were on laboratory scale alone.

In India, the Pravara S.S.K.Ltd. in the state of Maharashtra has set up in the year 1994, a commercial scale bio-gas plant based on filter cake. The bio-gas generated is being supplied to employ of the sugar factory for use of domestic fuel in their kitchens.

4. Use of Filter Cake As fuel:

Research work conducted by Elkadar and Yassin at the University of cairo Egypt showed the possibilities of using a mixture of filter cake and bagasse in the proportion of 1:12 as fuel in the boilers for the generation of steam. The calorific value of representative samples of bagasse and filter cake was found to be 4340 cal/g and 3675 cal/g respectively (dry basis).

5. Use of Filter Cake as Cattle Feed:

In Cuba, filter cake is used as animal feed. Over the past years, its use has been expanded in the form of blends with distillery effluent for the production of an animal feed known as 'Gicabu in Cuba'

2.5.5 B) Bio-Composting: (With spent wash filter cake)

Composting has come to be accepted as one of good solution to the problem of distillery effluent treatment. Scientifically operated bio-composting can result into zero effluent discharge. It can be used either as a primary treatment or as a tertiary treatment after concentration of spent wash. The advantages of composting over traditional methods of treatment are as follows.

- Negligible power requirement.

- Zero effluent discharge to inland watercourses.
- Compost produced is rich in organic and inorganic and also micronutrients. It can further enriched with micronutrients to improve its manure value.
- Compost cane be sold to farmers and substantial amount of income can be generated.
- Good solution for distilleries attached to sugar factory as filter material in the form of press mud cake is readily available.

Composting is a biological process in which organic matter is degraded under controlled conditions. It also involves microbial mineralization composting is an age old process essentially meant to utilize solid wastes of plant. Organic solid wastes or mixtures of solid and liquid wastes can be biologically decomposed at between 50-70% moisture content to relatively stable end product. The Principal decomposition products are humus or humus farming substances carbon dioxide and water the factors influencing composting i.e. Oxygen, moister content Temperature, phi, particle size, carbon to nitrogen ratio.

- **Composting process for distillery spent wash:**

The mixing of spent wash and press mud cake (50-70% moisture) has to be carried out (2.5:1 proportion) in surface windows. With the help of an aerotiller machine (self-propelling) for spraying, mixing, turning and aerating of compost material. Addition of special blend of cultures or cow dung provides bacterial culture required for composting. It is observed that in first five days, fungal activity is predominant and subsequent days bacterial activity continues until stabilization of organic matter into humans is accomplished. The aero tiller straddles wind rows of press mud (3.5m at base 10.5m height) in the process of aero tilling.

Aero tiller assures complete control of the decomposition process where the crucial balance of adequate aeration moisture content and temperature must be controlled in order to keep microbial activity at accelerated phase. The horsepower of different aero tiller machines available are in the range of 70 to225 HP and fuel consumption (diesel) is 15 to 40 liters per hour.

- **The salient features:**

Zero Discharge can be achieved it bio-composting is carried out under truly aerobic conditions. No odor or fly nuisance occurs if carried out scientifically. The finished product is entirely free from any repulsive odor. It offers destruction of BOD

if the effluent, high product value with quick payback, dry bag gable product that is easy to handily and transport.

- **Future technologies for bio-composting:**

a)Bio-composting of concentrated spent wash:

Various technologies of fermentation and distillation have been developed, which generate reduced quantity of spent wash such as conventional bio still continuous fermentation. It is possible to carry out bio-composting of concentrated spent wash with press mud. However concentrated spent wash bio-composting requires longer cycle time (60days) and depending on % solids in concentrated spent wash, the maximum possible ratio of spent wash to press mud achieved can get reduced to1.6 to1.8:1.

b) Bio-composting using alternate agro waste:

Research carried out at VSI has shown that alternate agro waste such as bagasses, sugar cane trash, coconut coir etc. also can be used combination with press mud (about20:80) ratio of alternate agro waste to press mud. This can be practiced in distilleries having shortage at press mud so as to meet the material balance.

c) Bio-composting under roof:

As per the CPCB guidelines distilleries having bio-composting system all allowed to work only for 270 days. It is also possible to carry out bio-composting under roof (such as greenhouse) with proper ventilation facilities. Such system are working in countries like Colombia, Thailand etc. Installation of such system will certainly increase the initial capital investment and necessary clearance from MOEF will have to be obtained. This will allow the distilleries to work for about 330 days.The cost for covering at compost yard is estimated to about Rs. 40 to 50 lacks per acre.

2.6 Alcohol Production World Scenario and Trends:

Production of ethyl alcohol from molasses more relevant. Molasses is the mother liquor left over after crystallization if sugar from concentrated cane juice. It is not commercially possible to extract any more sugar from it and hence used as raw material in the distilleries for producing ethyl alcohol from the sugar and reducing sugar contained in molasses.

In 1970 there were very few distillery plants based on conventional batch fermentation and atmospheric distillation technology in our country. Distillery industry has undergone sea changes during last two and half decades. Improved

fermentation, distillation, automation and effluent treatment technologies were introduced in the country by eminent players and face of the industry is now completed changed.

2.6.1 History of Alcohol Production:

Dates back to Vedic era, China-2000 BC, Egypt-4000BC. Human and animals know alcohol for thousands of years. Any sugar containing raw material can be converted into alcohol by natural yeast. Alcohol has been always under the control of Excise and prohibition Department almost in all countries. The first distillery unit in India started in the year 1905 in Up. Power alcohol law 20 % ethanol blending was carried out in India as early as in the year 1940 onwards (till 1950) though Brazil has introduced the National Alcohol Program me in the year 1975.

Uses of Alcohol: Alcohol, Ethyl alcohol or Ethanol is basically used three purposes as under

- Industrial alcohol for production of downstream chemical (Acttic acid, acetaldehyde, Ethel acetate.) perfumery and pharmaceuticals application and as a solvent for industrial application.
- Potable Alcohol for manufacture of alcoholic beverages (country liquor and I.M.F.L.)
- Fuel ethanol or anhydrous alcohol which can be blended with petrol or diesel.

2.6.2 Alcohol terms and Definitions:

- Rectified spirit (RS) or hydrous ethanol: 94.0 – 96.0% (v/v)+large amount of impurities (about 1000 -2000 ppm) + water.
- Export quality Rectified spirit (EQRS) or hydrous ethanol: 94.0 – 96.0% (v/v)+small amount of impurities (about 385 ppm) + water.
- Extra natural alcohol (ENA) or Neutral spirit (NS): 94.0 – 96.0% (v/v)+trace amount of impurities (about 125 -185 ppm) + water.
- Anhydrous alcohol or absolute alcohol or fuel ethanol or motor spirit: 99.5 – 99.9% (viv) +large amount of impurities (about 1000 ppm) (Dehydration) + small amount of water.
- Impure spirit or technical alcohol (Is or TA) : 94.0 – 95.0% (v/v)+very large amount of impurities (about 3500 -5000 ppm) + water.
- Industrial alcohol or ordinary denatured spirit (ODS) or special denatured spirit (SDS): Made unfit for drinking purpose by addition of denaturants.

Table No: 2.21 Total World Alcohol Productions

Sr. No.	World Reigns	Years and Production in million litters					
		2007	**2008**	**2009**	**2010**	**2011**	**2012**
1	EU	3703	4320	5613	6375	6523	7156
2	Europe	5037	5623	6817	7757	7867	8514
3	Africa	647	682	741	768	825	828
4	North C America	27227	44291	44609	53609	56044	56907
5	South America	23450	28127	27221	29244	24009	26449
6	Asia	10749	10863	10668	12186	13123	14091
7	Oceania	173	192	274	352	422	498
World Total		**67,283**	**83606**	**9,00,85**	**1,03,897**	**1,02,290**	**1,07,287**

Source: - V.S.I.:- Training manual January 16-20, 2012.

Table No.2.22 World Top Five Alcohol producing Countries

Sr. No	World Region	Years and Production countries in million litters					
		2007	**2008**	**2009**	**2010**	**2011**	**2012**
1	USA	25932	36468	42178	51538	53500	54250
2	Brazil	22551	27146	26075	27963	22550	24750
3	China	7000	6900	7317	8350	8600	8900
4	India	2078	2063	1565	1882	2327	2700
5	France	1137	1445	1790	1873	1720	1820

Source: -V.S.I.:- Training manual January 16-20, 2012.

2.6.3 Distillers in India's Point of view: (Alcohol Production)

The use of alcohol as drink is an age-old concept in India and it appears that the technique for fermentation and distillation was available even in the Vedic times it was called "Somarasa" and was used not only for its invigorating effect but also in worship and medicinal uses.

The first distillery in the country was set up at Cawnpore (Kanpur) in 1805 by Carew And Co. Ltd. for manufacture of Rum for the army. The technique of fermentation distillation and blending of alcoholic beverages was developed in our country on the lines of practices adopted overseas particularly in Europe.

The distillery industry today consists broadly of two parts one potable anhydrous ethanol for blending with petrol. The potable industry producing Indian

Made Foreign Liquor and country Liquor has a steady but limited demand with a growth rate of about 7-10 percent per annum. The industrial alcohol industry on the other hand is showing a declaring trend became of high price of molasses which is invariantly used as substrate for production of alcohol.

Indian Scenario: Alcohol Industries:

- Number of molasses based distillery units in India: about-400
- Molasses based installed capacity- +5.0 bln lit.
- Molasses production: 15.5 m/n M.T.
- Molasses for alcohol production: 10-85 m/n M.T.
- Total Molasses alcohol production: 2300 to 2600 m/n. lit.
- Requirement for potable purpose: 1500- 1600 m/n. lit.
- Requirement for (5%) blending purpose: 800-1050 m/n. lit.
- Requirement for industrial purpose: 650-1350 m/n. lit.

Table No.2.23 State wise Ethanol Producers industries in India. (Capacity in KLPD)

State	No. of Units	Industrial capacity KLPD
Bihar	3	155
U.P.	27	2106
Hariyana	01	90
Panjab	04	230
Andhra Pradesh	14	561
Odisha	2	80
Tamil Nadu	9	380
Maharashtra	65	1762
Gujrat	9	271
Karnatala	18	902
Grand Total	**143**	**6527.8**

W.W.W. Ethanol. org

TableNo.2.24 State wise co-generation attached Sugar Mills in India.

State	No. of co-gen. unit	Capacity in M.W Exportable Energy	
		Season	Off season
Bihar	3	27	21
U.P.	54	960.16	159.50
Uttaranchal	01	27.50	--
Haryana	6	32.60	--
Punjab	12	165.00	--
Andhra Pradesh	23	317.75	37.00
Tamil Nadu	27	514.70	89.00
Maharashtra	54	623.20	7.00
Karnataka	39	553.50	418.00
Grand Total	**211**	**3221.41**	**732.00**

W.W.W.cogen.org

2.6.4 Ethanol production (India)

Ethanol production in India is heavily dependent of production of sugar and sugarcane, which fluctuates due to their cyclic nature. Because of in India almost the entire ethanol is produced from sugarcane molasses.

According to the Minister of state for chemicals and fertilizers, the Government, under the Sugar Development Fund Rules, 1983, project cost, to sugar mills for setting up ethanol project to improve their viability via value addition to their by-product molasses.

Table No. 2.25 Production of Ethanol in India (Million liters)

Year	Production
2008-09	2264.86
2009-10	1830.40
2010-11	2046.47
2011-12	3785.00

Source: AIDA New Letter, Page no. 15

Ethanol blending programme in India:

It has gone through many ups and down. There are many hurdles. Players involved are Sugar lobby, OMCS , liquor, lobby and Alcohol based chemical manufactures. 5% blending has started and the all India tender requirement is 1077 min. liter (for 12 months). This will be influenced by the International crude price,

which has crossed 103 and may go up also. Sugar cane crop in India goes through cycle nature of ups and downs. Government has to design a long term policy that is sustainable and takes into consideration interest of all parties involved.

2.6.5 Liquor manufacturing in India:

- IMFL production in India (2010) was about 250 m/n cases. Alcohol requirement for IMFL in 2012 is 1100-1200m/n liters. IMFL manufacturing is growing at a rate of 14-15% per annum.
- Alcohol requirement for CL. In 2012 are 400-500 m/n litters. CL. manufacturing is growing at a rate of 8-10% per annum.
- Many new international players are entering Indian Market.
- Gradual shift of molasses alcohol to grain alcohol is taking place.
- 2012 Grain alcohol share in IMFL and CL manufacturing is excepted to be about 20%
- In many states CL. Manufacturing has shifted from molasses alcohol to grain alcohol.

2.6.6 A. Bagasses Based co-generation Indian scenario:

The term "co-generation" means the combined production of electric power and useful heat by the sequential use of energy form a common source of fuel. Co-generation facility is defined as a facility which produces electricity energy and steam or other forms of useful energy such as heat which are used for industrial commercial, heating or cooling purposes. Thus co-generation facility simultaneously produces two forms of useful energy namely electricity and heat.

The Co-generation Programme is currently is divided into two components-bagasse and non-bagasse Based. While bagasse Co-generation is essentially sugar mill oriented non-bagasse biomass Co-generation can be used in biomass industry. The ministry has two separate programmes for these.

In India sugar mills have always Co-generation steam and electricity using bagasse produced during crushing. Before the 1970's steam generation pressure temperature and boiler/turbine efficiencies were low while steam requirements for the process were high and hence the mills neither self sufficient in their steam requirements nor in electricity. Started utilizing waste heat, for power generation and was the starting of export of Co-generated power to grids. This is known as incidental Co-generation. Bagase based Co-generation is a Renewable source of energy and environment friendly.

2.6.6 Government policies at present in India:

- In 1993, the Ministry of Non-conventional Energy Sources (Now call Ministry of New and Renewable Energy or MNRE) prepared policy guidelines for the promotion of power generation from renewable energy source, some of the salient features of this policy guideline are-buy back price of Rs.2.25 per KWH with 5% annual escalation, with 1993 as the base year. Concessions regarding banking, wheeling and third-party sale, and fiscal incentives were also given. The MNRE guidelines were valid for a period of 10 years.
- The Electricity Act, 2003(EA2003) that was notified by the Ministry of power in June 2003 along with the National Electricity Policy recognized the role of renewable energy technologies and stand alone systems.
- The EA2003 has accorded significant responsibilities to the State Electricity Regulatory commissions (SERCS) that are now key players in setting tariffs for Renewable energy–based electricity generation and have also been mandated to set quotas for renewable energy as a percentage of total consumption of Electricity in the area of distribution licenses which would act as in incentive to attract optimum investment in the Co-generation sector.
- National electricity policy recognizes that Co-generation need to be promoted and states that significant potential for Co-generation exist in sugar industry.
- The National Traffics policy that was notified by the ministry of Power in January 2006. In continuation of the EA2003 and the National Electricity policy, also emphasizes the importance of setting renewable energy quotas and preferential tariffs for renewable energy procurement by the respective SERCS.

2.6.6 B. Baggasses based Cogeneration Power Plants in Maharashtra State: Current Scenario:

The potential for power generation from suger factories in Maharashtra, through bagasse-based cogeneration, staggers to the tune of 2000 M.W. with the increasing number of sugar factories, development of high pressure temperature Configuration and optimized steam and power Consumption for the sugar process. The Government of Maharashtra has undertaken several policy initiatives since 1995 and particularly since 2008. The main policy initiatives from the State Government include short-listing of about 60 sugar factories, 5% equity support, Waiver of cane

purchase tax benefit, appointment of a separate competent committee headed by the commissioner of Sugar for the purchase of machinery and monitoring and facilitation support.

The Central Government has also provided fiscal incentives for these projects since 1993. They mainly include exemption of excise duty, income tax holiday for 10 years, accelerated depreciation, capital grants and interest subsidies, promotional incentives, low interest loans from the Sugar Development Fund (Under the Department of Food and public Distribution) as well as directions to central (CERC) and State Electricity regulatory Commissions (SERC) for providing preferential tariffs for power evacuated from these projects. The Maharashtra Electricity Commission (MERC) declared a supportive tariff of Rs.4.79À-Kwh which was the highest triff being offered for bagasse based cogeneration projects at that time.

2.6.6 C. BOOT Project at Co-operative Sugar Mills in Maharashtra:

Implementation of cogeneration power plants along with concurrent sugar factory modernization on Build- own-operate-transfer³BOOT´ basis has been experimented with in State cooperative sugar factories, science 1995. The government of Maharashtra issued a supportive Government Regulation (GR) in 1995, allowing co-operative sugar factories to select competent BOOT developers and implement projects.

As of September 2012, eight co-operative sugar factories have implemented co-operation power plants and concurrent sugar factory modernization on BOOT basis cumulating to 214 M.W. of installed capacity.

Table No.:-2.26 Cogeneration Project in Maharashtra.

Sr. No.	Particular	No. of Units
1.	Co-generation project in operation	48
2.	Co-generation project in operation from the season 2012-13	14
3.	Co-generation project under construction and expected to commissioned in 2013	26
4.	BOOT Basis.	04
5.	Urjanku Nidhi- in operation	01
6.	Urjanka Nidhi- in construction	01
	Total project	**94**

Source:- Sakhar Diary 2013

Table No.:- 2.27 STATE WISE NUMBER OF DISTILLERIES, THEIR ANNUAL LICENSED AND INSALLED CAPACITY IN INDIA DURING 2011-12.

Sr. No.	State / U.T.	Number of distilleries	Annual licensed capacity (kilo-litre)	Annual installed capacity (kilo-litre)
1.	Andhra Pradesh	29 (12)	2,03,364 (1,09,750)	1,05,345 (1,05,345)
2.	Assam	----------	----------	----------
3.	Bihar	9 (4)	79,950 (28,950)	79,950 (28,950)
4.	Chhatisgarh	2 (--)	36,000 (--)	1,800 (--)
5.	Daman & Diu	4 (--)	17,160 (--)	17,160 (--)
6.	Goa	5 (--)	4,044 (--)	5,306 (--)
7.	Gujarat	15 (9)	1,68,710 (85,260)	1,71,050 (83,600)
8.	Haryana	9 (1)	85,950 (4,550)	85,950 (4,550)
9.	Himachal Pradesh	3 (--)	12,486 (--)	13,600 (--)
10.	Jummu & Kashmir	5 (--)	31,949 (---)	31,749 (--)
11.	Karnataka	40 (10)	3,87,089 (1,22,169)	3,74,514 (1,10,369)
12.	Kerala	10 (2)	28,328 (4,418)	23,730 (5,520)
13.	Madhya Pradesh	18 (--)	2,98,576 (--)	3,08,051 (--)
14.	Maharashtra	81 (59)	8,99,272 (7,20,945)	8,49,,222 (6,85,545)
15.	Nagaland	1 (--)	1,350 (--)	1,350 (--)
16.	Orissa	10 (3)	18,992 (3,720)	19,005 (3,720)
17.	Puducherry	4 (--)	22,900 (--)	11,700 (--)
18.	Punjab	13 (4)	2,87,479 (36,120)	2,56,847 (36,060)
19.	Rajasthan	9 (2)	1,01, 700 (11,400)	93,250 (11,400)
20.	Sikkim	2 (--)	1,971 (--)	3,504 (--)
21.	Tamil Nadu	26 (11)	4,10,150 (2,22,350)	4,16,425 (2,04,350)
22.	Uttar Pradesh	53 (23)	12,27,374 (6,18,000)	11,37,482 (6,18,000)
23.	Uttarkhand	3 (1)	99,190 (15,000)	99,190 (15,000)
24.	West Bengal	5 (--)	35,300 (--)	35,300 (--)
All India		**356 (141)**	**44,59,284 (19,78,632)**	**42,29,694 (19,12,409)**

Source: "COOPERATIVE SUGAR" December 2013, Vol. 45. No.4

Note : Figures given in parenthesis refer to distilleries attached with sugar factories

Table: 2.28 Production Performance of Distilleries Affiliated of co-operative sugar in Maharashtra.

Particular	Year		
	2009-10	**2010-11**	**2011-12**
A. Rectified Spirit production:- Number of Distilleries	65	67	67
Total Installed Capacity (Lakh lit/300days)	7230	7500	7635
Net working days (Average)	149.41 (52-disttillris)	181.26 (53-disttillris)	203.30 (53-disttillris)
Capacity Utilization %	46.45	55.99	67.99
Molasses Distilled(Lakh MT)	11.21	13.44	16.10
Total Alcohol Production(Rs+ENA+IS) (Lakh litters)	3023	3636.77	4416.17
Average Recovery of Alcohol (Lit.)	296.79	270.51	274.28
B. Extra Neutrals Alcohol Production:- Number of ENA Plants	37	40	40
Total Installed capacity(Lakh lit/300days)	2532	2622	2877
Net working days (Average)	96.50 (12ENA plant)	111.50 (14ENA plant)	129.07 (15ENA plant)
Capacity Utilization %	28.49	30.90	34.86
Rectified spirit used for ENA production(Rs.To ENA route) lakh lit.	188.06	170.32	131.45
Extra Neutral; Alcohol Production (lakh lit)	421.85	554.77	728.26
C.Fuel Ethanol Production Number of Ethanol products Plants	31	33	33
Total Installed capacity(Lakh lit/300days)	2709.60	2784.60	2919.00
Net working days (Average)	10 (6FA Plants)	56 (18FA plant)	87 (21FA Plant)
Capacity Utilization %	2.12	11.99	25.99

Rectified spirit used for the fuel Ethanol production (lakh lit)	18.25	264.30	635.93
Fuel Ethanol Production (lakh lit)	16.57	249.97	608.18
D. Country liquor Production(Lakh Cases)	123.094	129.93	129.50
E. Indian made Foreign Liquor Production (Lakh Cases)	3.95	4.86	19.11

Source: Technical performance of Cooperative Distilleries in Maharashtra. (Year 2009-10, 2010-11, 2011-12).

Note: Twenty plants are based on wash to ENA route. Therefore the quantity of ENA produced is seen more than rectified spirit used for ENA production.

Salient Features of Production Performance of Distilleries:

- The working days of distilleries largely depends on prevailing market prices of molasses, RS and ENA and availability of raw material (i.e. Cane Molasses). The average working days during the year 2009-10 were 179, (2010-11 were-181 and last year 2011-12 were 203.)
- The capacity utilization of distillery plants as increased during the year 2011-12 (69.99%) as against the year 2009-10) (46.45%)
- The alcohol yield lit/MT of Molasses has increased marginally during the year 2011-12 (274.28 lit/MT) has against the year 2009-10 (269.79 lit/MT).
- The capacity utilization of ENA Plants has increased during the year 2011-12 (34.86%) as against the year 2009-10 (28.49%)
- The capacity utilization of Fuel ethanol plants has increased during the year 2011-12 (25.99%) as compared to the year 2009-10 (2.12%)
- The production of Country liquor has increased during the year 2011-12 (i.e.129.50 lakh cases) as compared to the year 2009-10 (i. .e.123.094 lakh cases)
- The production of Indian made foreign liquor has increased during the year 2011-12 (i.e.19.11 lakh cases) as against the year 2009-10 (i.e. 3.956 lakh cases)

2.7 Functional area in Sugar Industry:

The sugar industry performs several activities which may be grouped under important functional department such as production, finance, marketing and human resource etc. Such functions differ from one organization to another. The function of an organization such as production, finance, marketing and human resource are known as operative functions. For instance scope of these department and inter-related. Now the sugar industry mills is becoming more commercial and will be looked into from pure business perspective. Today in all functional areas in sugar industry is a necessary. The main functional areas of management as explained are follows.

2.7.1 Production Department:

The major responsibility of production management is transformation of inputs like material, machinery, capital, information and energy into specified output as demanded by the society the technical and managerial qualifications and skills.

Sugar industry is seasonal industry. The duration of seasons depend upon the availability of sugarcane and there are also year to year variations. Hence the production performance of sugar industry depend on raw material of sugarcane, duration of the season, location of the factory, sugarcane production per hector, available modern machinery, new technology, capacity of the factory etc.

The sugar factory production departments the following functions are taken into account.

- Production planning and control.
- Material management
- Plant maintenance
- Process Automation
- Quality Assurance and Quality control.
- Production system.
- Location of plants
- Layout of plant

2.7.2 Financial Management:

Financial Management is that part of general management which is responsible for obtaining and effectively utilizing the funds for the efficient functional of business.

According to Joseph L. Massie, "Financial management is the operational activity of a business that is responsible for obtaining and utilizing the funds."

In sugar industry financial management is essential, function. It is major function of any sugar factory. It deals with the arrangement of adjectives of the sugar factory. Only arrangement of capital is not sufficient it is equally essential to utilize it in the best possible manner. Financial management includes the various function i.e. Capital budgeting and current assets decisions, working capital decision, financial accounting, sugarcane billing, Harvesters and Transporters billing, sales billing and Management, Deposits accounting, store accounting and costing etc.

2.7.3 Marketing Management:-

The concept of marketing is essentially a concept customer orientation. For a long time it has been Pre-achieved by all. According to Vinoba Bhave that the customer is king of market. The marketing concept involves customer orientation, competition orientation, organization Integration and Goal Achievement.

In the words of W. J. Stanton "Marketing is a total system of interacting business activities designed to plan price, promote and distribution, want satisfying to present and potential customers.

- **Sugar Marketing:**

Last few years various sugar factory started sugar marketing department. The following obligation Golf of India to any sugar factory it is as follows.

1. Since long Government of India is implementing Duel policy of sugar under the essential commodity Act 1955 i.e. levy sugar as required by Government of India and factories are permitted to sale non levy sugar in the open Market.
2. The Govt. of India has amended vide Notification No.535 dt. 24.09.2010 the levy percentage from 20% to 10% from 1.10.2010 season.
3. The Govt. of India fixing levy and non levy sugar quota for each month declaring by total quality and allotting levy and non levy sugar quantity proportionately to each sugar factory on monthly basis and directing sugar factories to sale and dispatch sugar stipulated period.
4. Alone levy sugar quota is realized by Govt. of India on monthly basis and Government has restricted to sale and dispatch this monthly quota in that month only. If the quota is not sold and dispatched of the end of each month, that quantity is to be diverted to levy.

2.7.4 Human Resource Management:

Human resource management is a behavioral approach to personal and it is a process, consisting of four functions- acquisition and maintenance of human resources. It is concerned with people at work and with their relationship into an effective organization.

According to Edward Flippo, "Human resource management is the planning, organizing, directing and controlling of the procurement, development compensation, integration; maintenance and separation of human resource and that individual organization and social objectives are accomplished."

Role of HRM as follows:

- Human Resources planning.
- Design of Organization and Job.
- Selection and staffing
- Training and Development
- Organization Development
- Compensation and Benefits.
- Employee Assistance
- Union/Labour Relations
- Personal Research and Information system

2.8 Conclusions:

Sugar industry is one of the major industries in India. It is the second largest industry next to textile industry its plays an eminent role in economic life in India. It is agro-based industry, located in rural areas. In India co-operative sugar factories are playing an important role, co-operative sugar movement is conducted in the area of socio-economic development is rural areas cooperative sugar factories are being considered as growth centre. Economic growth is closely linked with Industrial productivity and this is important of local national and International level with the gradual decline in prices of sugar in India and the concept of sugar complex has relatively slow progress because of financial crisis and government policies. The other problems like increase cost of production of sugar, low production capacity, because of it is not a healthy trend of a sugar industry.

This is therefore the right time to launch some by-product industry to make the sugar Industry financial viable. Lastly two decades some progressive co-operative

sugar factories in this direction has encouraged many more co-operative to set up such by-product industries. Now the sugar factories divert by setting up value addition sugarcane i.e. bagasse, molasses and press mud. Bagasse is largely used as fuel to generate steam for power and process purpose. In Recent years many factories have gone for co-generation project based on surplus bagasse to produce electric power. The sugarcane molasses is largely being used for the production of industrial alcohol, potable liquor, recently used ethanol production. Lastly filter cake was used for the preparing composting. Therefore the filter and more profitable utilization of the by-product of the sugar industry is inescapable.

The distillery industry today consists broadly of two parts one potable and anhydrous ethanol for blending with petrol. The potable industry producing Indian Made Foreign Liquor and country Liquor has a steady but limited demand with a growth rate of about 7-10 percent per annum. The industrial alcohol industry on the other hand is showing a declaring trend became of high price of molasses which is invariantly used as substrate for production of alcohol. Ethanol production in India is heavily dependent on production of sugar and sugarcane, which fluctuates due to their cyclic nature. Due to in India almost the entire ethanol is produced from sugarcane molasses.

The Co-generation Programme is currently is divided into two components-bagasse and non-bagasse. While bagasse Co-generation is essentially sugar mill oriented non-bagasse biomass Co-generation can be used in biomass industry. The ministry has two separate programmes for these.In India sugar mills have always Co-generation steam and electricity using bagasse produced during crushing. The potential for power generation from suger factories in Maharashtra, through bagasse-based cogeneration, staggers to the tune of 2000 M.W. with the increasing number of sugar factories, development of high pressure temperature Configuration and optimized steam and power Consumption for the sugar process.

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CHAPTER - III

Research Methodology and Review of Literature

Chapter Design

This chapter explain research Methodology that will be adopted, the statement of the problem, the area of the research, the sample size of the research, the data collection method i.e. primary and secondary data, and techniques of data analysis used and Review of literature included Ph.D. thesis, Journals and Books.

A) Research Methodology:

3.0 Introduction:

Sugarcane in as agri-energy crop and India is the homeland of these crops. India is one of the largest producer and consumer of sugar in the world. Sugar industry is the second major agro based industry of our country next only to cotton industry, which can generate prosperity in rural area through increasing employment and income. These generated income and employment have multiplier effect and helps in over all development of the country.

Indian sugar industry is an important and big share in agriculture processing industry. It has very strong impact on our rural development and provides successful rural economy. In our country nearly 50 million farmers provide employment. The Indian sugar mills currently has 527 operational sugar mills out of that 234 are in co-operative sector. Total sugar production in India 243 lakh tones out of 108.55 lakh tones in co-operative sector in the year 2010-11 also total sugar production in the year 2011-12 was 262 lakh tones and also sugar production in the year 2012-13 are 250 lakh tones, estimated production in the year 2013-14 were 237 lakh tones.

The sugarcane is grown in 21 various states of India. Mianly sugarcane mills are operating in large sugarcane growing areas like Maharashtra, Gujarat, Tamilnadu, Karnataka and Utter Pradesh. In Maharashtra alone is producing 30% of national sugar on put and maximum number of sugar mills are also in Maharashtra compared to other states in India. In the year of 2011-12 sugar factory crushing season, 118-co-operative and 51- private sugar factories have crushed the sugarcane and the total sugar production of 90^{th} Lakh tones and in the year 2012-13 sugar produced 70.44 lakh tones in Maharashtra State.

The experience of some of the progressive co-operative sugar factories, particularly those located in the State of Maharashtra in setting up and running the industries based on the by-products of the sugar industries have proved the multifarious advantages of such industries. The main by-products of the sugar industry are bagasse and molasses. By setting up industries to the first instate, it has been proved that waste materials can also be converted into wealth by adopting suitable technologies. In the second way, such industries create more employment opportunities in the rural parts of the country. Where the sugar factories are usually located such industries improve the economic status of thousand of sugarcane growers and the overall financial viability of the sugar factories there by making the working of the sugar factories much more successful. With the gradual decline in prices of sugar in India and increase in cost of production of sugar, the working of many sugar factories is not comfortable. Therefore this is the right time to launch some by-product industry, to make the sugar industry financially viable. The dynamic leadership given by some progressive co-operative sugar factories in this direction has encouraged many more co-operative sugar factories to set up such by-product industries.

3.1 Significance of the study:

In other countries sugar is a by-product, but in India sugar is the main product produced by sugar mills. India is producing large quantity of sugar because of our own needs, but now a day's only sugar production is not production is not profitable for sugar mills. Sugar industry needs to increase their capacity in by products like alcohol, ethanol co-generation etc. This could be possible only through fuller and better utilization of the by-products and alternative produce, so that the higher value products are manufactured from them and sugar industry derives maximum benefit from the sugar crop. The ultimate prosperity of the Indian sugar industry depends upon diversification into numerous avenues based on the by-products of the sugar industry. The following are reason for setting up by-product industries in India.

- To improve the general economy of the sugar industries and to make them financially viable.
- To improve the economic status of sugarcane growers and workers by way of paying higher prices for sugarcane crop.
- To create more employment opportunities in the rural areas by setting up industries based on sugarcane by-products.

- Judiciously utilizing sugarcane crop residues and industrial effluents to produce value-added products and minimize pollution hazards.

Biomass has always been an important energy source for the country considering the benefits it offers. It is renewable, widely available, carbon neutral and has the potential to provide significant employment in the rural areas. Biomass is also capable of providing firm energy. For efficient utilization of biomass, bagasse based cogeneration in sugar mills and biomass power generation have been taken up under biomass and cogeneration program me.

Sugar industry has been traditionally practicing cogeneration by using bagasse as a fuel. With the advancement in the technology for generation and utilization of steam at high temperature and pressure, sugar industry can produce electricity and steam for their own requirement. It can also produce significant surplus electricity for sale to the grid using same quantity of bagasse. The sale of surplus power generation though optimum cogeneration would help a sugar mill to improve its viability, apart from adding to the power generation capacity of the country.

Ethanol which is an alternatives fuel for automobile vehicle is produced from sugarcane molasses. The bio-ethanol blending program me reduce India's dependence of fossil fuel import, it also ensures that the nation moves towards energy efficiency. It also has other very important advantages of being the best oxidant which helps burn the petrol better when blended with it thereby reducing environmental pollution that fossil fuel are infamous for.

The Government of India realized the benefits of fuel ethanol use in India with the fast growing sugar industry. India being the second largest sugarcane producer in the World, it accepted that there is a huge potential of production and availability of the fuel ethanol. It was accepted by the Government in 2006, that a mandatory 5% ethanol blending with petrol (EBP) program me would directly benefit the sugarcane farmers by assuring the sugar industry a stable and reasonable return for the molasses and then passing a significant part of the same to the farmers.

3.2 STATEMENT OF THE PROBLEM:

The cooperative sector plays an important role in the Indian sugar industry. Co-operative sugar factories are the processing unit established by the farmer in the

rural area. The capital is collected from the farmers for their economical and social development. It is established as per the co-operative norms and rules. These co-operative sugar factories have created ample opportunities for employment in rural area. Today co-operative sugar mills are facing many problems like competitive environment, cyclic nature of the industry, high support price payable to farmers, inadequate working capital, low yield of sugarcane outdated machinery in old co-operative sugar factory, competition with Gur and Khandsari industry. Sugar export policy was unstable, more government regulations, high cost of production etc. because of this problems the working of many sugar factories is not comfortable. This is therefore, the right time to launch some by-product industry to make the sugar industry financial viable. The dynamic leadership given by some progressive co-operative sugar factories in this direction has encouraged many more co-operative sugar factories to set up such by-product industries.

Because of importance of by-products of the sugar industry the researcher selected research problem, "An Analytical study of By-products of sugar industry with reference to Kolhapur Districts"

3.3 OBJECTIVES OF THE STUDY:

Researcher has conducted research work on the basis of set objectives, the specific objectives are as follows:-

1. To know the growth and development of sugarcane By-products industries and their ancillaries.
2. To examine the financial position of the co-operative sugar factories and its departments of By-products.
3. To study the economics of by-products in sample Sugar factories.
4. To stud the functional areas like production, marketing, finance and Human Resource of by-products production in the sample units.
5. To know the financial liability of the by-products in sample sugar factories
6. To suggest product mix model to sample sugar factories.
7. To draw conclusion and suggest appropriate suggestion, if necessary.

3.4 HYPOTHESES OF THE STUDY:

1. Co-operative sugar factories are suffering from the losses due to high cost of production and low productivity in relation to by-product units.
2. Low level of efficiency is found at various By-product departments.
3. The functional areas of management like production, marketing, finance and HR are weak in the by-products sample units
4. By-Products production mix is not up to the mark in sample units.

3.5 Research Design and Methodology:

a) Sampling Design: It consists of selection of the study area and selection of the sample sugar factories.

- **Selection of the study Area:**

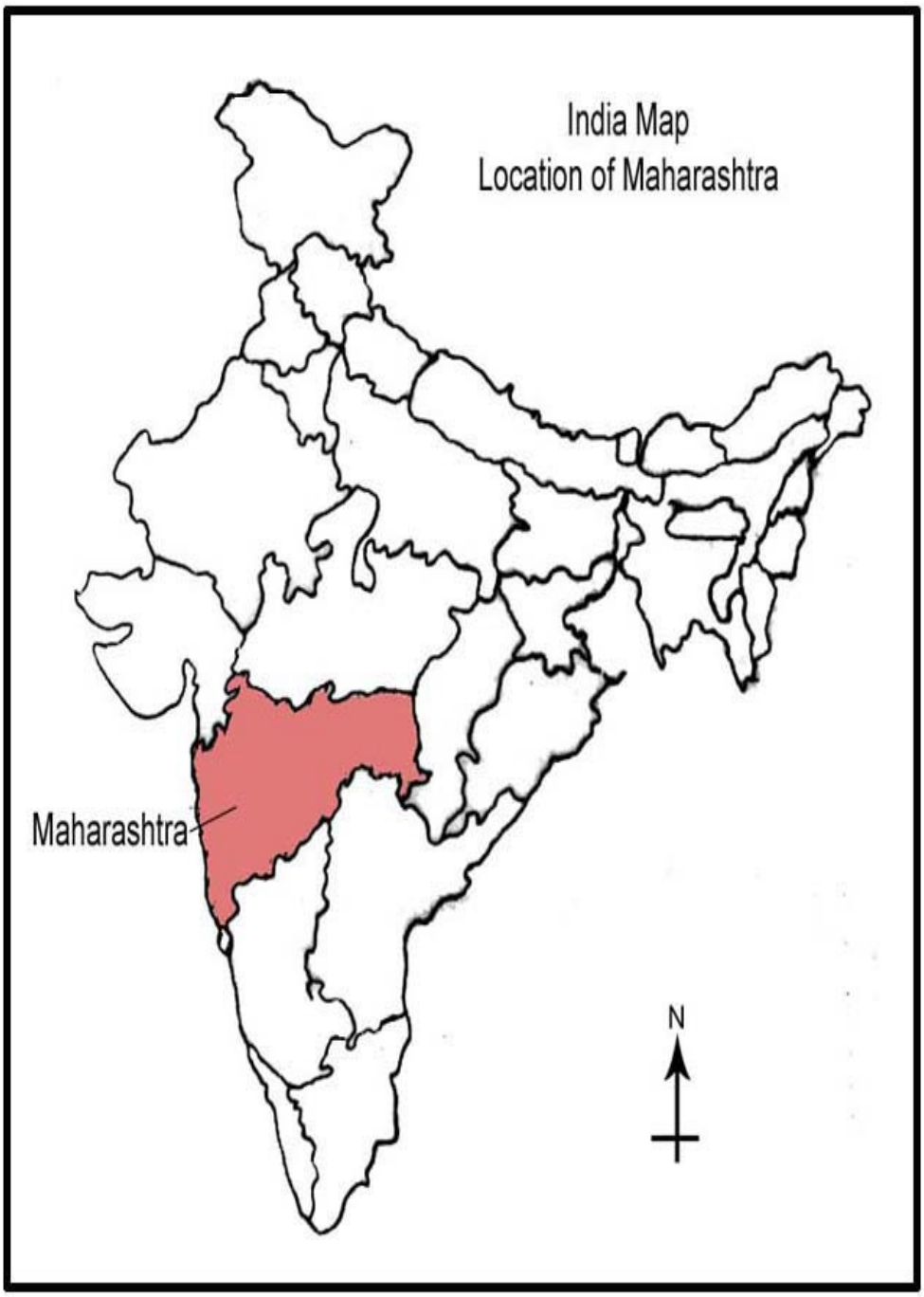
India has emerged as one of the largest production of sugarcane and sugar in the world with highest number of sugar factories. In India, Maharashtra is one of the major sugars producing State in the country and in Maharashtra; Kolhapur District in particular, became a potential sugarcane belt area. Sugarcane occupies an important place in the economy of the district it is the most important cash crop of the District.

The District as such as in the top on many indicators such as number of sugar factories, crushing capacity, cane crushed, cane recovery, Sugarcane by-product industries, etc. Kolhapur is the home district of the researcher, located in peninsular part of India of South-Maharashtra; it was chosen on convenient bases as the study area for the purpose of the present investigation.

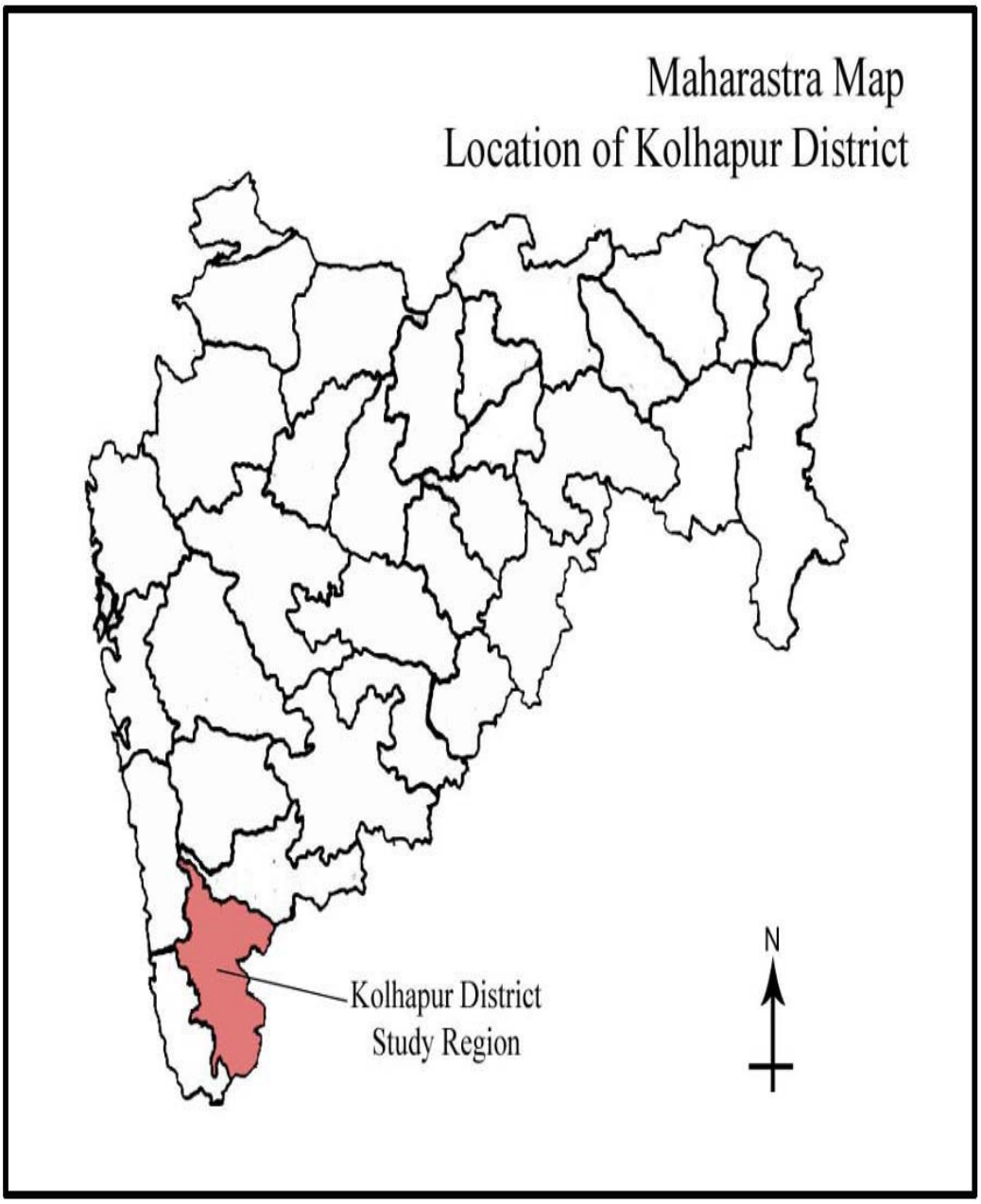
- **Selection of Sample Co-operative Sugar Factories in the Study Area.**

The total numbers of sugar factories in Kolhapur District are 21 Out of 17-sugar factories in co-operative sector. Researcher is selected 5 (30%) co-operative sugar factories. It is also considered that geographical location, area, size, age, crushing capacity, nature of production of by-products etc. The use of convenience sampling method was taken up for selection of the sugar factories.

Map No.3.1 Map shows location of Maharashtra:



Map no.3.2 Shows location of Kolhapur district



Map no.3.3 Location of Sample Sugar Factory

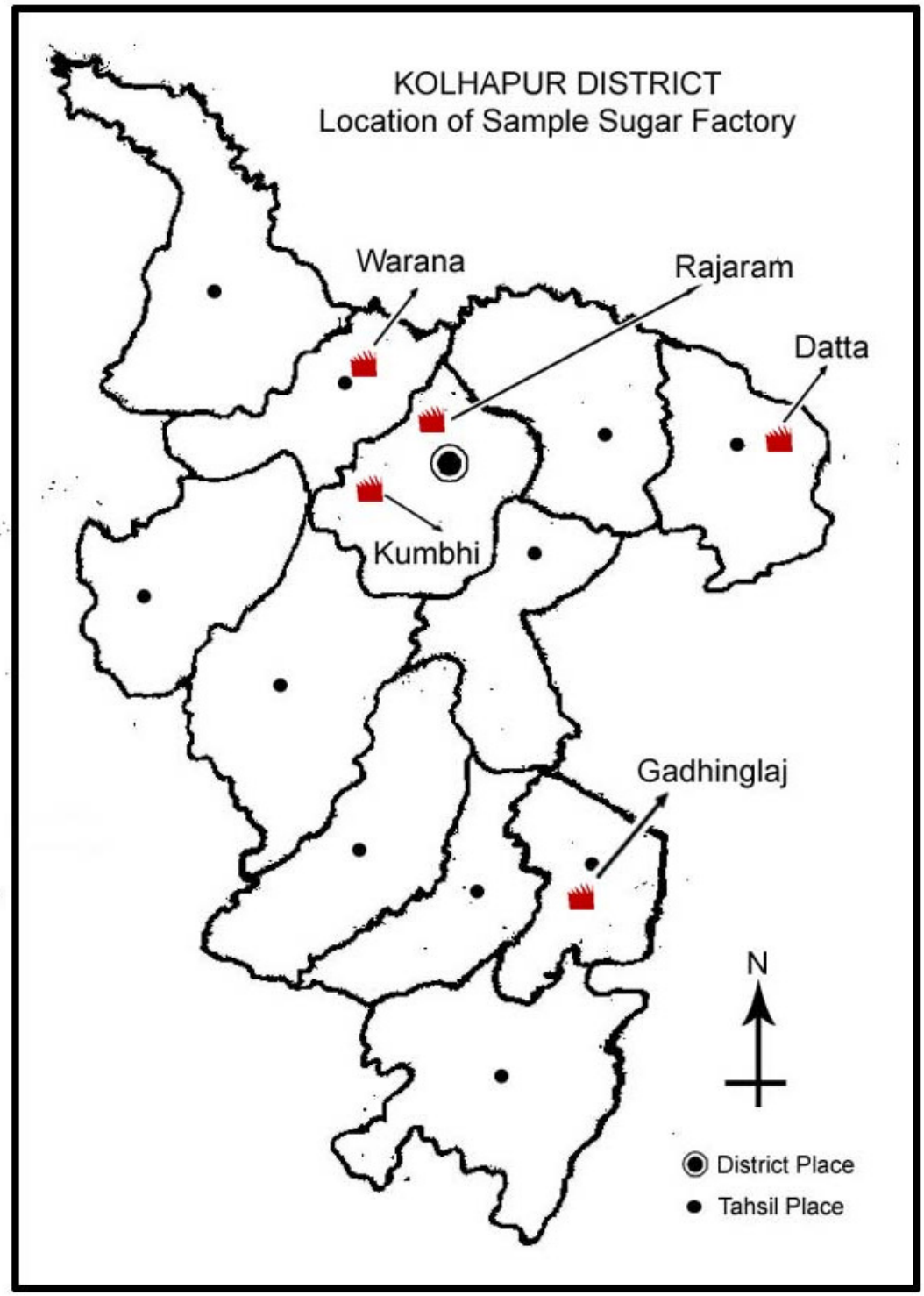


Table No.3.1 Details of samples co-operative sugar Factories in the Study Area

Name of the factory And address.	Year of the Regis-traction	First Crushing Season	Age on 31.03 .13	Installed Cap. (TCD)	Location From the Kolhapur	By products units
1	2	3	4	5	6	7
Sheri Datta Sahakari Sakhar Karkhana Ltd.Dattanagar, Tal-Shirol.	1969	1971-72	43	7000	East	Distillers, Ethanol, Bio-composting, co-generation
Kumbhi Kasari Sahakari Sakhar Karkhana,Ltd. Kuditre, Tal-Karveer.	1960	1963-64	50	3000	West	Distillers, Bio-composting, co-gen. (Projected) ENA (Projected)
Appasaheb Nalwade Gadhinglaj Taluka Sahakari Sakhar Karkhana Ltd.Harali, Tal.-Gahinglaj	1971	1978-79	25	2000	South	Distillery, Bio-Composting
Shri Tatyasaheb Kore Warana Sahakari Sakhar Karkhana Ltd. Warananagar,Tal-Panhala	1955	1959-60	54	7500	North	Distillers, Ethanol, Paper mill. ENA, co-generation (Projected)
Shri Chh. Rajaram Sahakari Sakhar KarkhanaLtd.Kasaba Bawada, Tal-Karveer.	1984	1985-86	27	2200	Central	---------

b) Methods of Data Collection:

In this study the research work is based mainly on primary as well as secondary sources of information.

- **Primary Data :**

The primary data the researcher has been visited to all sample sugar factories as well as through questionnaire, interview, discussion and observations. The researcher interview of the officials and management, by-product department heads, were organized questionnaire. Primary data has also been obtained through other methods like observation and field survey. The data about production performance, financial, marketing, and H.R. etc. it has been related with sample sugar factories and its by-products departments.

- **Secondary Data:**

The researcher has collected secondary data from Annual reports, books and published literature of the sample sugar factories. For theoretical background researcher has made use of textbooks related of the sugar industry and by-products industries.

Other necessary data is collected from:-

- Various Annual reports from the related sugar industry.
- Report of All India Distilleries Association.
- Reports of Renewable Energy Development Agency Ltd. New Delhi.
- Reports of ethanol producers Association.
- Report of co-cogeneration producers.
- Books and Magazines etc.
- Published and unpublished research work.
- The Internet.

c) Period of the study :

The sugar industry is cyclical in its nature, which is normally of four to five years i.e. two years of number sugarcane crop followed by two years as shortage of sugarcane due to draught or of market position and one year is as normal because of by-products sugar industry also affected. Naturally this cycle affects the cost effectiveness and economy of the sugar mill. Therefore, the researcher has decided to cover the period of eight years, which starts from 2005-06 to 2012-13. It was considered as an appropriate for the analysis of sugar factory and its by-products units a period of time.

d) Tools and Techniques Used :

The study is based on primary as well as secondary information. The data draw from the questionnaire is analysis with the help of various tools and techniques. The statistical tool like percentage, Trend Analysis, Mean, Standard Deviation, Correlation and co-efficient of Variances etc. is used where ever required. The researcher also analyzed and interpreted the collected data by use of computer with the SPSS software.

3.6 Scope and Limitation of the study:

The present study covers the sample sugar factories in Kolhapur District. The selected subject has following limitation.

- The study relates the selected five co-operative sugar factories in the Kolhapur District only.
- The researcher studied the functional areas like production, financial, marketing and human resource in relation to the sugar factories and its by-products developments.
- This study does not necessarily cover all these technical aspect of sugar factories.
- The period of the study is of only seven years i.e. from 2005-06 to 2012-13. Therefore time factor is the limiting factor.
- The conclusions drawn in this study are based on the data made available by these sugar factories.
- Use of statistical tools and technique has its own limitation

3.7 Chapteraization:

Chapter 1: Profile of Sample Sugar Factories:

This chapter explains a brief profile of the sugar factory included in the study and its organization history and there by-products departments and sugar factory.

Chapter 2: Theoretical Background:

This chapter deals with theoretical background of sugarcane industries and its brief history. Also the concept of sugar factory and present scenario and also the concepts of functional areas like production, finance, marketing and H.R.

Chapter 3: Research Methodology and Review of Literature:

A)Research Methodology : This part explain research Methodology that will be adopted, the statement of the problem, the area of the research, the sample size of the research, the data collection method i.e. primary and secondary data, and techniques of data analysis used and time period etc.

B) Review of literature: The review has been made in the following ways.

- Published books related to the sugar industry and by-product industries and other functional areas books.
- Research Articles, Journals and Reports on various institutions.
- M. Phil and Ph.D. thesis.

Chapter 4: Analysis and Interpretation: By- products.

This is a core aspect of the research study analyze the data. The functional areas production of by-products units analysis this chapter.

Chapter 5: Analysis and Interpretation:

Other functional areas of By-products in this chapter an attempt has been made to analyze and interpret the data pertaining to the sample study areas like financial, marketing and H.R. in relation to the by-products units.

Chapter 6: Analysis and Interpretation By products mix models:

This chapter has covered the appropriate suggestive models for By-products mix models relation to the production, marketing, financial and human resource.

Chapter 7: Conclusion and Suggestions:

The chapter has covered conclusion and Suggestions parts on the basis of study and derived models.

B. Review of Literature:

The researcher has been made review Ph. D. Thesis (14), research journal (11) and related books (10) total review 35 taken into account.

Ph.D. Thesis:

1. **R.M. Karche (1985**), for his doctoral research surveyed the co-operative sugar factories of Maratwade region in the light of the policy of the state Government towards the sugar industry, financial structure of the selected sugar factories, problems related to input supply and cane development, cost of production of sugar, working results, efficiency of the factories and the role of sugar co-operatives in area development. He also examined the policy of management in dealing with the problems confronted and offered useful suggestions. ***This Ph.D. thesis research about the co-operative sugar factories of Maratwade region in the light of the policy of the state government towards the sugar industry but does not study the by-products in sugar industry.***
2. **G.A. Nikam (1988),** He study "Inter-Regional financial Statements Analysis of sugar co-operatives, in Maharashtra", Ph.D. Thesis, Marathwade University, Aurangabad. In his analytical work on the inter-regional financial statement of the sugar co-operatives in Maharashtra, Selected nine sugar factories from different districts of Maharashtra. He analyzed their cost

structure and cost components, magnitude of total cost, cost trend, profitability, and financial strengths. He noticed that the volume of shareholders fund to net worth was negligible and the sugar factories relished depend on the borrowed capital. A comparison with the private sugar factories revealed that the percentage of the general and administrative expanses of co-operative sugar factories was higher than those of the private units. ***This research about the co-operative sugar factories only Inter-Regional financial Statements Analysis but does not study the by-products of sugar factory and its financial area.***

3.S.D. Potar (1998), "Working and Impact of Sugar cooperatives on the economic conditions of producer member in Kolhapur District" Ph.D. Thesis, Shivaji University, He enquired into the working and impact of sugar cooperatives on the economic conditions of the producer member in Kolhapur District. He studied Panchaganga cooperative sugar factory and analyses its role in the development of various infrastructure facilities, impact on economic conditions of producer members, development of by products, labor relations and co-structure with help of break even analysis. ***In his research about the working and impact of co-operative sugar factories on the economy condition of producer member only but he has not given any financial and production of co-perative sugar factories.***

4. V. M. Hilage (1989), His Ph.D. Thesis "Performance of Sugar cooperatives –A Comparative study of the two cooperatives sugar factories in southern Maharashtra", Shivaji University Kolhapur. He studied into the performance of the sugar cooperatives by comparing the operational performance of two sugar co-operatives in southern Maharashtra. He emphasized the significance of cane development, development of lift irrigation, proper attention to harvesting and transportation of cane and control of pests and diseases.***The researcher study only two co-operative sugar factories in southern Maharashtra about only cane development, irrigation scheme.***

5. G.S.Kamat (1965), He studied the management of co-operative sugar factories in Maharashtra by Selecting 14 cooperatives sugar factories established between 1950 to1962. He examined the polices relating to cooperative processing industries in India, in relation to production performance of sugar factories, financial structure and problems of cooperative processing provided

a spring board for rural development and cooperative sugar factories served as a modal in this tasks. ***He studied the management of co-operative sugar factories in Maharashtra by Selecting 14 cooperatives sugar factories established between 1950 to1962 it is old study now.***

6. S.K.Shiirodkar (1967) studied the cooperative movement in Kolhapur District. Reference to the development of sugar cooperatives in District, he observed that they provided stability to agricultural incomes due to reasonable and guaranteed prices for sugarcane and thereby provided incentive for increase in overall agricultural production.***The reseacher studied only the cooperative movement in Kolhapur District reference to the development of sugar cooperatives in Kolhapur District.***

7.R.B.Anekar (1970), attempted an economic survey lf the cooperative sugar in Maharashtra. His study covered twenty cooperative sugar factories in the state out of which four were in Kolhapur District. He examined the size, capital structure, cost structure, marketing structure, labor structure and social and economic effects of the sugar cooperatives, besides the linkage of sugar cooperatives with politics and their working. ***His study only covered twenty cooperative sugar factories in the State out of which four were in Kolhapur District in relation to size, capital structure, cost structure etc. but does not study the by-products in sugar industry.***

8.M.A.Patil (2002), He study the problems of workers in sugar industry in the Kolhapur District are in a way. His area recruitment policy, working period, type of training, wage structure, bonus schemes, problems of children's education, health problems, welfare activities, working conditions etc. in its objectives of the study are understand the problems of seasonal workers and to assess the wage structure, nature of salary, leave facilities provided by sugar factories to seasonal workers. He concluded that the sugar industry management should evaluate the areas of tension, theirs hopes and aspirations in life. ***He study the only problems of workers in sugar industry in the Kolhapur District but he has not include the area of workers in by-products of sugar industry.***

9.Shri C.M.Shinde (2003), these investigation ender ours to study the working capital management of sugar factories in Satara District. In its study objectives are to examine the composition of the capital structure and various

sources used by the sugar factories for obtaining the capital also he study the trends of the current assets and current liabilities, to assets, liquidity position of the sugar factories. He conclude the study it may be said that the efficiency of the working capital management of the sugar factories in the district will be definitely increase. A lot of funds now invested in inventory alternative use. ***He study the working capital management of sugar factories in Satara District. The researcher study only the capital structure and various sources.***

10. **.Dr. A.M.Gurava (2003),** he selected to study the cost and productivity of cooperative sugar factories in Kolhapur District. These study has been specific objectives are to be few selected cooperative sugar factories in Kolhapur District. Also to know the cost of production at the aggregate and of level of various cost and work center, also study the impact of government policy on cost and productivity of sugar factories, inventory management in sugar factories. Lastly concluded that in all sugar factories cane price and conversion cost fluctuating more in the study period. He also studied cost of production and productivity analysis. ***He has study the only cost and productivity of cooperative sugar factories in Kolhapur District but does not mentation the area of by-products industries in sugar industry.***
11. **Dr. S.M. Kamble (2005),** he studied for Ph.D. research under the title of "A study of problems and prospects of sugarcane harvesters and cane transporting laborers with special reference to Satara District." He has studied in detail the problems of sugarcane cutters and transporting laborers with sugar factories, also he covered that the sugarcane cutters problems in the area of physical, psychological and socio-economical. ***He only covered that the sugarcane cutters problems in the area of physical, psychological and socio-economical.***
12. **Dr. M. G. Pawar, (1995),** in his study entitled, "Raising and utilization of finances of by co-operative sugar factories in Satara District." He suggested that for sugarcane development sugar factory experiment, develop and popularize bio-fertilizers among the cane growers' adequate manpower should be appointed as per the rule of National Federation of Cooperative sugar factory, factories borrow short term funds to create current assets and long-term funds to create fixed assets.***The researcher study only the utilization of***

finances of by co-operative sugar factories in Satara District but neglected the area of production, finance.

13. **V.K. Abitkar, (2002),** she studied thirteen sugar factories in Kolhapur Districts. She identifies the deficiencies in the management process and application of management process at various levels in sugar factories. She observed that the organization are found to have developed and strategic controls measures, so she recommended that strategic control measures need to be devised to judge the overall functioning of the organization, factories have not given the importance to proper inventory management. ***The researcher identifies the deficiencies in the management process and application of management process at various levels in sugar factories but does not include the management process in by-product industries in the sugar factories.***
14. **Dr.V. A. Patial, (2002),** he studied various problems related to seasonal workers i.e. recruitment, training and development, promotion, wage structure, salary, leave facilities. He suggested that recruitment and selection committee under the control of employment exchange, in every sugar factory there should be a fully fledged separate personnel department, statutory provisions in the factories act should be strictly implemented, provision of better canteen facilities, rest-shelters are to be required by the workers in sugar factories. ***He studied only various problems related to seasonal workers i.e. recruitment, training and development, promotion, wage structure in relation to the sugar factory but does not work area of by-product industries in sugrar factory.***

Journals:-

15. **P.G.Bhoi and B.J.Takalkar,** write article "Present Scenario of sugar Industry in Maharashtra And its Future strategies." He was explained the main issues of cane yield and sugar recovery, sugar requirement and yield targets in India, Strategy for increasing sugarcane productivity and sugar recovery, Water management, Integrated soil fertility and plant nutrient management etc**.** ***The researcher study explained the main issues of cane yield and sugar recovery, sugar requirement and yield targets in India.***
16. **S.Ravi ,** in his article "Ethanol **:** A Solution to global fuel Demand." This article was developed and indicates that the ethanol becomes only solution to

the global fuel demand and it is one of the alternative fuel that suits the developing countries and safe fuel to the increasing vehicular populations. ***In his article Ethanol : A Solution to global fuel Demand related only world scenario but does not study the Indias point of view.***

17. **P.Ramasamy,** Write the paper "Ethanol production in sugar complex." In the lines this paper was the present scenario of sugar, Fossil oil stock and power shortage make it imperative to go for non-conventional, Bio-liquid fuel production and power production to cope up with the present and future demand. ***He write the paper "Ethanol production in sugar complex" but he neglected marketing of ethanol and marketing channel.***
18. **J.J.Bhagat and Dilip Jain,** write article "Indian sugar Industry-An overview." The paper discusses about the structure, size and influence of India sugar industry on world sugar market and present an overall view of the sugar industry and its socio-economic impact. The paper high lights the Indian sugar industry scenario, technology issue, efficiency improvement, by-product usage and environmental safeguards addressed by the Indian Sugar mills. ***This research article only Indian sugar Industry-An overview in relation to technology isseue, efficiency emprovement and by-product usage.***
19. **D.K.Pant, S.N.Saraswat and Ajay Mishra,** in his article "Sugar Industry Diversification For Valve Addition" He expressed clear that sugar factories cannot survive only on the basis of sugarcane to sugar. Unless the sugar factories diversify by setting up value addition industries based on the by-product of sugarcane i.e. molasses, press mud and bagasse etc. the realization of sugar industry cannot increased. ***In his article only focus Sugar Industry Diversification For Valve Addition product theoretical basis.***
20. **Shri Y. Sudarsan and P.K.Agrawal,** Write article "Some Factors Affecting Quality of Molasses for Alcohol Production." In this article cane molasses being the raw material for alcohol production in India, its composition is of great significance to distilleries. However molasses is a by-product of sugar industry and distilleries have little control over its composition. This paper describe clarification and processing procedures of cane juice which in turn, affected the composition of molasses and suggests ways and mean to improve the quality of molasses of sugar factory level. ***This article include cane***

molasses being the raw material for alcohol production in India and its composition is of great significance to distilleries.

21. **Shri. S.K.Sharma,** Write paper "Increasing Potential of sugar mill By-product." This paper focus Sugar production from cane yields a series of by-product that can be grouped according to the parts from which they are obtained i.e. those which are available during the cane harvest it self, such as cane tops and straw and those which are the result of the industrial process specifically bagasse, final molasses, and filter mud. Sugar industry is cyclic and is susceptible to the vagaries of nature. Moreover it is subject to various controls which restrict its profitability. These factors make it necessary to develop the concept of sugar mill complexes. ***This paper given importance to Increasing Potential of sugar mill By-product.***
22. **Shri. P. Thangamutha, and G.M. Jenekar** write paper "Production of Poor man's LPG from Press Mud" In those article the utilization of press mud for the efficient of bio-gas which was clean and cheap fuel. Those process called "Digestion" It was non conventional energy source. The Central and state Government are encouraging this programme. In Tamil Nadu State sugar factories are utilizing the Press-mud for the production of Bio-Gas which was called poor-man's LPG by avoiding deforestation to keep the environment without any change. ***In those research article given importance the utilization of press mud for the efficient of bio-gas which was clean and cheap fuel.***
23. **R.D.Mahuli,** Write article "Glories of Sugar Industry" He explained the co-operative movement in Maharashtra in post independence period i.e. 60'5, 70'5, 80'5 and first half of 90'5 have been considered as golden era for cooperative movement and more particularly for cooperative sugar industry. Second half of 90'5 and the first decade of 21st century has really been a setback for the cooperative sugar industry. He writes what is short margin? Most of the Sugar factories are facing this problem. What does it mean? Short margin simply means excess borrowing of in other words the existing stock if it is sold the entire liabilities cannot be liabilities over current assets. He lastly conclude we must say that there are some grey areas in the operation of sugar industry in co-operative sector and these are to be arrested and necessary corrective actions are to be taken on war footing to reestablish the glories of

co-operative sugar industry. ***He explained in his research article only the co-operative movement in Maharashtra in post independence period.***

24. **Shri G.D. Patil & B.N.Shinde**, write article "Chemical Nature of Spent wash/spent slurry Press mud compost" this article focus spent wash the effluent after alcohol distillation and spent slurry, the effluent after methane generation from spent wash pose problems of disposal and pollution. Composting of spent wash with press mud at 2:1 ratio has been adopted by some distilleries for spent wash deposal. However at this ratio all the spent wash and spent slurry generated cannot be composed with press mud Produced. Hence increased ration in composing and reported that compost with high C:N ratio could be prepared even from 2:1 to 6:1 ratio of spent wash and press mud within 15th 30 days. It was therefore the chemical nature of these composts for their use in crop production***. The researcher write article on Chemical Nature of Spent wash/spent slurry Press mud compost it is a by-product of sugar factory and distillery.***
25. **P.J.Manohar Rao,** Write paper "Energy conservation leading to Successful By-Product Industries." He was explained sugarcane is used as Food (sugar) fiber (cellulose), Fuel (Bagasse) and Foddle (Green tops, Trash molasses etc.) he also studied the main by-product of the sugar industry are 1) Bagasse 2) Molasses 3) Filter Press Cake, The other by-product which are of less commercial value are 1)Sugarcane Trash 2) Sugarcane Tops 3) Boiler Ash 4) Effluent. He is explained the sugar factory bagasse it is traditionally used as captive fuel. He is studied Adoption Energy conversation measures in Sugar Factories to save bagasse and Substitution of bagasse with alternate fuels and other uses explained bagasse based industries. He is an also studied molasses based industry that is use of molasses for Ethel alcohol Production, use of molasses for citric acid, Lactic acid, Use of molasses for cattle feeds***. The researcher studied the main by-product of the sugar industry are 1) Bagasse 2) Molasses 3) Filter Press Cake only theoritcal background.***

Books:

26. **P.J. Manohar Rao:** The author wrote the book "Industrial Utilization of Sugar Cane and Its co-products." The author of this book was a chemical Technologist with specialization in sugar and alcohol technologies. He worked for a number of years in different sugar factories, distilleries and paper

factories in India. The author had to visit the co-product industries in many countries in order to see for himself the working of these plants and collect data with the help of his friends in different countries. He was explained the two main part of co-product that is field co-product and factory co-product. In field co-product some part of sugarcane, such as leafy trash and green tops which as used as cattle feed. In factory co-product include Bagasse, Molasses and Filter mud. Main product of bagasse various uses i.e. burnet in the boilers and create a steam, used paper industry, Particle Boards, Boxes, furfural and co-generation etc. Another by-product of molasses can be converted into many value added product by application of modern technologies, the author was described in detail. Lastly the he explained the topic in filter cake and its different uses. ***This book gives information about sugarcane by-product industries theortical background in the old concept but not include current satuts of by-product industries in this book not include Indian sugar industry current status.***

27. **R. S. Dubey and N.C. Varma:** They wrote and published the book "Sugar by-products and subsidiary industries." They were writing proper utilization of the by-products is not only essential from the disposal point of view but also for reducing the cost of production of sugar. The by-products of the sugarcane industry are explained main two parts I) By-products of the sugarcane farm namely cane tops and cane trash. II) By-products of sugar manufacture namely bagasse, molasses, press mud and furnish ash. Amount to about 40 percent to the weight of cane crushed. They were explained chapter two Bagasse its meaning and various uses of bagasse. Chapter three the waste molasses is largely being used for the production of industrial alcohol is being utilized for the production of a few organic chemicals. Chapter five Press-Mud its meaning and its used. A study of the subject has, therefore, been made in considerable detail with a view to collecting relevant technical information about the by-products, their avenues of utilization and scope for development of by- product industries in the context of the Indian sugar industry.This book proves to good reference to the research of sugarcane by-product industries. ***This book written by R.S.Dubey and N. C. Varama explain in detailed about sugarcane by-product industries about indian scenario but there is no reference to sugarcane by-product industries in***

curretnt context and particularly about sugarcane by-product industry in Kolhapur district.

28. **D.P. Kulkarni and R.K. Sardeshmukh:** Write a topic "Utilization of Sugarcane Bagasse for fuel and co-generation of power in the sugar industry." In the book of "Sugarcane: Agro-Industrial Alternatives." He expressed the rising development of the by-product industry and the tradition energetic commitment of bagasse are being to assume significant economic importance. He also explained bagasse based power co-generation in sugar factories. ***The author Write a topic on Utilization of Sugarcane Bagasse for fuel and co-generation of power in the sugar industry it is a main by-product in sugar industry now.***
29. **Dr. R.S.Verma**: He wrote book "Sugarcane Production Technology in India." He write chapter first Sugarcane in India, this topic included economic importance, Sugarcane origin and history, the global distribution of sugarcane and in India, Area, production and productivity in world and in India, fluctuations in sugarcane productions, Development of the India sugar industry, utilization of sugarcane for different purposes, consumption of sweetening agents in India, and India sugar exports. ***The author write chapter Sugarcane in India only given importace to sugarcane in India, area, production but not coveread the area of by-product of sugar industry.***
30. **K.K.Mishra (1985),** worked on sickness in Indian Sugar Industry. The work was undertaken to study the causes of sickness of sugar industry and assess the cost, realization and profitability of each of sixteen zones in the country. He also studied the impact of government policies on the health of the factories in various zones. He noted four basic causes of sickness of sugar industry, viz. lack of availability of good quality of cane within a reasonable distance, high cost of conversion, pricing of sugarcane and pricing of sugar.

He concluded with these suggestions:

- To direct the extra labor force of the factory to the field of cane management.
- Provision of adequate good quality of cane in vicinity of the factory.
- Pricing of levy sugar on the basis of zoning of the factories based on their age and production capacity. ***The author work was undertaken to study the causes of sickness of sugar industry only.***

31. **R.V.Sinha (1988),** Studied the sugar Industry in India. In his work he analyses critically the economics. Of sugarcane production problems of cane marketing and transport, technical performance, cost structure, utilization of by products, labor relations, sugar policies, fiscal and financial aspects of the sugar Industry.
32. **D.P.Kulkarni,** studied cane sugar manufacturing in India. This book first topic sugar and sugarcane explained historical aspect of sugarcane, Growth of sugar Industry after 1995, Present status of the world cane sugar industry, Indian cane sugar industry scenario, Sugarcane, with its high fiber and carbohydrate content constitute an important renewable source of energy. He also explained the major components of sugarcane i.e. sugars as sucrose and Glucose, starch, Fiber and other organic polymers. And process of manufacture of sugar from sugarcane brief outline. The important topic analyses this book topic no seventeen Utilization of by-products of cane sugar manufacture i.e. bagasse, molasses and Filter cake. ***The author studied cane sugar manufacturing in India. This book first topic sugar and sugarcane explained historical aspect of sugarcane, Growth of sugar industry but does not include the by-product industries signicicance.***
33. **P.K. Agrawal,** write a topic 'Ethanol from sugarcane and its Use alternative Transportation Fuel. "In the book of 'Sugarcane' Agro Industrial Alternatives" he studied Ethyl Alcohol as Trans-portation fuel and performance of internal combustion engines using Alcohol in Diesel Blends. He explained induction of Ethanol in Diesel engine. He also studied performance of internal combustion Engines (ICE) using alcohol in Gasoline Blends. ***The author write a topic 'Ethanol from sugarcane and its Use alternative Transportation Fuel. In the book of 'Sugarcane' Agro Industrial Alternatives gives only importance to ethanol production.***
34. **G.M.S. Mann,** explained Indian Sugar Industry Retrospect and Prospect. The sugar industry is one of the highly regulated industries, starting from sugarcane to the end product i.e. Sugarcane. He also examined export potential, India is one of the leading sugar exporting countries of the world. Even where the factories make some profit it is quite merge and does not compare with the return available on investment in other industries. The Government has been emphasizing diversification into by-product based

industries such as alcohol, paper, co-generation of power etc. the diversification into by-product based industries is also quite significant considering its importance to the national economy. ***The author explained Indian Sugar Industry Retrospect and Prospect in relation to Indian sugar industry.***

35. **B. Singh and S. Solomn,** He studied the topic on Alternative Products from Sugarcane. Industrial and Agricultural uses. He analyzed the main reasons for setting up industries based on the alternatives products in developing countries, especially in India, are as follows.

- To improve the general economy of the sugar industries and to make them financial viable.
- To improve the economic status of sugarcane growers and workers by way of paying higher prices for sugarcane crop.
- To create more employment opportunities in the rural areas by setting up industries based on sugarcane by-products.
- Judiciously utilizing sugarcane crop residues and industrial effluents to produce value-added products and minimize pollution hazards.***The author studied the topic on Alternative Products from Sugarcane, Industrial and Agricultural uses onle theorital background.***

3.8 Conclusion:

The above Research Methodology and Review of Literature reveal that the researcher. India has emerged as one of the largest production of sugarcane and sugar in the world with highest number of sugar factories. In India, Maharashtra is one of the major sugars producing State in the country and in Maharashtra; Kolhapur District in particular, became a potential sugarcane belt area. Sugarcane occupies an important place in the economy of the district it is the most important cash crop of the District. The dynamic leadership given by some progressive co-operative sugar factories in this direction has encouraged many more co-operative sugar factories to set up such by-product industries. Because of importance of by-products of the sugar industry the researcher selected research problem. The experience of some of the progressive co-operative sugar factories, particularly those located in the State of Maharashtra in setting up and running the industries based on the by-products of the sugar industries has proved the multifarious advantages of such industries.

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CHAPTER-IV
Analysis and Interpretation

Chapter Design

This Chapter has covered core aspect of the research study analysis and interpretation of the production area. The functional areas production of by-products units analysis and interpretation covered 30 tables.

4.0 Introduction:

In the co-operative sugar factories the role of production department is very important. The sugar factories have a nature of functions in seasonal period, during the period various functions are arranged. Sugar factories have so far been primarily engage in producing sugar from sugarcane. While processing of sugar manufacture the factory produces three important by-products i.e. bagasse, molasses and press mud. In this chapter studies the production of these by-products of sample sugar factories. Also this could be possible better utilization of the by-products and alternative product, so that the higher value product are manufactured from them.The sample sugar factories working of molasses based distillery project and ethanol plant and extra neutral alcohol plant, bagasse based pulp project and co-generation plant and compost plant. This chapter studies the production performance of these plants.

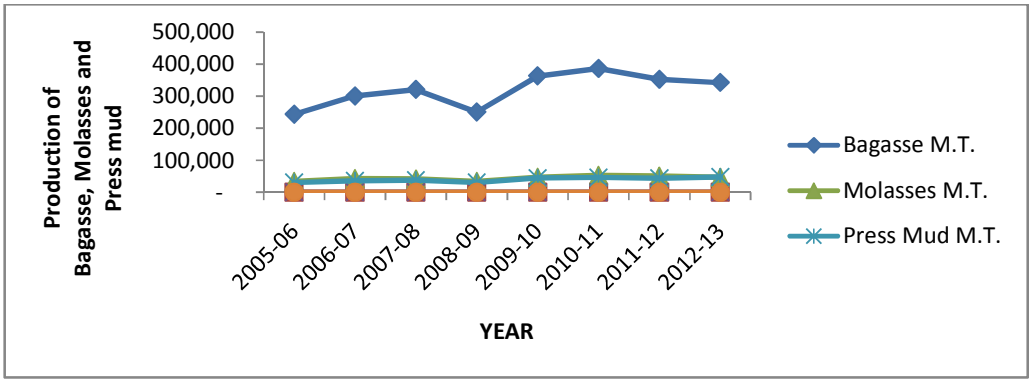
4.1 Analysis and Interpretation:

Table No. 4.1 Showing Datta sugar factory production of By-product Bagasse, Molasses and Press Mud.

Years	Bagasse		Molasses		Press Mud	
	M.T.	% of Cane	M.T.	% of Cane	M.T.	% of Cane
1	2	3	4	5	6	7
2005-06	2,43,096	29.25	33,495	4.02	30,168	3.63
2006-07	3,00,100	29.27	42,021	4.09	35,167	3.43
2007-08	3,20,555	29.15	40,833	3.71	37,211	3.38
2008-09	2,50,151	28.59	33,315	3.80	30,186	3.45
2009-10	3,62,971	28.68	46,071	3.63	44,042	3.48
2010-11	3,86,194	28.72	52,119	3.87	45,316	3.37
2011-12	3,52,177	28.65	49,806	4.05	43,269	3.52
2012-13	3,42,352	28.62	46,095	3.85	47,398	3.45
Total	**25,57,596**	**230.93**	**3,43,755**	**31.02**	**3,12,757**	**27.71**
Mean	**3,19,700**	**28.87**	**42,969**	**3.88**	**39,095**	**3.46**
S.D.	**52032.72**	**0.30**	**6951.66**	**0.17**	**6840.80**	**0.08**
C.V.	**16.28**	**1.04**	**16.18**	**4.26**	**17.50**	**2.40**

Source: Annual Report and Field work

Graph No.4.1 Shows production of Bagasse, Molasses and Press Mud



When sugarcane is crushed in the milling plants of the sugar factory for extracting its juice, the fibrous residue left over after the extraction of juice is known as bagasse. Bagasse contains mainly fibre, pentoses, lignin sugar and mineral. Hence the production of bagasse or bagasse percentage of cane depend on many factors such as the verity of sugarcane crushed, the input (fertilizer and irrigation water) applied to the sugarcane crop, methods of harvesting of sugarcane adopted, milling practices adopted etc. As the average fibre percentage sugarcane varies between 12.00 to 16.00 percent in many sugarcane producing countries, the net bagasses percentage cane is generally between 25.00 to 33.00 percentages.

In India sugar factories the bagasse percentage cane varies from 30 to 35 percentages. With fibre contains of about 12 to 15 percentage in sugarcane. In southern Indian fibre contains is usually 12-14 percentage, resulting in a bagassess yield 26-30 percentage on cane.

The table no.4.1 shows Datta sugar factory bagasse production in M.T. and bagasse percentage on cane crushed. The mean value the production of bagasse is 3,19,700 M. T. The quantity of bagasse ranged between 2, 43,096 M.T. minimum during the year 2005-06 and 3,86,194 M.T. maximum during the year 2010-2011. The higher C.V. (16.28) value indicates more fluctuation in the quantity of bagasse production during the study period. The table also shows that bagasse percentage on cane crushed. The mean value of bagasse percentage on cane crushed is 28.87 percent. The lower C. V. (1.04) value indicates the more uniformity in the percentage of bagasse in the sugarcane crushed.

The final mother liquor obtained from the processing of sugarcane into sugar is known as cane molasses and discarded as a by-product. It is thus dark chocolate coloured viscous liquid containing about 15 to 20 percent and about 50 to 55 percent

of total sugar (sucrose and reducing sugars) and the rest non sugars. The production of molasses in any sugar factory depends on the total quantity of sugarcane crushed for the manufacture of sugar, the quality of sugarcane and the quality of juice obtained and also the type of juice clarification and boiling techniques adopted. In India the generation of molasses from one tone of cane crushed varies from 3.5 percent to 4.5 percent.

The table No.4.1 shows that mean value of molasses production in the study period is 42,969 metric tons. The quantity of molasses ranged between 33,315 metric tons is minimums during the year 2008-09 and 52,119 metric tons is produced as maximum during the year 2010-11. The high C.V. (16.18) value indicates the more fluctuations in production of molasses. It is also this table shows percentage of molasses on cane crushed. In the study period is mean value of cane molasses is 3.88 percent. The high C.V. (4.26) value indicates the lower uniformity in the molasses percentage on cane crushed.

Press mud is waste material in a sugar factory process. Press mud is obtained in sugar factory to a tune of about three percent on the weight of cane crushed. Press mud contains sizable quality of macro and micro nutrients besides 20-25 percent of organic carbon. Press mud is used as manure by sugarcane farmers.

The table no.4.1 shows Press mud production. This mean value in the study period is 39,095 metric tons. The quantity of press mud ranged between 30,168 metric tons is minimums during the year 2005-06 and 47,398 metric tons as maximum during the year 2012-13. The high C.V. (17.50) value indicates the more fluctuations in the production of press mud. It is also found this table percentage of press-mud on cane crushed. In the study period is mean value of press mud is 3.46 percent. The lower C.V. (2.40) value indicates the more uniformity in the press mud percentage on cane crushed.

It is interpreted that to know the production of by-products and its percentage of cane crushed. All this by-products are important in a sugar factory. It gives income by way of sales these by-products. The standard bagasse percentage in cane crushed should be 30 percent. This factory is located in Southern region in Maharashtra and also in India. India's Southern region bagasses percentage is between 26 to 30 percent. This sugar factory mean value of bagasse is 29.17 percent .This factory properly maintain bagasses percentage on cane crushed. The standard molasses percentage should be 3.5 percent on cane crushed. This sugar factory its mean value

of molasses is normally high because it is bad indicator. The acceptable standard percentage of press mud is 3 to 3.5 percent as per V.S.I. norms. It is found this sugar factory press mud percentage on cane crushed near about this figure.

The C.V. value of bagasse, molasses and press mud production indicate high fluctuations in the production of the factory. Hence the sugar factory suggested that well plan in relation to increase quantity of sugarcane and stability of sugarcane crushed and increases availability quality sugarcane. The C.V .value of molasses percentage on cane crushed is normally high it is bad indicator. It can be suggested that the sugar factory adoption of new technology and maintain lowest percentage of molasses.

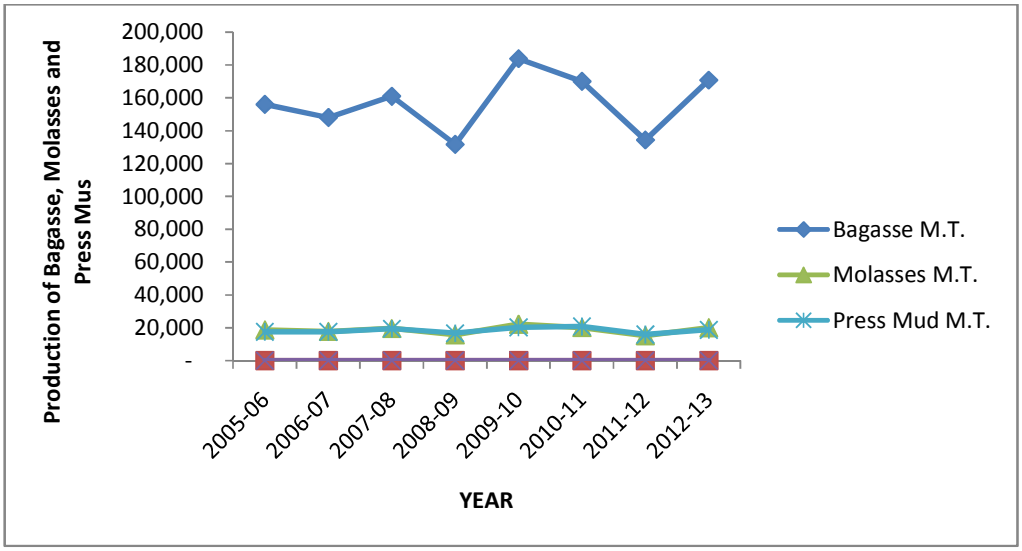
The bagasse produced during the running the sugar factory is first used in boilers as fuel for steam generation and surplus quantity of bagasse is used as co-generation project. Also the production of molasses used in distillery and ethanol plant as a raw material. And press mud used in composting project. Because of this entire project the factory improve the profitability of the sugar factory.

Table No.4.2 Showing Kumbhi sugar factory production of by-products Bagasse, Molasses and Press Mud.

Years	Bagasse		Molasses		Press Mud	
	M.T.	% of Cane	M.T.	% of Cane	M.T.	% of Cane
1	2	3	4	5	6	7
2005-06	1,56,019	29.68	18,748	3.56	17,553	3.34
2006-07	1,48,078	28.8	17,828	3.46	17,539	3.41
2007-08	1,60,992	29.29	19,569	3.56	19,449	3.54
2008-09	1,31,712	28.76	15,687	3.42	16,780	3.66
2009-10	1,83,861	29.32	22,185	3.53	20,321	3.24
2010-11	1,70,045	29.15	20,151	3.45	20,888	3.59
2011-12	1,34,354	29.20	15,228	3.31	15,870	3.45
2012-13	1,70,790	29.24	20,090	3.44	18,788	3.48
Total	**12,55,851**	**233.44**	**1,49,486**	**27.73**	**1,47,188**	**27.71**
Mean	**1,56,981**	**29.18**	**18,686**	**3.47**	**18,399**	**3.46**
S.D.	**18247.00**	**0.29**	**2355.30**	**0.08**	**1757.24**	**0.14**
C.V.	**11.62**	**1.01**	**12.60**	**2.42**	**9.55**	**3.92**

Source: Annual Report and Field work

Graph No.4. 2 shows production of Bagasse, Molasses and Press Mud



The table no.4.2 shows Kumbhi sugar factorly production of by-products bagasse, molasses and press mud in the study period. The mean value is the production of bagasse is 1,56,981 metric tons. The quantity of bagasse ranged between 1,31,712 metric tons is minimum during the year 2008-09 and 1,83,861 metric tons as maximum during the year 2009-10. The high C.V. (11.62) value indicate more fluctuations in the production of bagasse. It is also table no.4.2 shows production of bagasse percentage on cane crushed. The mean value in the percentage of bagasse on cane crushed is 29.18.The lower C.V. (1.01) value indicates the more uniformity in the percentage of bagasse in the sugarcane crushed.

The table no.4.2 also shows molasses production. This mean value of molasses production is 18,686 metric tons. The quantity of molasses ranged between 15,228 metric tons is minimum during the 2011-12 and 22,185 metric tons as maximum during the year 2009-10. The high C.V. (12.60) value indicates more fluctuations in the production of molasses. It is also found the above table the production of molasses percentage on cane crushed. The mean value of molasses production percentage on cane crushed is 3.47 percent. The lower C.V. (2.42) value indicates more uniformity in the molasses percentage on cane crushed.

The table no.4.2 also shows press mud production in the study period. This mean value of press mud production is 18,399 metric tons in the study period. The quantity of press mud ranged between 15,870 metric tons is minimums during the year 2011-12 and 20,888 metric tons as maximum during the year 2010-11. The high C.V. (9.55) value indicates more fluctuations in the production of press mud. This table also shows the production of press mud percentage on cane crushed. The mean

value of production of press mud percentage on cane crushed is 3.46 percent. The lower C.V. (3.92) indicates the normally uniformity in the press mud percentage on cane crushed.

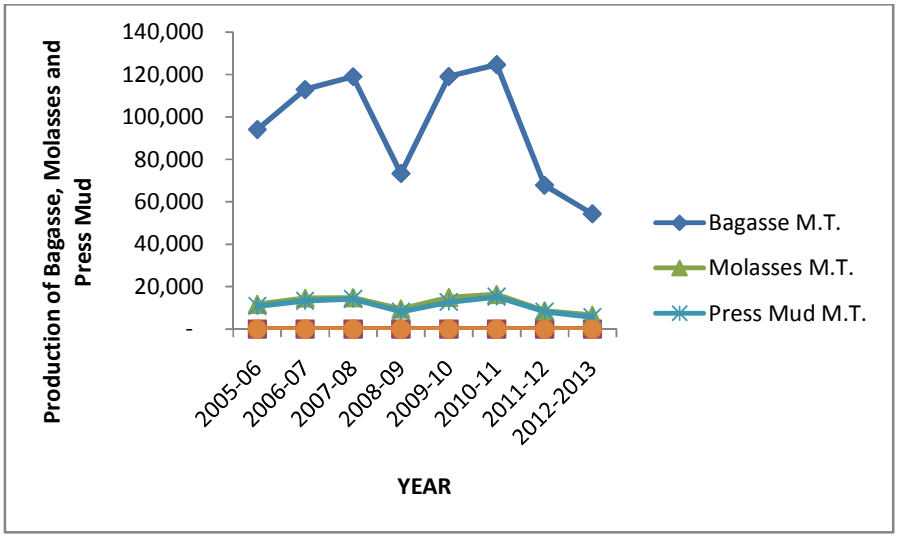
It is interpreted that regarding production of by-products and its percentage of cane crushed. The C.V. value of bagasse, molasses and press production is indicated high. Hence the factory suggested that concentrates more plans in relation to increase quantity of sugarcane and stability of sugarcane crushed and increase availability quality of sugarcane, and increased crushing capacity . It is also found C.V. value of percentage of bagasse and molasses on cane crushed is lower value indicate the factory proper main ting the percentage of bagasse and molasses. The C.V. value of press mud percentage on cane crushed is normally high it is bad indicator. It can be suggested that the sugar factory proper cleaning of sugarcane, removing cane binding material before process and using mud setting modern pots and technology. It is also all this by- products are important in a sugar factory. It gives income by way of sales these by-products.

Table No.4.3 Showing Gadhinglaj sugar factory production of By -products Bagasse, Molasses and Press Mud

Years	Bagasse		Molasses		Press Mud	
	M.T.	% of Cane	M.T.	% of Cane	M.T.	% of Cane
1	2	3	4	5	6	7
2005-06	94,068	29.24	11,678	3.63	10,841	3.37
2006-07	1,12,932	29.85	14,603	3.86	13,317	3.52
2007-08	1,18,967	30.44	14,812	3.79	14,186	3.63
2008-09	73,323	29.05	9,540	3.78	8,203	3.25
2009-10	1,19,044	29.18	14,972	3.67	12,687	3.11
2010-11	1,24,598	28.29	16,329	3.76	15,243	3.51
2011-12	67,845	29.37	8,570	3.71	8,223	3.56
2012-13	54,342	29.31	6,516	3.72	5,658	3.23
Total	**7,65,119**	**234.73**	**97,020**	**29.92**	**88,358**	**27.18**
Mean	**95,640**	**29.34**	**12,128**	**3.74**	**11,045**	**3.40**
S.D.	**27276.58**	**0.62**	**3588.08**	**0.07**	**3390.10**	**0.19**
C.V.	**28.52**	**2.11**	**29.59**	**1.95**	**30.69**	**5.47**

Source: Annual Report and Field work

Graph No.4. 3 Shows production of Bagasse, Molasses and Press Mud



The table no.4.3 shows Gadhinglaj sugar factory production of by-products bagasse, molasses and press mud and also percentage on cane crushed in the respective element. The mean value of production of bagasse is 95,640 metric tons. The quantity of bagasse ranged between 54,342 metric tons is the minimum during the year 2012-13 and 1,24,598 metric tons as maximum during the year 2010-11. High C.V (28.52) indicate that more fluctuation in the quantity of bagasse production during the study period. It is also above table shows production of bagasse percentage on cane crushed. The mean value of bagasse is 29.34 percent on cane crushed. The lower C.V. (2.11) value indicate the more uniformity in the bagasse percentage on cane crushed.

The table no.4.3 also shows production of molasses. The mean value of the production of molasses is 12,128 metric tons. The quantity of molasses ranged between 6,516 metric tons is the minimum during the year 2012-13 and 16,329 metric tons as maximum during the year 2010-11. The high C.V. (29.59) indicates that more fluctuation in the quantity of molasses production during the study period. Also it is found the production of molasses percentage on cane crushed. The mean value of production of molasses percentage on cane crushed is 3.74 percent. The lower C.V. (1.95) value indicates the more uniformity in the molasses percentage on cane crushed.

The table no.4.3 also shows production of press mud. The mean value of the production of press mud is 11,045 metric tons. The quantity of press mud ranged between 5,658 metric tons is minimums during the year 2012-13 and 15,243 metric

tons as maximum during the year 2010-11. The high C.V. (30.69) value indicate that more fluctuation in the quantity of press mud production during the study period. Also it is found the production of press mud percentage on cane crushed. The mean value of production of press mud percentage on cane crushed is 3.40 percent. The C.V. (5.47) value indicates the not stability in the press mud percentage on cane crushed.

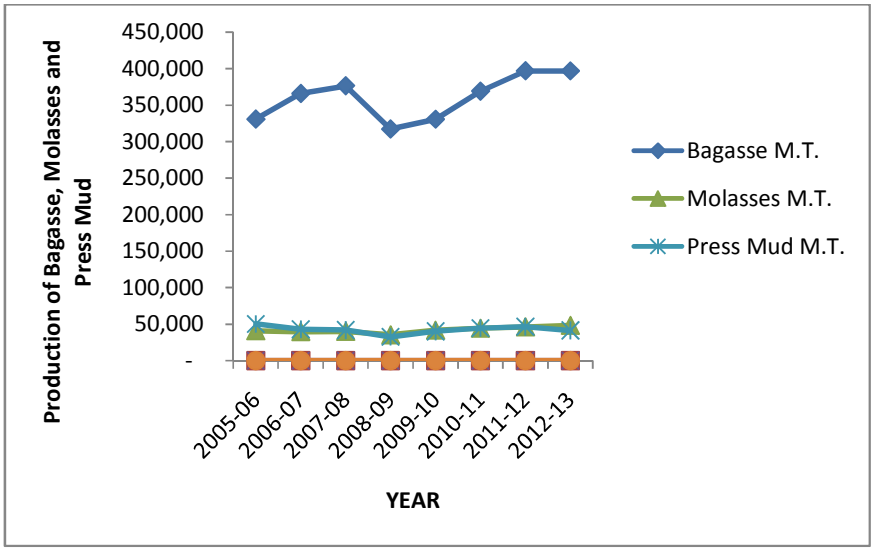
It is interpreted that the C.V. value of bagasse, molasses and press mud production is very high. It is suggested that proper planning in relation to increase quantity of sugarcane and stability of sugarcane crushed, increase availability of sugarcane, increased crushing capacity of sugar factory. It is also found C.V. value of press mud is high it is a bad indicator. It can be suggested that the factory proper planning in cleaning of sugarcane, removing cane binding material before process and using mud setting modern pots and technology. It is indicate these by-products are important in a sugar factory. It gives income by way of sale these by-products.

Table No.4.4 Showing Warana sugar factory production of By -products Bagasse, Molasses and Press Mud

Years	Bagasse		Molasses		Press Mud	
	M.T.	% of Cane	M.T.	% of Cane	M.T.	% of Cane
1	2	3	4	5	6	7
2005-06	3,30,710	28.49	41,083	3.40	50,353	3.99
2006-07	3,65,779	29.13	39,840	3.17	42,910	3.50
2007-08	3,76,330	30.25	40,256	3.24	42,000	3.38
2008-09	3,17,249	29.51	35,472	3.28	32,749	3.05
2009-10	3,30,617	27.91	41,816	3.46	40,360	3.41
2010-11	3,68,967	27.01	44,536	3.24	44,684	3.26
2011-12	3,96,832	28.55	46,426	3.34	46,645	3.35
2012-13	3,96,657	29.72	48,376	3.62	41,496	3.08
Total	**28,83,141**	**230.57**	**3,37,805**	**26.75**	**3,41,197**	**27.02**
Mean	**3,60,393**	**28.82**	**42,226**	**3.34**	**42,650**	**3.38**
S.D.	**30772.17**	**1.05**	**4096.40**	**0.15**	**5134.33**	**0.29**
C.V.	**8.54**	**3.64**	**9.70**	**4.36**	**12.04**	**8.68**

Source: Annual Report and Field work

Graph No.4.4 shows Production of Bagasse, Molasses and Press Mud



The table no.4.4 shows Warana sugar factory production of by-products bagasses, molasses and press mud and also percentage on cane crushed in respective element. The mean value of production bagasse is 3,60,393 metric tons. The quantity of bagasse ranged between 3,17,249 metric tons during the year 2008-09 and 3,96,832 metric tons as maximum during the year 2011-12. The high C.V. (8.54) value indicates more fluctuations in the production of bagasse. . It is also above table shows production of bagasse percentage on cane crushed. The mean value of bagasse is 28.82 percent on cane crushed. The lower C.V. (3.64) value indicate the more uniformity in the bagasse percentage on cane crushed.

The table no.4.4 also shows production of molasses. The mean value of the production of molasses is 42,226 metric tons. The quantity of molasses ranged between 35,472 metric tons is the minimum during the year 2008-09 and 48,376 metric tons as maximum during the year 2012-13. The high C.V. (9.70) indicates that more fluctuation in the quantity of molasses production during the study period. Also it is found the production of molasses percentage on cane crushed. The mean value of production of molasses percentage on cane crushed is 3.30 percent. The lower C.V. (4.36) value indicates the more uniformity in the molasses percentage on cane crushed.

The table no.4.4 also shows production of press mud. The mean value of the production of press mud is 42,650 metric tons. The quantity of press mud ranged between 32,749 metric tons is minimum during the year 2008-09and 50,353 metric tons as maximum during the year2005-06. The high C.V. (12.04) value indicate that

more fluctuation in the quantity of press mud production during the study period. Also it is found the production of press mud percentage on cane crushed. The mean value of production of press mud percentage on cane crushed is 3.38 percent. The high C.V. (8.68) value indicates the more fluctuation in the press mud percentage on cane crushed.

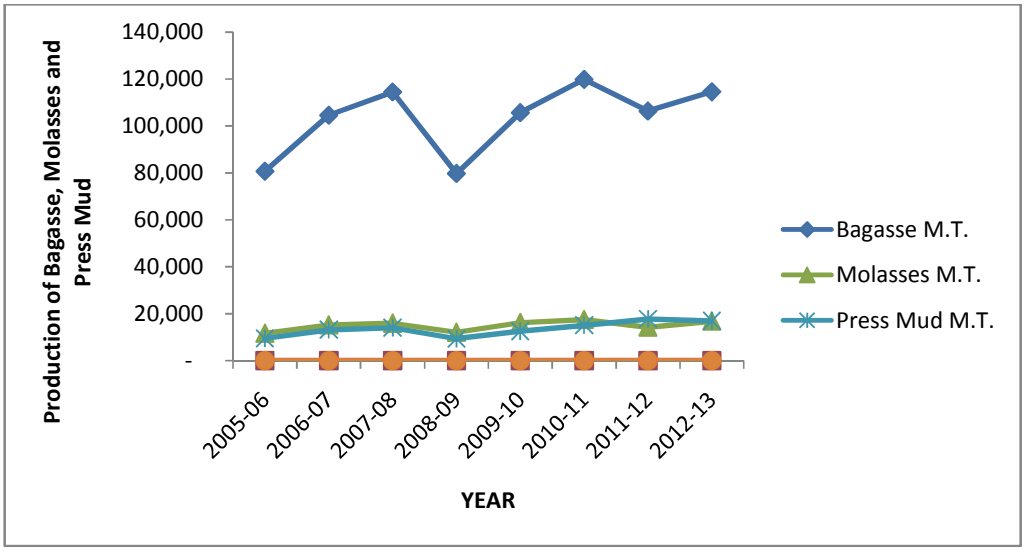
This sugar factory is largest capacity of sugarcane crushed in the entire sample sugar factory. It is interpreted that the bagasse and molasses production lower C.V. value than other sample sugar factory indicate lower fluctuation in the production of bagasse and molasses. It observed high C.V. value of production of press mud and percentage of cane on cane crushed. It can be suggested that the factory proper cleaning of sugarcane, removing cane binding material before process and using modern pots and technology. All these by-products are large producer of this sugar factory. It gives large income by way of sale these by-products.

Table No.4.5 Showing Rajaram sugar factory production of By–products Bagasse, Molasses and Press Mud.

Years	Bagasse		Molasses		Press Mud	
	M.T.	% of Cane	M.T.	% of Cane	M.T.	% of Cane
1	2	3	4	5	6	7
2005-06	80,680	28.11	11,710	4.08	9,471	3.30
2006-07	1,04,496	27.84	15,239	4.06	13,177	3.42
2007-08	1,14,437	27.8	15,971	3.88	13,994	3.40
2008-09	79,703	27.8	12,156	4.24	9,375	3.27
2009-10	1,05,607	27.96	16,241	4.30	12,539	3.32
2010-11	1,19,780	28.31	17,500	3.92	15,084	3.38
2011-12	1,06,299	27.90	14,340	3.75	17,755	3.34
2012-13	1,14,525	28.37	16,900	4.19	16,927	3.35
Total	**8,25,527**	**224.09**	**1,20,057**	**32.42**	**1,08,322**	**26.78**
Mean	**1,03,191**	**28.01**	**15,007**	**4.05**	**13,540**	**3.35**
S.D.	**15145.76**	**0.23**	**2129.64**	**0.19**	**3090.67**	**0.05**
C.V.	**14.68**	**0.81**	**14.19**	**4.71**	**22.83**	**1.52**

Source: Annual Report and Field work

Graph No.4.5 shows production of Bagasse, Molasses and Press Mud



The table no.4.5 shows Rajaram sugar factory production of by-products bagasses, molasses and press mud and also percentage on cane crushed in respective element. The mean value of production bagasse is 1,03,191 metric tons. The quantity of bagasse ranged between 79,703 metric tons during the year 2008-09 and 1,19,780 metric tons as maximum during the year 2010-11. The high C.V. (14.68) value indicates more fluctuations in the production of bagasse. . It is also above table shows production of bagasse percentage on cane crushed. The mean value of bagasse is 28.02 percent on cane crushed. The lower C.V. (0.81) value indicate the more uniformity in the bagasse percentage on cane crushed.

The table no.4.5 also shows production of molasses. The mean value of the production of molasses is 15,007 metric tons. The quantity of molasses ranged between 11,710 metric tons is the minimum during the year 2005-06 and 17,500 metric tons as maximum during the year 2010-11. The high C.V. (14.19) indicates that more fluctuation in the quantity of molasses production during the study period. Also it is found the production of molasses percentage on cane crushed. The mean value of production of molasses percentage on cane crushed is 4.05 percent. The lower C.V. (4.71) value indicates the more uniformity in the molasses percentage on cane crushed.

The table no.4.5 also shows production of press mud. The mean value of the production of press mud is 13,540 metric tons. The quantity of press mud ranged between 9,375 metric tons is minimums during the year 2008-09 and 17,775 metric tons as maximum during the year 2011-12. The high C.V. (22.83) value indicate that

more fluctuation in the quantity of press mud production during the study period. Also it is found the production of press mud percentage on cane crushed. The mean value of production of press mud percentage on cane crushed is 3.35 percent. The lower C.V. (1.52) value indicates the more uniformity in the production of press mud percentage on cane crushed.

It is interpreted that the C.V. value of production of by-products bagasse, molasses and press mud is high. It is suggested that proper planning in relation to increase quantity of sugarcane and stability of sugarcane crushed, increased availability of sugarcane and increased capacity of the sugar factory.

Table No.4.6 Sample sugar factories Bagasse production (M.T.)

Year	Datta	Kumbhi	Gadhinglj	Warana	Rajaram	Average
1	**2**	**3**	**4**	**5**	**6**	**7**
2005-06	2,43,096	1,56,019	94,068	3,30,710	80,680	1,80,915
2006-07	3,00,100	1,48,078	1,12,932	3,65,779	1,04,496	2,06,277
2007-08	3,20,555	1,60,992	1,18,967	3,76,330	1,14,437	2,18,256
2008-09	2,50,151	1,31,712	73,323	3,17,249	79,703	1,70,428
2009-10	3,62,971	1,83,861	1,19,044	3,30,617	1,05,607	2,20,420
2010-11	3,86,194	1,70,045	1,24,598	3,68,967	1,19,780	2,33,917
2011-12	3,52,177	1,34,354	67,845	3,96,832	1,06,299	2,11,501
2012-13	3,42,352	1,70,790	54,342	3,96,657	1,14,525	2,15,733
Average	3,19,700	1,56,981	95,640	3,60,393	1,03,191	**2,07,181**

Graph No.4.6 shows sugar factories Bagasse production (M.T.)

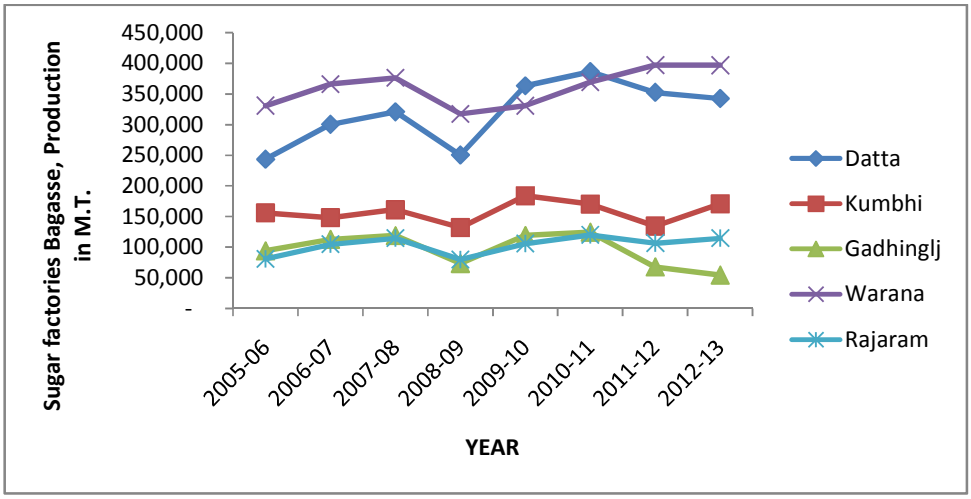
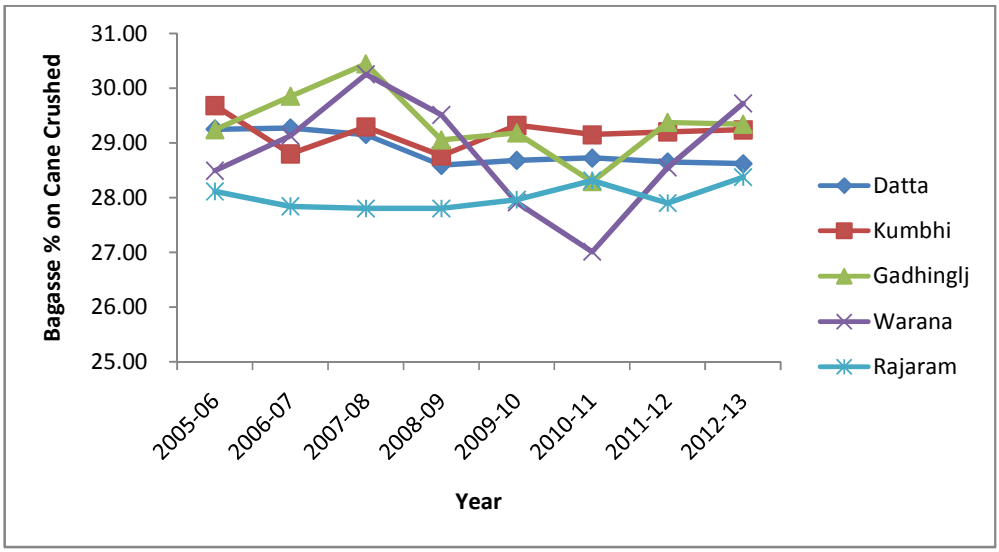


Table No.4.7 Sample sugar factories Bagasse % of cane crushed

Year	Datta	Kumbhi	Gadhinglj	Warana	Rajaram	Average
1	2	3	4	5	6	7
2005-06	29.25	29.68	29.24	28.49	28.11	28.95
2006-07	29.27	28.80	29.85	29.13	27.84	28.98
2007-08	29.15	29.29	30.44	30.25	27.80	29.39
2008-09	28.59	28.76	29.05	29.51	27.80	28.74
2009-10	28.68	29.32	29.18	27.91	27.96	28.61
2010-11	28.72	29.15	28.29	27.01	28.31	28.30
2011-12	28.65	29.20	29.37	28.55	27.90	28.73
2012-13	28.62	29.24	29.34	29.72	28.37	29.06
Average	28.87	29.18	29.35	28.82	28.01	**28.84**

Graph No.4.7 shows sample Sugar factories Bagasse % of cane crushed



The table no.4.6 shows sample sugar factories bagasses production in metric tons. The quantity of average bagasse produced by Datta, Kumbhi, Gadhinglaj, Warana, and Rajaram were 3,19,700, 1,56,981, 95,640, 3,60,393 and 1,03,191 metric tons respectively. The highest average bagasse produced by Warana (3,60,393) metric tons and lowest average bagasse produced by Ghdhingij (95,640) metric tons.

Table no.4.7 indicates the percentage of bagasse production by the sample sugar factories. The average percentage of bagasse to cane per tonne of Datta, Kumbhi, Gadhinglaj, Warana and Rajaram were 28.87%, 29.18%, 29.35%, 28.82%, and 28.01% respectively. The highest(29.35) average percentage of bagasse was

found in Gadhinglaj and lowest (28.01) average percentage of bagasse was found in Rajaram.

It is interpreted that the standard bagasse percentage in cane should be 30 percentages. It is observed that in all factories the average bagasse produced is about 28.02 percentages. All the sample sugar factories produced bagasse near about standard bagasse parcentage. It is good indicator of sample sugar factories. The bagasse percentage in the cane is depending on fibre percentage in the cane and fibre percentage in the cane is depending on quality of cane, soil quality. It is showed that bagasse is another significant by- product in a co-operation sugar factory. It gives income by way of sale of bagasse and also it will be used as a fuel for boilers of the sample sugar factory.

Table No.4.8 Sample sugar factories Molasses production (M.T.)

Year	Datta	Kumbhi	Gadhinglj	Warana	Rajaram	Average
1	**2**	**3**	**4**	**5**	**6**	**7**
2005-06	33,495	18,748	11,678	41,083	11,710	23,343
2006-07	42,021	17,828	14,603	39,840	15,239	25,906
2007-08	40,833	19,569	14,812	40,256	15,971	26,288
2008-09	33,315	15,687	9,540	35,472	12,156	21,234
2009-10	46,071	22,185	14,972	41,816	16,241	28,257
2010-11	52,119	20,151	16,329	44,536	17,500	30,127
2011-12	49,806	15,228	8,570	46,426	14,340	26,874
2012-13	46,095	20,090	6,516	48,376	16,900	27,595
Average	42,969	18,686	12,128	42,226	15,007	**26,203**

Source: Annual Report and Field work

Graph No.4.8 shows sample sugar factories Molasses production (M.T.)

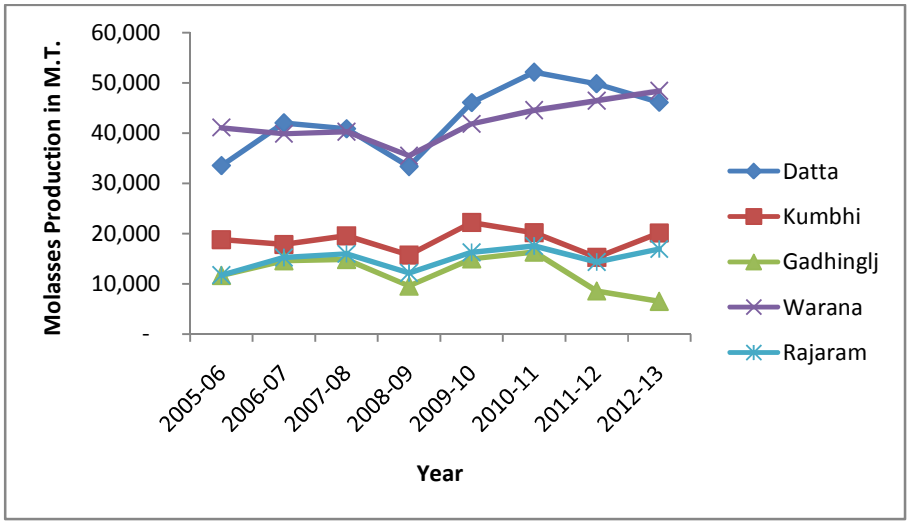
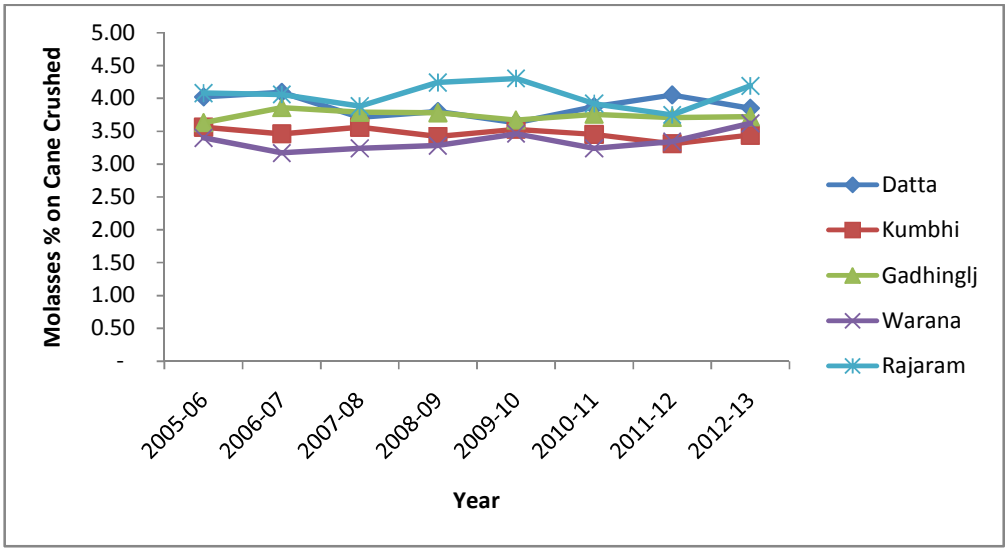


Table No.4.9 Sample sugar factries Molasses % on cane crushed

Year	Datta	Kumbhi	Gadhinglj	Warana	Rajaram	Average
1	**2**	**3**	**4**	**5**	**6**	**7**
2005-06	4.02	3.56	3.63	3.40	4.08	3.74
2006-07	4.09	3.46	3.86	3.17	4.06	3.73
2007-08	3.71	3.56	3.79	3.24	3.88	3.64
2008-09	3.80	3.42	3.78	3.28	4.24	3.70
2009-10	3.63	3.53	3.67	3.46	4.30	3.72
2010-11	3.87	3.45	3.76	3.24	3.92	3.65
2011-12	4.05	3.31	3.71	3.34	3.75	3.63
2012-13	3.85	3.44	3.72	3.62	4.19	3.76
Average	3.88	3.47	3.74	3.34	4.05	**3.70**

Source: Annual Report and Field work

Graph No.4.9 shows sample sugar factories Molasses % on cane crushed



The table no.4.8 shows average quantity of molasses produced by Datta, Kumbhi, Gadhinglaj, Warana, and Rajaram were 42,969, 18,686, 12128, 42,226 and 15,007 metric ton respectively. The highest average molasses produced by Datta-42,969 metric ton and lowest molasses produced by Gadhinglaj-12,128 metric ton. The total molasses production is depending on total cane crushed by the concern sugar factory. Highest molasses produced factory earnings highest amount of income by way of sale of molasses.

Molasses is the main by-product of sugar factories. The table no.4.9 shows average percentage of molasses on cane crushed in sample sugar factory Datta, Kumbhi, Gadhinglaj, Warana, and Rajaram were 3.88%, 3.47%, 3.74%, 3.34%, and

4.05 percentages respectively. The highest 4.05 percentage of molasses was found in Rajaram and lowest 3.34 percent of molasses was found in Warana.

It is interpreted that the highest molasses percentage in cane is a bad indication and lowest molasses percentage in cane is good indication. The acceptable Standard molasses percentage is 3.5 to 4.00 percent. With compare to standard Warana has first rank, Kumbhi has second rank, Gadhinglaj has Third, and Datta has fourth rank, and Rajaram has fifth. The above table no 4.9 shows sample sugar factories average molasses percentage is 3.70%. This average is near about acceptable standard molasses percentage.

Table No.4.10 Sample sugar factories Press Mud production (M.T.)

Year	Datta	Kumbhi	Gadhinglj	Warana	Rajaram	Average
1	**2**	**3**	**4**	**5**	**6**	**7**
2005-06	30,168	17,553	10,841	50,353	9,471	23,677
2006-07	35,167	17,539	13,317	42,910	13,177	24,422
2007-08	37,211	19,449	14,186	42,000	13,994	25,368
2008-09	30,186	16,780	8,203	32,749	9,375	19,459
2009-10	44,042	20,321	12,687	40,360	12,539	25,990
2010-11	45,316	20,888	15,243	44,684	15,084	28,243
2011-12	43,269	15,870	8,223	46,645	17,755	26,352
2012-13	47,398	18,788	5,698	41,927	16,927	26,148
Average	39,095	18,399	11,050	42,704	13,540	**24,957**

Source: Annual Report and Field work

Graph No.4.10 shows sample sugar factories Press Mud production (M.T.)

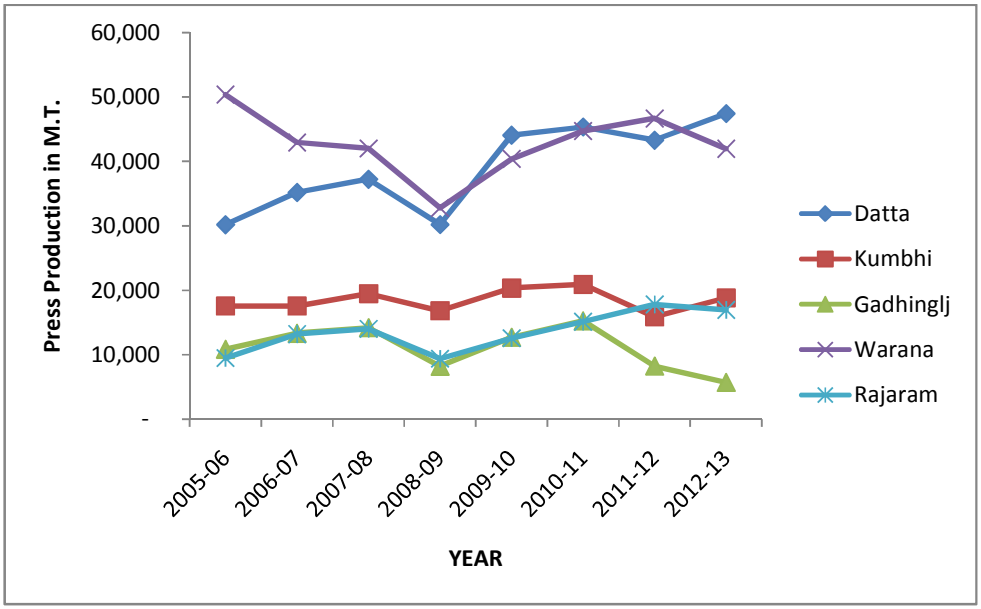
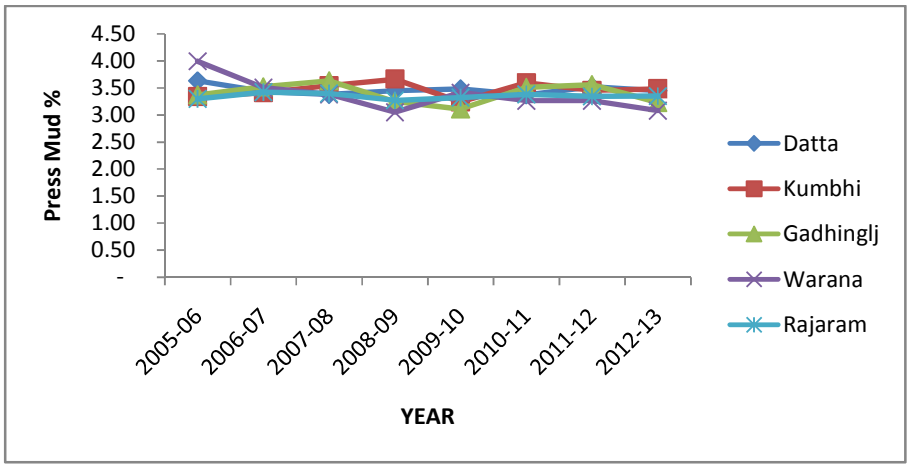


Table No.4.11 Sample sugar factories Press Mud % on cane crushed

Year	Datta	Kumbhi	Gadhinglj	Warana	Rajaram	Average
1	**2**	**3**	**4**	**5**	**6**	**7**
2005-06	3.63	3.34	3.37	3.99	3.30	3.53
2006-07	3.43	3.41	3.52	3.50	3.42	3.46
2007-08	3.38	3.54	3.63	3.38	3.40	3.47
2008-09	3.45	3.66	3.25	3.05	3.27	3.34
2009-10	3.48	3.24	3.11	3.41	3.32	3.31
2010-11	3.37	3.59	3.51	3.26	3.38	3.42
2011-12	3.52	3.45	3.56	3.26	3.34	3.43
2012-13	3.45	3.48	3.23	3.08	3.35	3.32
Average	3.46	3.46	3.40	3.37	3.35	**3.41**

Source: Annual Report and Field work

Graph No.4.11 Sample sugar factories Press Mud % on cane crushed



The table no.4.10 shows average quantity of Press mud produced by Datta, Kumbhi, Gadhinglaj, Warana, and Rajaram were 39,095, 18,399, 11,050, 42,704 and 13,540 metric ton respectively. The highest average press mud produced by Warana-42,704 metric ton and lowest molasses produced by Gadhinglaj-11,050 metric ton. The total press mud production is depending on total cane crushed by the concern sugar factory.

The table no.4.11 also shows that the press mud production percentage on cane crushed of sample sugar factories. The average percentage of press mud of Datta, Kumbhi, Gadhinglaj, Warana, and Rajaram were 3.46%, 3.46%, 3.40%, 3.37%, and

3.35% respectively. The highest 3.46 percentage of press mud and filter cake was found in Datta and Kumbhi and lowest 3.35 percentage of press mud was found in Rajaram.

It is interpreted that the highest percentage of press mud and filter cake indicate the non cleanness of the sugar cane while it was harvested, in includes cane leaves, cover, roots, mud and non sugar etc. The accepted standard percentage of press mud and filter cake is 3 to 3.5 as per VSI norms. All the sample sugar factories are completed this norms. High percentage of press mud leads to high process cost. This should be reduced by proper cleaning of sugarcane, removing cane binding material before process, using mud setting modern pots and technology etc.

It is studied that press mud and filter cake is the waste in sugar factories. The using press mud as a basic raw material for the production of compost manure. This manure is used for agriculture as a fertilizer. This compost manure will give more monetary benefits to the sugar factories and ultimately this becomes an important source of income for sugar factories. The sample sugar factories Datta, Kumbhi, Gadhinglaj, Warana attached compost fertilizer plant.

Table No.4.12 shows sample sugar factories Co-efficient of Variance

Factory Name	Bagasse		Molasses		Press Mud	
	Production	% of cane	Production	% of cane	Production	% of cane
1	2	3	4	5	6	7
Datta	16.28	1.04	16.18	4.26	17.50	2.40
Kumbhi	11.62	1.01	12.60	2.42	9.55	3.92
Gadhinglaj	28.52	2.11	29.59	1.95	30.69	5.47
Warana	8.54	3.64	9.70	4.36	12.04	8.68
Rajaram	14.68	0.81	14.19	4.71	22.83	1.52

It is Interpreted that bagasse and molasses and press mud production higher C.V. value of Gadhinglaj sugar factory shows higher variability in bagasse and molasses and press mud production than other sugar factory. It suggested this factory proper planning to increase quantity and stability of sugarcane crashed, increase availability of sugarcane and increased capacity of sugar factory. It is also indicated that Warana sugar factory high C.V. value of bagasse percentage on cane crushed

higher than other sugar factory. It is suggested that maintain fibre percentage in the cane through available quality of sugarcane and increase soil quality of sugarcane farmers through the sugar factory. It is also shows Warana sugar factory C.V. value of press mud percentage on cane crushed is high it is bad indicator. It can be suggested the factory proper cleaning of sugarcane, removing cane binding material before process and using modern pots and technology.

Datta sugar factory was set up two plants of distilleries. Old plant of distillery batch type 30000 litters per day was set up 10th September 1982. Modernization distillery plant was set up 19th October 2000. This additional plant of 30,000 litters per day capacity based on continuous fermentation and multi pressure vacuum distillation technology has been installed and commissioned from 27th February 2002.

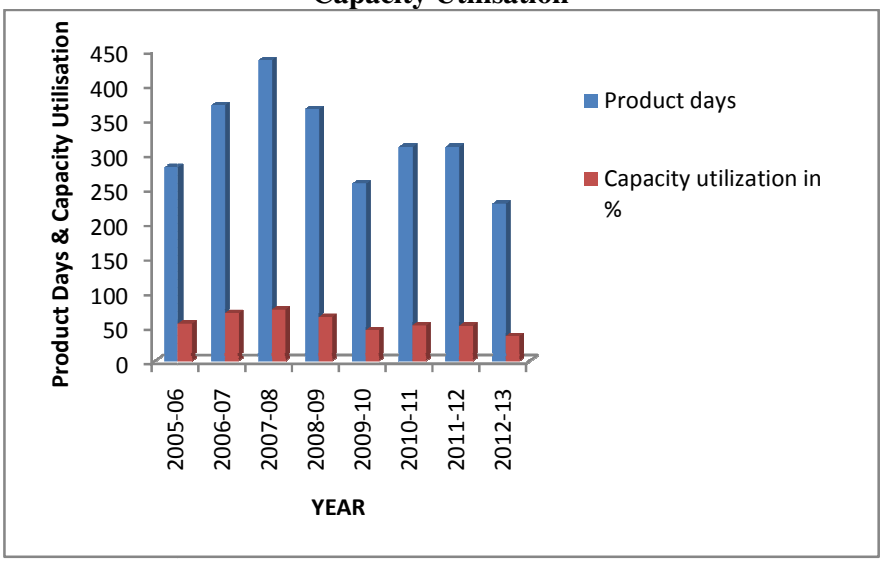
Table No. 4.13 Datta Sugar Factory Production Performance of Distillery Establishment Date-1983(Old Project), New Project Establishment Year - 2000 Production Types-Continuous-Cascade

Year	Installed Capacity Per day lit.	Product days	Capacity utilization in %	Molasses Used (M. T.)	Total Alcohol Production In lakh Lit.	Average Recovery of Alcohol (P.M.T.)
1	2	3	4	5	6	7
2005-06	60,000	281	54.00	36,685	97.53	266.80
2006-07	60,000	371	69.50	46,369	125.30	269.05
2007-08	60,000	436	74.50	50,188	134.79	267.45
2008-09	60,000	365	63.50	42,649	114.85	265.65
2009-10	60,000	257	44.50	29,675	79.87	262.60
2010-11	60,000	310	51.50	34,645	91.79	265.00
2011-12	60,000	310	51.00	34,249	92.29	263.50
2012-13	60,000	228	35.95	24,152	64.74	268.10
Total		**2558**	**444.45**	**2,98,612**	**801.16**	**2128.15**
Mean		**319.75**	**55.56**	**37326.5**	**100.15**	**266.02**
S.D.		**67.86**	**12.89**	**8657.78**	**23.46**	**2.25**
C.V.		**21.22**	**23.20**	**23.19**	**23.42**	**0.85**

Source: Annual Report and Field work

Note:- Column no. 2 Datta sugar factory attachaed two distilleries plant hense table shows two plants production days.

Graph No. 4.12 Shows Datta Sugar Factory Distillery Product day and Capacity Utilisation



The table no.4.13 shows production performance of Distillery plant. It is production types is continuous fermentation and total installed capacity is 60,000 per day lit. Capacity utilization based on 300 days per annum. The table shows mean value of production days in the study period is 319.75. days. The production days ranged between 257-days is minimums during the year 2009-10 and 436-days as maximum during the year 2007-08. The high C.V. (21.22%) value indicate the more fluctuation in the production days.

The table no.4.13 also observes capacity utilization of distillery plant. The mean value capacity utilization is 55.56 percent. Its capacity utilization ranged between 44.50 percent is minimums during the year 2009-10 and 74.50 percent as maximum in the year 2007-08. The high C.V. (23.20%) value indicates more fluctuation in the capacity utilization.

The table no.4.13 also shows raw material (molasses used) for production of the alcohol. The mean value of molasses used in the study period is 37326.50 metric tons. The molasses used ranged between 29,275 metric tons is minimums during the year 2009-10 and 50,188 metric tons maximum in the year 2007-08. The high C.V. (23.19%) value indicate more fluctuation in the molasses used.

The table no.4.13 also foinds it total alcohol production in the study period. The mean value of alcohol production is 100.15 lakh litres. The quantity of total alcohol production ranged between 79.87 lakh litres minimum in the year 2009-10 and 134.79 lakh litres as maximum during the year 2007-08. The high C.V. (23.42) indicates more fluctuation in the total alcohol production.

The tables also 4.13 shows average recovery of alcohol produced in per metric tons of molasses. The mean value of average recovery of alcohol in per metric tons of molasses is 266.02. The quantity of average recovery of alcohol in per metric tons ranged between 262.45 litres minimum in the year 2012-13 and 269.05 litres as maximum in the year 2006-07. The lowest C.V (0.86) value indicates more uniformity in the average recovery of alcohol in per metric tons of molasses. It found it alcohol is used for the production ODS and SDS and fusil oil.

It is interpreted that the sugar factory attached distilleries plant molasses can be converted into many value-added products by application of modern technology. The sample distiller shows product days, capacity utilization in percent, molasses used and total alcohol production its C.V. value is high indicated all these element are more fluctuations. Hence it is suggested that old project of distilleries adopted modern technology and introduced automation and sufficient molasses provide to distilleries. It also shows average recovery of alcohol production in per metric tons its C.V. value is low indicated more stability in this element.

Table No.4.14 Showing Datta distillery Production of S.D.S.and O.D.S. and Fousil Oil

Year	Used RS for the Production in lakh Lit		Production in Lakh Lit		Fusil Oil in Litre
	S.D.S	O.D.S.	S.D.S	O.D.S.	
1	2	3	4	5	6
2005-06	29.50	1.15	29.78	1.92	29,330
2006-07	20.14	1.11	20.33	1.12	33,400
2007-08	57.61	0.41	58.17	0.42	13,130
2008-09	3.34	0.47	5.39	0.47	31,800
2009-10	4.97	0.00	5.03	0.00	25,150
2010-11	13.87	0.00	14.01	0.00	32,440
2011-12	0.00	0.00	0.00	0.00	9,125
2012-13	0.00	0.00	0.00	0.00	17,693
Total	**129.43**	**3.14**	**132.71**	**3.93**	**192068**
Mean	**16.18**	**0.39**	**16.59**	**0.49**	**24008.50**
S.D.	**19.74**	**0.49**	**19.76**	**0.70**	**9482.05**
C.V.	**122.04**	**125.97**	**119.11**	**142.03**	**39.49**

Source: Annual Report and Field work

Table no.4.14 shows alcohol is used for the production of SDS and ODS and fusil oil. The production of SDS, ODS and fusil oil its mean value is 16.59 lakh, 0.49 lakh and 24008.50 litres respectively. Also the production of SDS and ODS its C.V. value is higher than its mean value hence it is called higher variability in the production of SDS and ODS. The production of fusil oils its C.V. (39.49) value indicates higher fluctuation in the production of fusil oil. It is interpreted that SDS and ODS and fusil oil is other by-products of distillery. Its production is depending on only demand and market price in the market. Hence all these elements C.V. value is high.

It is interpreted that the rectified sprit is used for the production of special denatured spirit (SDS) and Ordinary denatured spirit it made unfit for drinking purpose by addition of denaturants. Special denatured spirit is more marketable sprit hence factory distillery prepare this spirit other than Ordinary denatured spirit and fusil oil.

Table No.4.15 Kumbhi Sugar Factory Production Performance of Distillery

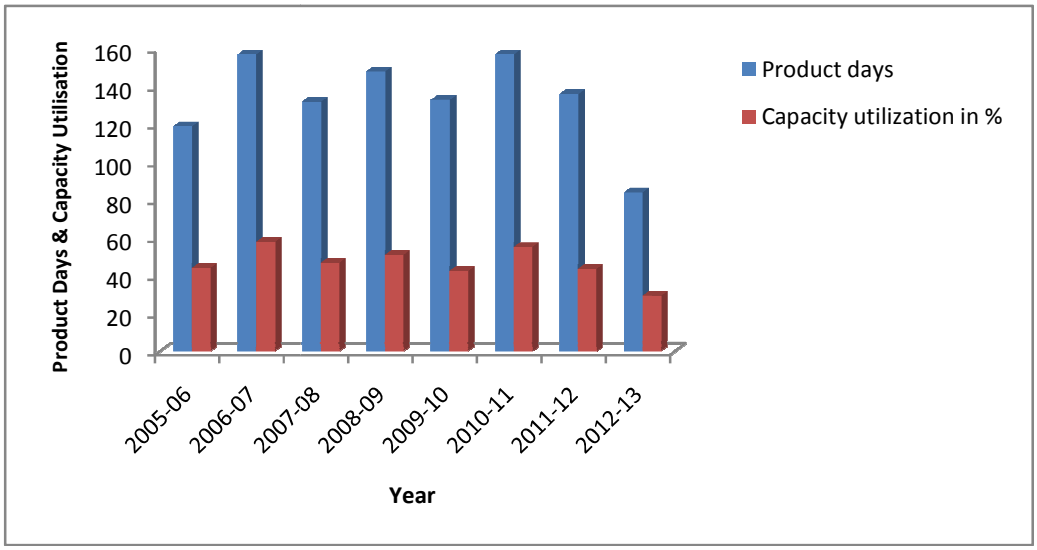
Establishment Date-1992 **Capicity-30 KLPD**

Production Types-Continuous-Cascade **Storage Capicity-19.5 Lakh Lit.**

Year	Installed Capacity Per day lit.	Product days	Capacity utilization in %	Molasses Used (M. T.)	Total Alcohol Production In lakh Lit.	Average Recovery of Alcohol (P.M.T.)
1	2	3	4	5	6	7
2005-06	30,000	119	44.05	14,286	39.64	277.50
2006-07	30,000	157	57.96	18,916	52.16	275.8
2007-08	30,000	132	46.73	15,231	42.05	276.1
2008-09	30,000	148	50.90	16,578	45.81	276.3
2009-10	30,000	133	42.43	14,044	38.18	271.90
2010-11	30,000	157	55.14	18,190	49.62	272.80
2011-12	30,000	136	43.48	16,374	44.85	273.90
2012-13	30,000	84	29.37	9,674	26.43	273.30
Total		**1066**	**370.06**	**1,23,293**	**338.74**	**2197.60**
Mean		**133.25**	**46.26**	**15411.63**	**42.34**	**274.70**
S.D.		**23.86**	**8.86**	**2887.83**	**7.98**	**1.99**
C.V.		**17.90**	**19.16**	**18.74**	**18.84**	**0.72**

Source: Annual Report and Field work

Graph No.4.13 shows Kumbhi sugar factory distillery Product days and capacity utilization in%



This sugar factory has started its own distillery of 30,000 litres per day capacity in 1993. Distilleries and sugar factory are closely associated with each other; distilleries have little control over quality improvement of molasses. By adopting proper techniques both at the sugar factory and distillery level, much can be done to improve the molasses quality for increased alcohol production. Distillery used alcohol the production of special denature sprit (SDS). Ordinary Denature Sprit (ODS) and Fusil oil.

The table no.4.15 shows production performance of Distillery plant. It is production types is continuous Cascade and its installed capacity is 30,000 per day lit. Capacity utilization based on 300 days per annum. The table shows mean value of production days in the study period is 133.25 days. The production days ranged between 84-days is minimums during the year 2012-13 and 157-days as maximum during the year 2010-11. The high C.V. (17.90) value indicate the more fluctuation in the production days.

The table no.4.15 also observed capacity utilization of distillery plant. The mean value capacity utilization is 46.26 percent. Its capacity utilization ranged between 29.37 percent is minimums during the year 2012-13 and 57.96 percent as maximum in the year 2006-07. The high C.V. (19.16) value indicates more fluctuation in the capacity utilization.

The table no.4.15 also shows raw material (molasses used) for production of the alcohol. The mean value of molasses used in the study period is 15,411.63 metric tons. The molasses used ranged between 9674 metric tons is minimums during the year 2012-13 and 18916 metric tons maximum in the year 2006-07. The high C.V. (118.74) value indicate more fluctuation in the molasses used.

The table no.4.15 also found it total alcohol production in the study period. The mean value of alcohol production is 42.34 lakh litres. The quantity of total alcohol production ranged between 26.43 lakh litres and 52.16 lakh litres as maximum during the year 2006-07. The high C.V. (18.84) indicates more fluctuation in the total alcohol production.

The table no.4.15 also shows average recovery of alcohol produced in per metric tons of molasses. The mean value of average recovery of alcohol in per metric tons of molasses is 274.70. The quantity of average recovery of alcohol in per metric tons ranged between 271.90 litres 200-10 and 277.5 litres as maximum in the year 2005-06. The lowest C.V (0.72) value indicates more uniformity in the average recovery of alcohol in per metric tons of molasses.

It is interpreted that the sample sugar factory working molasses based distillery plant. Sugarcane molasses constitutes an ideal raw material to produce alcohol. The table shows product days, capacity utilization in percent, molasses used and alcohol production these entire elements indicate high C.V. value observed higher fluctuation. It is observed average recovery of molasses is more stability. The main problem of distillery traditional source raw material (molasses) and distillery unit not available sufficient steam energy for processing from the sugar factory hence it is suggested that the sufficient molasses available from other sugar factory and reduction in steam consumption through modern technology adopted and Increase quantity of sugarcane crushed and increased capacity of sugar factory and achieve maximum utilization of distillery.

Table no.4.16 shows Kumbhi distillery production of SDS and ODS and fusil oil

Year	Used RS for the Production in lakh Lit		Production in Lakh Lit		Fuosil Oil in Liter
	S.D.S	O.D.S.	S.D.S	O.D.S.	
1	2	3	4	5	6
2005-06	34.73	0.30	34.99	0.30	0
2006-07	31.46	0.67	31.66	0.39	4,100
2007-08	43.16	0.00	43.35	0.16	4,400
2008-09	20.80	0.67	20.94	0.54	2,600
2009-10	7.63	0.67	7.91	0.67	400
2010-11	51.74	1.26	52.24	1.26	4,100
2011-12	40.13	1.28	40.52	1.18	0
2012-13	32.91	1.43	35.94	1.10	0
Total	**262.56**	**6.28**	**267.55**	**5.60**	**15600**
Mean	**32.82**	**0.79**	**33.44**	**0.70**	**1950.00**
S.D.	**13.64**	**0.50**	**13.74**	**0.43**	**2052.18**
C.V.	**41.57**	**64.20**	**41.09**	**61.05**	**105.24**

Source: Annual Report and Field work

The above table no.4.16 shows distillery production of SDS, ODS and fusil oil all these mean vale is SDS (33.44) ODS (0.70) and fusil oil (1950). Also all these product its C.V. value is SDS (41.09), ODS (61.05) and fusil oil (105.24) in indicate higher fluctuation in production. It is observed that the SDS product is most demanded product produced by the distillery.

It is interpreted that the rectified sprit is used for the production of special denatured spirit (SDS) and Ordinary denatured spirit it made unfit for drinking purpose by addition of denaturants. Special denatured spirit is more marketable sprit hence Kumbhi distillery prepare this spirit other than Ordinary denatured spirit and fusil oil.

Tableno.4.17 Gadhingalaj sugar factory Production Performance of Distillery

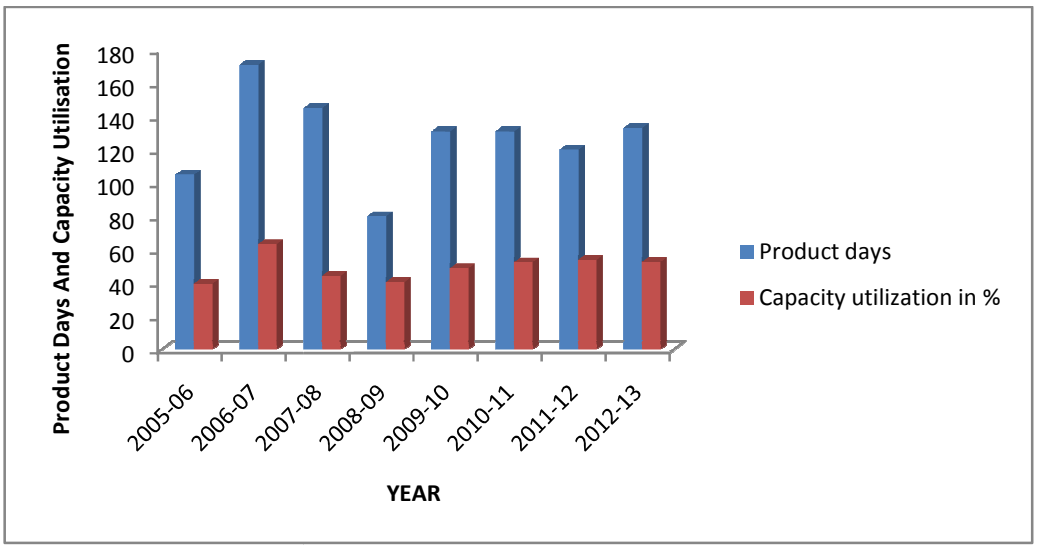
Establishment Date: 1986 Capicity:25 KLPD

Production Types-Continuous-Casade Storage Capicity-24 Lakh Lit.

Year	Installed Capacity Per day lit.	Product days	Capacity utilization in %	Mollased Used (M. T.)	Total Alcohol Production (RS) In lakh Lit.	Average Rercovery of Alcohol (P.M.T.)
1	2	3	4	5	6	7
2005-06	25,000	105	39.31	11,481	30.79	268.23
2006-07	25,000	171	63.07	17,026	45.71	268.46
2007-08	25,000	145	44.02	14,497	40.15	276.96
2008-09	25,000	80	40.27	8,489	23.34	274.97
2009-10	25,000	131	48.59	14,041	38.91	277.11
2010-11	25,000	131	52.15	16,996	46.73	274.95
2011-12	25,000	120	53.64	14,367	40.23	280.02
2012-13	25,000	133	52.39	15,005	39.45	281.00
Total		**1016**	**393.44**	**1,11,902**	**305.31**	**2201.70**
Mean		**127**	**49.18**	**13987.75**	**38.16**	**275.21**
S.D.		**26.91**	**7.89**	**2834.52**	**7.70**	**4.75**
C.V.		**21.19**	**16.04**	**20.26**	**20.17**	**1.72**

Source: Annual Report and Field work

Graph No.4.14 shows production days and capacity utilization



The table no.4.17 shows production performance of Distillery plant. It is production types is continuous Cascade and its installed capacity is 25,000 per day lit.

Capacity utilization based on 300 days per annum. The table shows mean value of production days in the study period is 127 days. The production days ranged between 80-days is minimums during the year 2008-09 and 171-days as maximum during the year 2006-07. The high C.V. (21.19) value indicate the more fluctuation in the production days.

The table no.4.17 also observed capacity utilization of distillery plant. The mean value capacity utilization is 49.18 percent. Its capacity utilization ranged between 39.31 percent is minimums during the year 2009-10 and 63.07 percent as maximum in the year 2006-07. The high C.V. (16.04) value indicates more fluctuation in the capacity utilization.

The table no.4.17 also shows raw material (molasses used) for production of the alcohol. The mean value of molasses used in the study period is 13,987.75 metric tons. The molasses used ranged between 8,489 metric tons is minimums during the year 2008-09 and 17,026 metric tons maximum in the year 2006-07. The high C.V. (20.26) value indicate more fluctuation in the molasses used.

The table no.4.17 also finds it total alcohol production in the study period. The mean value of alcohol production is 38.16 lakh litres. The quantity of total alcohol production ranged between 23.34 lakh litres and 46.73 lakh litres as maximum during the year 2010.11. The high C.V. (20.17) indicates more fluctuation in the total alcohol production.

The tables no.4.17 also shows average recovery of alcohol produced in per metric tons of molasses. The mean value of average recovery of alcohol in per metric tons of molasses is 275.21. The quantity of average recovery of alcohol in per metric tons ranged between 268.23 litres minimums in the year 2005-06 and 281.00 litres as maximum in the year 2012-13. The lowest C.V (1.72) value indicates more uniformity in the average recovery of alcohol in per metric tons of molasses.

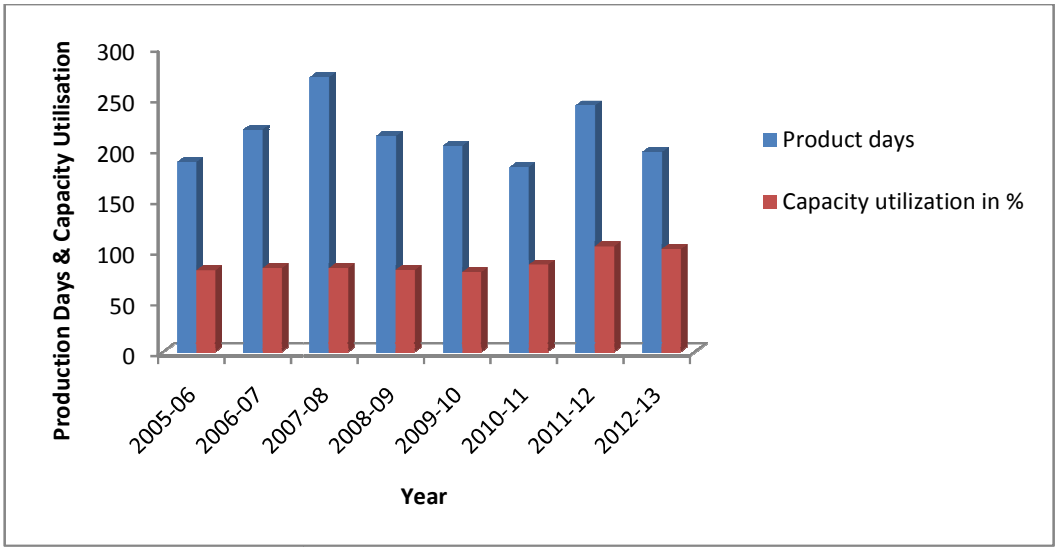
It is interpreted that the sample sugar factory working molasses based distillery plant. The table shows product days, capacity utilization in percent, molasses used and alcohol production these entire elements indicate high C.V. value observed higher fluctuation. It is observed average recovery of molasses is more stability. The main problem of distillery traditional source raw material (molasses) and distillery unit not available sufficient steam energy for processing from the sugar factory hence it is suggested that the sufficient molasses available from other sugar factory and reduction in steam consumption through modern technology adopted and Increase quantity of sugarcane crushed and increased capacity of sugar factory and achieve maximum utilization of distillery.

Table no.4.18 shows Warana distillery plant production performance.

Year	Installed Capacity Per day lit.	Product days	Capacity utilization in %	Mollased Used (M. T.)	Total Alcohol Production (RS) In lakh Lit.	Average Rercovery of Alcohol (P.M.T.)
1	2	3	4	5	6	7
2005-06	30,000	187	80.35	27,781	72.31	260.30
2006-07	30,000	219	82.42	30,208	74.48	245.60
2007-08	60,000	271	82.33	54,119	133.36	246.40
2008-09	60,000	213	80.82	42,121	102.64	243.70
2009-10	60,000	203	78.40	39,302	95.47	243.00
2010-11	60,000	182	85.90	38,063	114.92	246.00
2011-12	60,000	243	104.02	59,338	144.67	255.90
2012-13	60,000	197	101.30	46,523	119.7	257.30
Total		**1715**	**695.54**	**3,37,455**	**857.55**	**1998.20**
Mean		**214.375**	**86.94**	**42181.88**	**107.19**	**249.78**
S.D.		**29.95**	**9.96**	**10900.16**	**26.05**	**6.87**
C.V.		**13.97**	**11.46**	**25.84**	**24.30**	**2.75**

Source: Annual Report and Field work

Graph no.4.15 shows Warana distillery product days and capacity utilization.



In the year 1989 sugar factory has installed and started Distillery plant to utilize the by-product molasses with 30000 Lit. per day capacity producing Industrial

Alcohol and Rectified spirit. Now the karkhana has modernization and increased the capacity of distillery up to 60000 lit. per day since actual production started from the year 2007-08. Distillery used Biostill Continuous Fermentation process. In the bios till process molasses is diluted with water and fed into the fermented. A special feature of the bios till continuous fermented process is the recycling of the "weak wash". This is a stream of wash passed through the Distillation column and exhausted of most of the alcohol. Because of modernization of the plant to improve the spirit quality, reduce steam consumption and minimize spent wash generation considerably.

The table no.4.18 shows Warana distillery production performance of the distillery plant. The mean value of production days in the study period is 214.37 days. The production days ranged between 182 days is minimums during the year 2010-11 and 271 days as maximum during the year 2007-08. The high C.V. (13.97) value indicate the more fluctuation in the production days.

The table no.4.18 also shows capacity utilization of the distillery plant. The mean value of capacity utilization is 86.94 percent. Distillery plant capacity utilization ranged between 78.40 percent is minimums during the year 2009-10 and 85.90 percent as maximum in the year 2010-11. The higher C.V. (11.46) value indicates more fluction in the capacity utilization.

The table no.4.18 also finds it molasses used for the production of alcohol. The mean value of molasses used in the study period is 42,181 metric tons. Molasses used ranged between 27,781 metric tons is minimums during the year 2005-06 and 54119 metric tons maximum in the year 2007-08. The high C.V. (25.84) value indicates more fluctuation in the molasses used for the production.

The table no.4.18 also found it total alcohol production in the study period. The mean value of alcohol production is 101.19 lakh litres. The quantity of total alcohol production ranged between 72.31 lakh litres is minimums during the year 2005-06 and 151.86 lakh litres maximum during the year 2011-12. The high C.V. (24.30) value indicates more fluctuation in the total alcohol production.

The table no.4.18 also shows Average recovery of alcohol per metric tons of molasses. The mean value of average recovery of alcohol is 249.78 litres. The quantity of average recovery of alcohol in per metric tons ranged between 243.70 litres is minimums in the year 2009-10 and 260.3 litres as maximum in the year 2005-06. The lower C.V. (2.75) value indicates more uniformity in the average recovery of alcohol in per metric tons of molasses. It is also found it alcohol is used for the production of SDS, Ethanol and Indian Made Foreign liquor (IMFL), and ENA.

It is interpreted that the sample distillery plant used Bio still continuous fermentation process. It is observed the C.V. value of product days, molasses used and total alcohol production is high it indicate higher fluctuation. And the C.V. value of capacity utilization and average recovery of molasses is low it show the plant is more stability in this element.

Table no 4.19 Shows Warana distillery Production of SDS

Year	Used RS for the Production in lakh Lit	Production in Lakh Lit
	S.D.S	S.D.S
1	2	3
2005-06	11.37	11.52
2006-07	31.75	31.75
2007-08	1.27	1.30
2008-09	3.39	3.41
2009-10	8.98	9.02
2010-11	11.85	12.07
2011-12	0.00	0.00
2012-13	0.00	0.00
Total	**68.61**	**69.07**
Mean	**8.58**	**8.63**
S.D.	**10.58**	**10.59**
C.V.	**123.33**	**122.64**

Source: Annual Report and Field work

The Warana distillery also produced SDS from the raw material of Rectified spirit. In the production of SDS its mean value is 8.63 and it's C.V. (122.64) value is indicate more variability in the production of SDS. It studied that sample unit also produce ethanol and ENA because SDS is not produced by distillery last two years.

Table no.4.20 Datta Sugar Factory Production Performance of Ethanol

Establishment Date-06/08/2001 Total Capicity-30 KLPD

Production Types-Continuous-Casade Storage Capicity-6.00 Lakh Lit.

Year	Installed Capacity Per day lit.	Product days	Capacity utilization in %	Rectified sperit used in lakh Lit.	Ethanol production in lakh lit.
1	**2**	**3**	**4**	**5**	**6**
2005-06	30,000	0	0.00	0.00	0.00
2006-07	30,000	0	0.00	0.00	0.00
2007-08	30,000	24	7.42	7.04	6.67
2008-09	30,000	56	17.70	16.78	15.91
2009-10	30,000	22	6.56	6.21	5.90
2010-11	30,000	36	10.60	10.02	9.50
2011-12	30,000	129	36.30	34.45	32.67
2012-13	30,000	13	3.60	3.46	3.28
Total		**280**	**82.18**	**77.96**	**73.93**
Mean		**35**	**10.27**	**9.745**	**9.24**
S.D.		**42.26**	**12.01**	**11.40**	**10.81**
C.V.		**120.75**	**116.94**	**116.95**	**116.94**

Source: Annual Report and Field work

The table no.4.20 shows production performance of ethanol project. This plant established dated 6/8/2001; its installed capacity is 30000 per day litters. This plant in the study period first two years is not in operation. It is a mean value of the production days (35), capacity utilization (10.27), used alcohol for the production of ethanol (9.745) and Ethanol production (9.24). These all element shows higher C.V. value indicates the ethanol plant is more fluctuate. The main problem of this plant is entirely depending on sugarcane molasses and also the problem of the ethanol pricing policy of Government is not a firm.

It is interpreted that the ethanol production depends largely on availability of sugarcane molasses. Lower sugarcane molasses availability and consequent higher molasses prices affect the ethanol production. Also ethanol blending programme in India is highly regulated and heavily burdened hence these entire element affect this

project. In the study period two years not in operation this project and not use installed capacity of the project efficiently.

Table No.4.21 showing Warana Ethanol plant production performance

Year	Installed Capacity Per day lit.	Product days	Capacity utilization in %	Rectified sperit used in lakh Lit.	Ethanol production in lakh lit.
1	**2**	**3**	**4**	**5**	**6**
2005-06	30,000	0	0.00	1.95	1.78
2006-07	30,000	0	0.00	0.00	0.00
2007-08	30,000	157	35.30	31.17	29.28
2008-09	30,000	33	9.33	5.39	5.29
2009-10	30,000	0	0.00	0.00	0.00
2010-11	30,000	84	23.41	22.53	21.07
2011-12	30,000	92	21.42	20.94	19.28
2012-13	30,000	10	2.50	1.54	1.57
Total		**376**	**91.96**	**83.52**	**78.27**
Mean		**47**	**11.50**	**10.44**	**9.78**
S.D.		**58.17**	**13.57**	**12.43**	**11.59**
C.V.		**123.77**	**118.06**	**119.03**	**118.50**

Source: Annual Report and Field work

The table no.4.21 shows production performance of ethanol project. This plant installed capacity is 30000 per day litters. This plant in the study period two years is not in operation. It is a mean value of the production days (47), capacity utilization (11.50), used rectified spirit for the production of ethanol (10.44) and Ethanol production (9.78). These all element shows higher C.V. value indicates the ethanol plant is more fluctuate.

It is interpreted this plant is entirely depending on sugarcane molasses and also the problem of the ethanol pricing policy of Government is not a firm. In the study period three years not in operation this project and not use installed capacity of the project efficiently.

Table No.4.22 showing Warana plant Extra neutral alcohol production performance Extra neutral alcohol

Year	Installed Capacity Per day lit.	Product days	Capacity utilization in %	ENA production in lakh lit.
1	**2**	**3**	**4**	**5**
2005-06	-	-	-	-
2006-07	-	-	-	-
2007-08	55,000	90	32.00	50.54
2008-09	55,000	60	25.00	28.05
2009-10	55,000	20	6.09	10.96
2010-11	55,000	20	5.01	9.11
2011-12	55,000	13	3.99	7.18
2012-13	55,000	N.A.	N.A.	N.A.
Total		**203**	**72.09**	**105.84**
Mean		**29**	**10.30**	**15.12**
S.D.		**33.62**	**12.81**	**18.24**
C.V.		**115.93**	**124.39**	**120.61**

Source: Annual Report and Field work

The table no 4.22 shows production performance of Extra Neutral Alcohol project. This plant installed capacity is 55,000 per day litters. This plant started from the-year 2007-08.It is a mean value of the production days (29), capacity utilization (10.30), used rectified and Extra Neutral Alcohol production (15.12). These all element shows higher C.V. value indicates the ethanol plant is more fluctuate. The main problem of this plant is entirely depending on sugarcane molasses and also the problem of the ENA pricing policy of Government is not a firm.

It is interpreted the ENA production, government of India is highly regulated and also heavily duties, taxes and fees. The production of ENA marketers are depends upon Indian Made Foreign Liquor manufactures and the controls of excises on alcohol sales. Because this plant not use installed capacity in full strength.

The table no.4.23 shows production days of sample sugar factories distilleries. Average production days of distilleries are Datta-320, Kumbhi-134, Gadhinglaj-127, and Waran-214 respectively. The highest production days are Datta-320 days and lowest production days is Gadhinglaj-127.

Table No.4. 23 Sample Sugar Factories Production Days of distilleries

Year	Datta	Kumbhi	Gadhinglaj	Warana	Total	Average
1	**2**	**3**	**4**	**5**	**6**	**7**
2005-06	281	119	105	187	692	173
2006-07	371	157	171	219	918	230
2007-08	436	132	145	271	984	246
2008-09	365	148	80	213	806	202
2009-10	257	133	131	203	724	181
2010-11	310	157	131	182	780	195
2011-12	310	136	120	243	809	202
2012-13	228	87	133	197	645	161
Total	2,558	1,069	1,016	1,715	6,358	**1,590**
Average	320	134	127	214	795	**199**

Source: Annual Report and Field work

Note:- Column no. 2 Datta sugar factory attachaed two distilleries plant hense table shows two plants production days.

It is interpreted the production days of distilleries largely depends of prevailing market price of molasses, rectifies spirit and extra natural alcohol and availability of molasses. The table no.4.23 observed that Datta and Warana sugar factory distilleries are worked more days. These distilleries sufficient molasses are available by own sugar factoris.

Table No.4.24 Sample Sugar Factories - Capacity Utilization in % of distilleries

Year	Datta	Kumbhi	Gadhinglaj	Warana	Total	Average
1	**2**	**3**	**4**	**5**	**6**	**7**
2005-06	54.00	44.05	39.31	80.35	217.71	54.43
2006-07	69.50	57.96	63.07	82.42	272.95	68.24
2007-08	74.50	46.73	44.02	82.33	247.58	61.90
2008-09	63.50	50.90	40.27	80.82	235.49	58.87
2009-10	44.50	42.43	48.59	78.40	213.92	53.48
2010-11	51.50	55.14	52.15	85.90	244.69	61.17
2011-12	51.00	43.48	53.64	104.02	252.14	63.04
2012-13	35.95	29.37	52.39	101.30	219.01	54.75
Total	444.45	370.06	393.44	695.54	1,903.49	**475.87**
Average	55.56	46.26	49.18	86.94	237.94	**59.43**

Source: Annual Report and Field work

The table no.4.24 shows average capacity utilization of sample sugar factories distilleries. Average capacity utilization of distilleries is Datta-55.56 %, Kumbhi-46.26%, Gadhinglaj-49.18%, and Waran-86.94% respectively. The highest capacity utilization is Waran-86.94% and lowest capacity utilization is Kumbhi-48.46%.

It is interpreted the capacity utilization is the most important factory in reducing the production cost. Optimum capacity utilization results in reducing the use of oil, lubricants and process chemicals etc. Continuous operation the higher capacity utilization can be achieved which results reducing consumption of steam.

Testing of Hypothesis No.2: Low level of efficiency is found at various By-product departments. (Reference Table no.4.13, 4.15, 4.17, 4.18, 4.20, 4.21, 4.22 and 4.24)

This Hopothesis tested as follows:

Mean= 37.90, Varance= 842.108, S.D.=29.019

$t = x - \mu \div \sigma/\sqrt{n}$

t *=37.90-100÷ 29.019*$/\sqrt{7}$

t= -5.6618

Table vlue at 5% level of significant is 1.86

t = -5.66< table value is 1.86

Hence Researcher accepte this hopthesis.

The 't' value from t distribution table is 1.89 and observed calculate valueis t= -5.66 less than table value hence Null hypothesis is accepted and researcher conclude the difference is not significant and is is due to sampling fluctuations.

Table No.4.25 Sample sugar factories Distilleries Molasses Used in M.T.

Year	Datta	Kumbhi	Gadhinglaj	Warana	Total	Average
1	**2**	**3**	**4**	**5**	**6**	**7**
2005-06	36,685	14,286	11,481	27,781	90,233	22,558
2006-07	46,369	18,916	17,026	30,208	1,12,519	28,130
2007-08	50,188	15,231	14,497	54,119	1,34,035	33,509
2008-09	42,649	16,578	8,489	42,121	1,09,837	27,459
2009-10	29,675	14,044	14,041	39,302	97,062	24,266
2010-11	34,645	18,190	16,916	38,063	1,07,814	26,954
2011-12	34,249	16,374	14,367	59,338	1,24,328	31,082
2012-13	24,153	9,674	15,005	46,523	95,355	23,839
Total	2,98,613	1,23,293	1,11,822	3,37,455	8,71,183	**2,17,796**
Average	37,327	15,412	13,978	42,182	1,08,898	**27,224**

Source: Annual Report and Field work

The table no.4.25 shows sample sugar factories average molasses used in our distilleries for the production of alcohol. Average molasses used by Datta-37,327, Kumbhi-15,412, Gahinglaj-13,978 and Waran-42,182 in M.T. respectively. The highest average molasses used by Warana-42,182 M.T. and lowest average molasses uses by Gadhinglaj distillery 13,978 M.T.

It is interpreted that all the sample sugar factories molasses production depends on the total quantity of sugarcane crushed, capacity of the sugar factory, quality of sugarcane, the quality of juice obtained, the type of juice clarification, boiling techniques adopted and molasses percentage on cane crushed and all of these factors determined availability of molasses. Above data Datta and Warana distilleries are uses more molasses.

Table no.4.26 Sample Sugar Factories Distilleries Alcohol Production

In lakh Lit.

Year	Datta	Kumbhi	Gadhinglaj	Warana	Total	Average
1	**2**	**3**	**4**	**5**	**6**	**7**
2005-06	97.53	39.64	30.79	72.31	240.27	60.07
2006-07	125.30	52.16	45.71	74.18	297.35	74.34
2007-08	134.79	42.05	40.15	133.36	350.35	87.59
2008-09	114.85	45.81	23.34	102.64	286.64	71.66
2009-10	79.87	38.18	38.91	95.47	252.43	63.11
2010-11	91.79	49.62	46.73	114.92	303.06	75.77
2011-12	92.29	44.85	40.23	144.67	322.04	80.51
2012-13	64.74	26.43	39.45	119.07	249.69	62.42
Total	801.16	338.74	305.31	856.62	2,301.83	**575.46**
Average	100.15	42.34	38.16	107.08	287.73	**71.93**

Source: Annual Report and Field work

The table no.4.26 shows sample sugar factories distilleries average alcohol production in lakh litters. Average alcohol produced by Datta-100.15, Kumbhi-42.34, and Gadhingalj-38.16 and Warana-107.08 lakh litters respectively. Highest Alcohol produced by Warana-107.08 and lowest alcohol produced by Gadhinglaj-38.16 lakh litters.

It is interpreted that Warana and Datta distilleries its large capacity of distilleries other than two sample distilleries. It is also benefited large molasses available from its own factory.

Testing of hypothesis No.1. Co-operative sugar factories are suffering the losses due to high cost of production and low productivity in relation to by-product units. (Reference table no. 4.20, 4.21, 4.22, 4.24)

b) Low productivity

This Hopothesis tested as follows:

Mean=45.28 , S.D.=41.79

$t = x - \mu \div \sigma/\sqrt{n}$

t =45.28 -0.41/ $41.79/\sqrt{7}$

t= 2.84

Table vlue at 5% level of significant is 1.94

t = 2.84 > table value is 1.94

Hence Researcher reject this hopthesis.

The 't' value from t distribution table is 1.94 and observed calculate value is t= 2.84 is more than the table value, hence the set hypothesis has rejected.

Testing of Hypothesis No.3: The functional areas of management like production, marketing, finance and HR are weak in the by-products sample units. In it hypothesis only production is tested. (Reference table no. 4.20, 4.21, 4.22, 4.24)

a) Production

This Hopothesis tested as follows:

Mean=45.28S.D.=41.79 $t = x - \mu \div \sigma\sqrt{n}$

t =45.28 -0.41÷ $41.79/\sqrt{7}$

t= 2.84

Table vlue at 5% level of significant is 1.94

t = 2.84 > table value is 1.94

Hence Researcher reject this hopthesis.

The 't' value from t distribution table is 1.94 and observed calculate value is t= 2.84 is more than the table value, hence the set hypothesis has rejected.

Table No.4.27 Shows sample sugar factories distilleries average alcohol production in Per Metric Tons.

Year	Datta	Kumbhi	Gadhinglaj	Warana	Total	Average
1	**2**	**3**	**4**	**5**	**6**	**7**
2005-06	266.80	277.50	268.23	260.30	1,072.83	268.21
2006-07	269.05	275.80	268.46	245.60	1,058.91	264.73
2007-08	267.45	276.10	276.46	246.40	1,066.41	266.60
2008-09	265.65	276.30	274.97	243.70	1,060.62	265.16
2009-10	262.60	271.90	277.11	243.00	1,054.61	263.65
2010-11	265.00	272.80	274.95	246.00	1,058.75	264.69
2011-12	263.50	273.90	280.02	255.90	1,073.32	268.33
2012-13	268.10	273.30	281.00	250.30	1,072.70	268.18
Total	2,128.15	2,197.60	2,201.20	1,991.20	8,518.15	**2,129.54**
Average	266.02	274.70	275.15	248.90	1,064.77	**266.19**

Source: Annual Report and Field work

The table no.4.27 observed that the sample sugar factories distilleries average recovery of per ton of molasses. Average recovery produced by Datta-266.02, Kumbhi-274.70, and Gadhingalj-275.15 and Warana-248.90 litters per ton of molasses respectively. Highest average recovery produced by Gahingalaj-275.15 and lowest average recovery produced by Warana-248.90 litters per metric ton.

It is interpreted that recently alcohol yield per ton of molasses ranges from 240 litters to 280 litters as per new technology development. All the sample units alcohol yield in this range.

Composting sample sugar factories has come to be accepted as one of the good solution to the problem of distillery effluent treatment. Scientifically operated bio-composting can result in to zero effluent discharge. In these plants using mixing of spent wash and press mud has to be carried out (2.5:1 proportion) in surface windows with the help of an aero tiller machine for spraying, mixing, turning and aerating of compost material. Addition of special blend of cultures or cow dung provides bacterial cultures required for composting. The aero tiller straddles windows of press mud (3.5 at base by 1.5 meter height) in the process of aero tilling. It has the capacity to handle 800-1200 MT per hour of composting material. The horse power of different aero tiller machines available are in the range of 70 to 225 HP and the fuel consumption (diesel) is 15 to 40 litres per hour.

Table No.4.28 Sample sugar factory Production of Bio-composting in M.T.

Year	Datta	Kubhi	Gadhinglaj	Warana
1	**2**	**3**	**4**	**5**
2005-06	19,958	20,996	7,350	21,204
2006-07	20,004	18,664	8,126	34,309
2007-08	20,105	18,144	8,779	22,178
2008-09	50,533	18,156	4,466	33,556
2009-10	42,417	22,852	8,289	15,689
2010-11	36,821	21,226	7,730	11,114
2011-12	63,240	17,135	10,088	21,126
2012-13	44,175	20,746	8,822	31,217
Total	**2,97,253**	**1,57,919**	**63,650**	**1,90,393**
Mean	**37,157**	**19,740**	**7,956**	**23,799**
S.D.	**16111.55**	**1981.43**	**1634.93**	**8484.22**
C.V.	**43.36**	**10.04**	**20.55**	**35.65**

Source: Annual Report and Field work

The table no.4.28 shows sample sugar factories production of bio-composting in M.T. The mean value of bio-composting data is Datta-37,157, Kumbhi-19,740, Gadhinglaj-7,956 and Warana-23,799 M.T. respectively. Highest mean value of Datta sugar factory is 37,157 M.T. and Lowest mean value of Gadhinglaj sugar factory is 7,956 M.T. The table also shows C.V. value of bio-composting production is Datta-43.36, Kumbhi-10.04, Gadhinglaj-20.55 and Warana-35.65 respectively. It is observed higher C.V. value of Datta, Gadhinglaj and Warana it is indicated more fluctuation in the production of bio-composting. Kumbhi sugar factory lowest C.V. value shows comparatively other sugar factory hence this factory stability in the production of bio-composting.

It is interpreted that the bio-composting is most suitable for sample distilleries attached with sugar factory. Because of bio-composting plant distilleries can be try to achieve zero discharge or pollution. Compost produced is rich in organic and inorganic nutrients and also micronutrients. It can be further enriched with micronutrients to improve its manure value. Sample sugar factory compost can be sold to farmers and substantial amount of income can be generated. Datta, Gadhinglaj and Warana sugar factory showing high C.V. value indicate more variability in the production of bio-composting plant. Kumbhi sugar factory lowest C.V. indicates more stability in the production of composting plant.

Table no.4.29 shows Warana Pulp Project Production performance

Year	Pulp Production in M.T.	Sodium Powder in M.T.	Lignoslfonate Liquir in M.T.
1	**2**	**3**	**4**
2005-06	130	-	50
2006-07	890	47	315
2007-08	1,080	197	885
2008-09	928	311	1,106
2009-10	880	419	1,171
2010-11	936	424	1,106
2011-12	799	466	1,183
2012-13	553	191	440
Total	**6,196**	**2,055**	**6,256**
Mean	**775**	**257**	**782**
S.D.	**300.59**	**176.81**	**447.78**
C.V.	**38.81**	**68.83**	**57.26**

Source: Annual Report and Field work

The table no.4.29 shows pulp production, sodium powder and lignosulphonate liquor production. This three elements its mean value is Pulp production-775 M.T., sodium powder-257 M.T. and lignosulphonate liquor-782 M.T. This table also shows C.V. value of pulp production (38.81), sodium powder (68.83) and lignosulphonate liquor (57.26) indicate more fluctuation in the production of all these elements. It is interpreted that pulp project and lignosulphonate plant has not efficiently worked in the study period. Hence this project indicated low productivity.

Table no.4.30 shows Datta power company (Co-generation project on BOOT) Electricity production (44 M.W. Capacity)

Particular	Year	
	2011-12	**2012-13**
Production electricity M.W. (Daily Produced)	33.50	34.50
Bagasse Used in M.T.	78,073	80,874
Electricity produced in Units (lakh units)	1128.94	1888.00
Consumed sugar factory and other by-products units (lakh untis)	300.24	592.00
Transfer to Grid (lakh units)	828.70	1396.00

Source: Annual Report and Field work

Datta sugar factory established Shri Datta Power Company Ltd (BOOT) basis co-generation plant of 36 M.W. From this plant average daily Electricity produce in the year 2011-12 is 33.50 M.W. and in the year 2012-13 is 34.50. Above table shows bagasse used in the production of electricity and also this table shows actual electricity produced in the year 2011-12 is 1128.94 lakh units and 2012-13 is 1888 lakh units. The table also shows sugar factory and its by-products units consumed

electricity in the year 2011-12 is 300.24 lakh unit and 2012-13 is 595 lakh units and remaining surplus units this company transfer to sale to third parties. It is the first ever project of Maharashtra Government under the Urjaunkur Nidhi Trust. It is the second season from the beginning of co-generation project.

It is interpreted that the government of Maharashtra has created the Urjankur Nidhi Trust to promote bagasse based cogeneration plant in sugar mills. Under this scheme a 36 MW bagasse cogeneration plant was set up at Datta sugar factory and a company was formed in the name of Urjankur Shree Datta Power Co. Ltd. Because of this project during the crushing season, electricity and steam for the sugar mill will be given by the company free of charge and will also include electricity for street lamps and the labour colony.

4.2 Conclusion:

It is concluded from the above by-products production i.e. bagasses, molasses and press mud its production depends on sugarcane crushing in sugar factory, maturity of sugarcane. It also shows production performance of by-products units i.e. distillery plant, ethanol plant, ENA plant, co-generation plant and bio composting plant. Adoption of by-product technology will be beneficial both for sugar industry and nation by way of attaining energy security. The sample sugar factory working molasses based distillery plant. Sugarcane molasses constitutes an ideal raw material to produce alcohol. The sample sugar factory attached distilleries plant molasses can be converted into many value-added products by application of modern technology. Ethanol production depends largely on availability of sugarcane molasses. Lower sugarcane molasses availability and consequent higher molasses prices affect the ethanol production. Also ethanol blending programme in India is highly regulated and heavily burdened hence these entire element affect this project. In the sample unit only two sample unit produced ethanol and one unit is extra natural alcohol. Compost produced is rich in organic and inorganic nutrients and also micronutrients. It can be further enriched with micronutrients to improve its manure value. Sample sugar factory compost can be sold to farmers and substantial amount of income can be generated. The Warana pulp project and lignosulphonate plant has not efficiently worked in the study period. Hence this project indicated low productivity. The government of Maharashtra has created the Urjankur Nidhi Trust to promote bagasse based cogeneration plant in sugar mills. Under this scheme 36 M.W. bagasse cogeneration plant was set up at Datta sugar factory and a company was formed in the name of Urjankur Shree Datta Power Co. Ltd. Because of this project during the crushing season, electricity and steam for the sugar mill will be given by the company free of charge and will also include electricity for street lamps and the labour colony.

CHAPTER - V
Analysis and Interpretation

Chapter Design

This chapter has been covered other functional areas of By-products areas like financial, marketing and H.R. in relation to the by-products units. Marketing 31 tables, Human resource management 4 tables and finance and cost 31 table analysis and interpretation.

5.0 Introduction:

The sugar industry performs several activities which may be grouped under important functional department such as production management, financial management, marketing management and human resource management. The functions of any sugar factory and its by-products departments such as production, financial, marketing and human resources management all these are known as operative functions. For instance scope of these department are inter-related. Now the sample sugar factory and its department by-products are becoming more commercial and will be looked into from of pure business perspective. Hence this chapter the studies of marketing, finance and human resource departments of sample sugar factories.

5.1 Analysis and Interpretation:

Table No. 5.1 Datta sugar factory Bagasse sales data

Year	Sales in the Year			Closing Balance	
	M.T	Rate Per Tone Rs.	Rs.	M.T	Rs.
1	2	3	4	5	6
2005-06	28,099	726	2,03,93,411	8,020	58,20,000
2006-07	22,718	309	70,19,862	5,049	15,60,000
2007-08	28,319	338	95,66,158	16,187	54,68,000
2008-09	25,744	1466	3,77,48,427	11,149	1,63,47,000
2009-10	14,916	1525	2,27,51,524	5,316	82,00,000
2010-11	19,457	845	1,64,47,586	8,182	35,35,000
2011-12	14,684	1416	2,07,89,167	195	2,56,000
2012-13	470	1564	7,35,080	-	-
Total	**154407**	**8189.28**	**13,54,51,215**	**54,098**	**4,11,86,000**
Mean	**19300.875**	**1023.66**	**1,69,31,402**	**6,762**	**51,48,250**
S.D.	**9312.76**	**533.85**	**11396306**	**5419**	**5361175**
C.V.	**48.25**	**52.15**	**67.31**	**80.13**	**104.14**

Source: Annual Report and Field Visit

It is studied that bagasse is very important by-product in a sugar factory. It gives income by way of sale of this by-product. The table no.5.1 shows Datta sugar factory bagasse sales data. The mean value of bagasse sales is 19300.87 M.T. The higher C.V. (48.25) value indicate more fluctuations in the quantity of bagasse sales. The above table no.5.1 also shows rate per ton of bagasse in a study period. The mean value of bagasse rate per ton is Rs. 1023.66. The rate per ton of bagasse lowest rate Rs.309 in the year 2006-07 and highest rate Rs.1,564 in the year 2012-13. The higher C.V. (52.15) value indicate more fluctuation in the rate per ton of bagasse. It is also shows total income sales in the study period. Its mean value is Rs. 1,69,31,402. The higher C.V (67.31) value indicate more variations in the total income sales of bagasse. It is also shows closing balance of the quantity of bagasse. The mean value of quantity of bagasse closing balance 6,762 M.T. and its C.V. (80.13) value indicate more variation in quantity of bagasse closing balance. The mean value of closing balance price is Rs.51, 48,250. And its higher C.V. (104.14) value shows higher fluctuation in the closing of bagasse.

It is interpreted that Datta bagasse sales data is very ups and downs sales quantity and rate per ton of bagasse in the study period. It gives income by way of sales bagasse. It is observed that this sugar factory sold out bagasse as such, very good returns income to the sugar factory. It is also observed sample sugar factory effectively implemented marketing policy of bagasse sales quantity in the study period. Hence closing balance of bagasse quantity and its value shows low comparatively sales in the study period. It studied that inventory turnover ratio of mean value of net sales income to mean value of closing balance 3.28:1. It shows a high turnover ratio indicate that maximum sales turnover is obtained by investing minimum possible funds in the inventory which is a sign of better performance of the sales bagasses.

Table No. 5.2 Kumbhi sugar factory Bagasse sales data

Year	Sales in the Year			Closing Balance	
	M.T	Rate Per Tone Rs.	Rs.	M.T	Rs.
1	2	3	4	5	6
2005-06	11,596	563	65,26,925	1,635	9,19,000
2006-07	11,238	350	39,36,334	1,943	2,30,000
2007-08	11,460	616	70,63,944	1,993	14,45,000
2008-09	11,045	1774	1,95,93,499	-	-
2009-10	12,648	1296	1,63,97,247	1,297	14,95,000
2010-11	10,840	895	97,01,800	1,826	16,35,000
2011-12	9,403	1206	1,13,38,894	2,520	3,42,900
2012-13	7,230	1486	1,07,43,780	10,631	1,57,97,666
Total	**85,460**	**8,187**	**8,53,02,422**	**21,845**	**60,66,900**
Mean	**10,683**	**1,023**	**1,06,62,803**	**2,731**	**8,66,700**
S.D.	**1661.49**	**497.50**	**5200701**	**3277**	**5316016**
C.V.	**15.55**	**48.61**	**48.77**	**120.00**	**613.36**

Source: Annual Report and Field Visit

Bagasse is very important by-product in a sugar factory. It gives income by way of sale of this by-product. The table no.5.2 shows Kumbi sugar factory bagasse sales data. The mean value of bagasse sales is 10,683 M.T. The higher C.V. (15.55) value indicate more fluctuation in the quantity of bagasse sales. The above table no.5.2 also shows rate per ton of bagasse in a study period. The mean value of bagasse rate per ton is Rs. 1023. The rate per ton of bagasse lowest rate Rs.350 in the year 2006-07 and highest rate Rs.1,774 in the year 2008-09. The higher C.V. (48.61) value indicate more fluctuation in the rate per ton of bagasse. It is also shows total income of bagasse sales in the study period. Its mean value is Rs. 1,06,62,803. The higher C.V (48.77) value indicate more variations in the total income sales of bagasse. It is also shows closing balance of the quantity of bagasse sales. The mean value of quantity of bagasse closing balance 2,731 M.T. and its C.V. (120) value indicate more variation in quantity of bagasse closing balance. The mean value of closing price is Rs.8,66,700. And its higher C.V. (613.36) value shows higher variability in the closing sales value of bagasse.

It is interpreted that Kubhi bagasse sales quantity normally fluctuate and rate per ton of bagasse is very ups and downs in the study period. It gives income by way

of sales bagasse. It is observed that this sugar factory sold out bagasse as such, very little returns income to the sugar factory. It is also observed sample sugar factory effectively implemented marketing policy of bagasse sales quantity in the study period. Hence closing balance of bagasse quantity and its income shows low comparatively net sales in the study period. It is also calculate inventory turnover ratio of the mean value of bagasse sales income to mean value of closing balance is found (12.30:1) ratio. This ratio found high turnover ratio is obtained in sales data. Because it found good inventory which is a sign of better performance of sales of bagasses

Table No.5.3 Gadhingalaj sugar factory Bagasse sales data

Year	Sales in the Year			Closing Balance	
	M.T	Rate Per Tone Rs.	Rs.	M.T	Rs.
1	2	3	4	5	6
2005-06	-	-	-	3,912	33,58,000
2006-07	624	656	4,09,556	4,204	35,82,000
2007-08	11,220	382	42,80,430	1,595	6,24,000
2008-09	3,512	1,922	67,48,975	4,327	83,16,000
2009-10	5,341	1,463	78,15,272	4,234	47,37,000
2010-11	2,313	1,126	26,04,531	8,448	57,86,000
2011-12	2,125	1,125	23,90,625	2,235	25,12,153
2012-13	1,904	1,152	21,93,408	12	13,824
Total	**27,039**	**7,826**	**2,64,42,797**	**28,967**	**2,89,15,153**
Mean	**3,380**	**978**	**33,05,350**	**3,621**	**41,30,736**
S.D.	**3570.53**	**611.27**	**2803670.42**	**2497.12**	**2706327.90**
C.V.	**105.64**	**62.49**	**84.82**	**68.96**	**65.52**

Source: Annual Report and Field Visit

It is studied that bagasse is very important by-product in a sugar factory. It gives income by way of sale of this by-product. The table no.5.3 shows Gadigalaj sugar factory bagasse sales data. The mean value of bagasse sales is 3,380 M.T. The higher C.V. (105.64) value indicate more variability in the quantity of bagasse sales. The above table no.5.3 also shows rate per ton of bagasse in a study period. The mean value of bagasse rate per ton is Rs.978. The rate per ton of bagasse lowest rate Rs.382 in the year 2007-08 and highest rate Rs.1,922 in the year 2008-09. The higher C.V. (62.49) value indicate more fluctuation in the rate per ton of bagasse. It is also shows

total income of bagasse sales in the study period. Its mean value is Rs.33,05,350. The higher C.V (84.82) value indicate more variations in the total income sales of bagasse. It is also shows closing balance of the quantity of bagasse sales. The mean value of quantity of bagasse closing balance 3,621M.T. and its C.V. (68.96) value indicate more variation in quantity of bagasse closing balance. The mean value of closing value is Rs.41,30,736. And its higher C.V. (65.52) value shows higher variability in the closing sales price of bagasse.

It is interpreted that Gadhinglaj bagasse sales data is very fluctuate sales quantity and rate per ton of bagasse in the study period. It gives income by way of sales bagasse. It is observed that this sugar factory sold out bagasse as such, very little returns income to the sugar factory. It is also observed sample sugar factory does not effectively implemented marketing policy of bagasse sales quantity in the study period. It is also calculate inventory turnover ratio of the mean value of bagasse sales income to mean value of closing balance is found (0.98:1) ratio. This ratio found low turnover ratio is obtained in sales data, it shows that marketing policy is not effectively implemented by the factory. It found that over investment in inventory of bagasse.

Table No. 5.4 Warana sugar factory Bagasse sales data

Year	Sales in the Year			Closing Balance	
	M.T	Rate Per Tone Rs.	Rs.	M.T	Rs.
1	2	3	4	5	6
2005-06	23,797	626	1,48,96,922	4,797	30,02,000
2006-07	43,903	475	2,08,53,925	-	-
2007-08	1,28,064	440	5,63,48,160	18,384	80,89,000
2008-09	93,377	1,690	15,78,07,130	18,511	3,12,84,000
2009-10	90,825	1,512	13,73,27,400	11,334	1,71,22,000
2010-11	68,544	954	6,53,90,976	63,050	6,01,50,000
2011-12	64,864	1,377	8,93,17,728	33,349	4,59,21,573
2012-13	9,931	2,165	2,15,00,615	25,646	5,55,23,590
Total	**5,23,305**	**9,239**	**56,34,42,856**	**1,75,071**	**16,55,68,573**
Mean	**65,413**	**1,155**	**7,04,30,357**	**21,884**	**2,36,52,653**
S.D.	**38979.54**	**629.84**	**54282667.46**	**19806.36**	**24040916.94**
C.V.	**59.59**	**54.54**	**77.07**	**90.51**	**101.64**

Source: Annual Report and Field Visit

It is studied that bagasse is very important by-product in a sugar factory. It gives income by way of sale of this by-product. The table no.5.4 shows Warana sugar factory bagasse sales data. The mean value of bagasse sales is 65,413 M.T. The higher C.V. (59.59) value indicate more fluctuation in the quantity of bagasse sales. The above table also shows rate per ton of bagasse in a study period. The mean value of bagasse rate per ton is Rs.1,155. The rate per ton of bagasse lowest rate Rs.440 in the year 2007-08 and highest rate Rs.2,165 in the year 2012-13. The higher C.V. (54.54) value indicate more fluctuation in the rate per ton of bagasse. It is also shows total income of bagasse sales in the study period. Its mean value is Rs.7,04,30,357. The higher C.V (77.07) value indicate more variations in the total income sales of bagasse. It is also shows closing balance of the quantity of bagasse. The mean value of quantity of bagasse closing balance 21,884 M.T. and its C.V. (90.51) value indicate more variation in quantity of bagasse closing balance. The mean value of closing value is Rs.2,36,52,563. And its higher C.V. (101.64) value shows higher variability in the closing value of bagasse.

It is interpreted that Warana bagasse sales quantity fluctuate and rate per ton of bagasse is very ups and downs in the study period. It gives income by way of sales bagasse. It is observed that this sugar factory sold out bagasse as such, good returns income to the sugar factory. It is also observed sample sugar factory effectively implemented marketing policy of bagasse sales quantity in the study period. Hence closing balance of bagasse quantity and its income shows low comparatively net sales in the study period. It is also calculate inventory turnover ratio of the mean value of bagasse sales income to mean value of closing balance is found (2.97:1) ratio. This ratio found high turnover ratio is obtained in bagasses sales data. It shows a high turnover ratio indicate that maximum sales turnover is obtained by investing minimum possible funds in the inventory which is a sign of better performance of the sales bagasses.

Table No.5.5 Rajaram Sugar factory Bagasse Sales Data

Year	Sales of the Year		
	M.T	Rate Per Tone Rs.	Rs.
1	2	3	4
2005-06	7,596	742	56,39,954
2006-07	14,967	361	53,97,849
2007-08	16,438	532	87,45,016
2008-09	11,619	1,836	2,13,32,484
2009-10	7,440	1,597	1,18,81,680
2010-11	18,373	1,060	1,94,75,380
2011-12	12,761	1,390	1,77,37,790
2012-13	20,348	1,703	3,46,52,644
Total	**1,09,542**	**9,221**	**12,48,62,797**
Mean	**13,693**	**1,153**	**1,56,07,850**
S.D.	**4732.76**	**562.26**	**9852889.05**
C.V.	**34.56**	**48.78**	**63.13**

Source: Annual Report and Field Visit

It is studied that bagasse is very important by-product in a sugar factory. It gives income by way of sale of this by-product. The table no.5.5 shows Rajaram sugar factory bagasse sales data. The mean value of bagasse sales is 13,693 M.T. The higher C.V. (34.56) value indicate more variability in the quantity of bagasse sales. The above table also shows rate per ton of bagasse in a study period. The mean value of bagasse rate per ton is Rs.1153. The rate per ton of bagasse lowest rate Rs.361 in the year 2006-07 and highest rate Rs.1,836 in the year 2008-09. The higher C.V. (48.78) value indicate more fluctuation in the rate per ton of bagasse. It is also shows total income of bagasse sales in the study period. Its mean value is Rs.1,56,07,850. The higher C.V (63.13) value indicate more variations in the total income sales of bagasse.

It is interpreted that Rajaram bagasse sales data is very ups and downs sales quantity and rate per ton of bagasse in the study period. It gives income by way of sales bagasse. It is observed that this sugar factory sold out bagasse as such, very valuable returns income to the sugar factory. It is also observed sample sugar factory effectively implemented marketing policy of bagasse sales quantity in the study period. This factory bagasse turnover is high, it shows good marketing policy implements by the factory.

Table No.5.6 Bagasse sales coefficient of variation:

Factory Name	M.T.	Rate per tone Rs.	Sales income in Rs.
1	2	3	4
Datta	48.25	52.15	67.31
Kumbhi	15.55	48.61	48.77
Gadingahlaj	105.64	62.49	84.82
Warana	59.59	54.54	77.07
Rajaram	34.56	48.78	63.13

By considering table no.5.6 bagasse sales coefficient of variation it is found Kumbhi has lower coefficient of variation in relation to bagasse sales in M.T., Rate per tone, sales income in Rs. and Gadhingalaj has higher coefficient of variation all these element. Highest coefficient of variation indicate that higher variability in bagasse sales quantity, Rate per ton of bagasse and sales income in Rs. And low coefficient of variation means low variability in bagasse sales quantity, Rate per ton of bagasse and sales income in Rs. Higher variability in bagasse sales data is not good indication in this industry.

Table No.5.7 Showing Datta sugar factory Molasses sales data

Year	Sales of the Year			Closing Balance	
	M.T	Rate Per Tonne Rs.	Rs.	M.T.	Rs.
1	2	3	4	5	6
2005-06	27,532	3,941	10,85,03,612	10,181	4,01,23,321
2006-07	37,941	2,577	9,77,73,957	11,164	2,87,69,628
2007-08	35,926	1,775	6,37,68,650	22,961	4,07,55,775
2008-09	39,004	4,010	15,64,06,040	18,575	7,44,85,750
2009-10	37,999	5,468	20,77,78,532	12,801	6,99,95,868
2010-11	45,577	3,752	17,10,04,904	21,728	8,15,23,456
2011-12	50,069	3,968	19,86,73,792	12,193	4,83,81,824
2012-13	45,700	4,600	21,02,20,000	11,019	5,06,87,400
Total	**3,19,748**	**30,091**	**1,21,41,29,487**	**1,20,622**	**43,47,23,022**
Mean	**39,969**	**3,761**	**15,17,66,186**	**15,078**	**5,43,40,378**
S.D.	**7033.12**	**1140.25**	**55647601**	**5180.687**	**18819549.59**
C.V.	**17.60**	**30.31**	**36.67**	**34.36**	**34.63**

Source: Annual Report and Field Visit

It is studied that molasses is another very important by-product in a sugar factory. It gives income by way of sale of this by-product. The table no.5.7 shows Datta sugar factory molasses sales data. The mean value of molasses sales is 39,969 M.T. The higher C.V. (17.60) value indicate more fluctuations in the quantity of molasses sales. The above table also shows rate per ton of molasses in a study period. The mean value of molasses rate per ton is Rs. 3,761.The rate per ton of molasses lowest rate Rs.1,775 in the year 2007-08 and highest rate Rs.5,468 in the year 2009-10. The higher C.V. (30.31) value indicate more fluctuation in the rate per ton of molasses. It is also shows total income sales in the study period. Its mean value is Rs. 15,1766,186. The higher C.V (38.80) value indicate more variations in the total income sales of molasses. It is also shows closing balance of the quantity of molasses sales. The mean value of quantity of molasses closing balance 15,078 M.T. and its C.V. (19.33) value indicate more variation in quantity of molasses closing balance. The mean value of closing sales price is Rs. 5,43,40,378. And its higher C.V. (34.63) value shows higher fluctuation in the closing sales price of molasses.

It is interpreted that molasses sales data is very ups and downs sales quantity and rate per ton of molasses in the study period. It gives income by way of sales molasses. It is observed that this sugar factory sold out molasses such, very good returns income to the sugar factory. It is also observed sample sugar factory effectively implemented marketing policy of molasses sales quantity in the study period. It calculates turnover ratio of mean value of total sales income to closing balance value. It is found turnover ratio (2.63:1) a high inventory ratio indicate that maximum sales turnover obtained by investing minimum possible funds in the inventory.

It is studied that molasses is another very important by-product in a sugar factory. It gives income by way of sale of this by-product. The table no.5.8 shows Kumbhi sugar factory molasses sales data. The mean value of molasses sales is 17,672 M.T. The higher C.V. (22.84) value indicate more fluctuations in the quantity of molasses sales.

Table No. 5.8 Kumbhi sugar factory Molasses sales data

Year	Sales in the Year			Closing Balance	
	M.T	Rate Per Tone Rs.	Rs.	M.T.	Rs.
1	2	3	4	5	6
2005-06	14,286	3,319	4,74,15,234	6,518	2,16,33,242
2006-07	19,261	2,282	4,39,53,602	4,817	1,09,92,394
2007-08	15,230	1,698	2,58,60,540	8,903	1,51,17,294
2008-09	16,434	2,962	4,86,77,508	8,708	2,57,93,096
2009-10	18,371	4,498	8,26,32,758	8,937	4,01,98,626
2010-11	26,159	3,301	8,63,50,859	5,072	1,67,42,672
2011-12	13,257	3,725	4,93,82,325	7,043	2,62,35,175
2012-13	18,380	3,581	6,58,18,780	11,347	4,06,33,607
Total	**1,41,378**	**25,366**	**45,00,91,606**	**61,345**	**15,67,12,499**
Mean	**17,672**	**3,171**	**5,62,61,451**	**7,668**	**2,23,87,500**
S.D.	**4035.51**	**868.37**	**20532043**	**2215**	**9650356**
C.V.	**22.84**	**27.39**	**36.49**	**28.88**	**43.11**

Source: Annual Report and Field Visit

The above table also shows rate per ton of molasses in a study period. The mean value of molasses rate per ton is Rs. 3,171.The rate per ton of molasses lowest rate Rs.1,698 the year 2007-08 and highest rate Rs.4,498 in the year 2009-10. The higher C.V. (27.39) value indicate more fluctuation in the rate per ton of molasses. It is also shows total income sales in the study period. Its mean value is Rs.5,62,61,451. The higher C.V (36.49) value indicate more variations in the total income sales of molasses. It is also shows closing balance of the quantity of molasses sales. The mean value of quantity of molasses closing balance 7,668 M.T. And its C.V. (28.88) value indicate more variation in quantity of molasses closing balance. The mean value of closing vale is Rs.223,87,500.And its higher C.V.(43.11) value shows higher fluctuation in the closing sales price of molasses.

It is interpreted that molasses sales data is very ups and downs sales quantity and rate per ton of molasses in the study period. It gives income by way of sales molasses. It is observed that this sugar factory sold out molasses such, very good returns income to the sugar factory. It is also observed sample sugar factory effectively implemented marketing policy of molasses sales quantity in the study

period. Hence closing balance of molasses quantity and its value shows comparatively low in the mean value of sales in the study period. It is found turnover ratio (2.51:1) a high inventory ratio indicate that maximum sales turnover obtained by investing minimum possible funds in the inventory.

Table No.5.9 Showing Gadhingalaj Sugar factory Molasses sales data

Year	Sales of the Year			Closing Balance	
	M.T.	Rate Per Tone Rs.	Rs.	M.T.	Rs.
1	2	3	4	5	6
2005-06	11,172	3,010	3,36,27,720	255	7,67,550
2006-07	12,356	2,024	2,50,08,544	572	11,57,728
2007-08	15,076	757	1,14,12,532	1,375	10,40,875
2008-09	10,892	2,083	2,26,88,036	1,509	31,43,247
2009-10	14,300	4,408	6,30,34,400	1,371	60,43,368
2010-11	14,224	2,835	4,03,25,040	1,221	34,61,535
2011-12	14,367	2,954	4,24,40,118	510	15,06,540
2012-13	5,502	4,000	2,20,08,000	2,015	80,60,000
Total	**97,889**	**22,071**	**26,05,44,390**	**8,828**	**1,71,20,843**
Mean	**12,236**	**2,759**	**3,25,68,049**	**1,104**	**24,45,835**
S.D.	**3142.31**	**1157.05**	**16039155**	**599**	**2655757**
C.V.	**25.68**	**41.94**	**49.25**	**54.25**	**108.58**

Source: Annual Report and Field Visit

It is studied that molasses is another very important by-product in a sugar factory. It gives income by way of sale of this by-product. The table no.5.9 shows Gadinglhaj sugar factory molasses sales data. The mean value of molasses sales is 12,236 M.T. The higher C.V. (25.68) value indicate more fluctuations in the quantity of molasses sales. The above table also shows rate per ton of molasses in a study period. The mean value of molasses rate per ton is Rs2,759.The rate per ton of molasses lowest rate Rs.757 the year 2007-08 and highest rate Rs.4,048 in the year 2009-10. The higher C.V. (41.94) value indicate more fluctuation in the rate per ton of molasses. It is also shows total income sales in the study period. Its mean value is Rs.3,25,68,049. The higher C.V (49.25) value indicate more variations in the total income sales of molasses. It is also shows closing balance of the quantity of molasses

sales. The mean value of quantity of molasses closing balance1,104 M.T. And its C.V. (54.25) value indicate more variation in quantity of molasses closing balance. The mean value of closing value is Rs.24,45,835.And its higher C.V. (108.58) value shows higher fluctuation in the closing sales price of molasses.

It is interpreted that molasses sales data is very ups and downs sales quantity and rate per ton of molasses in the study period. It gives income by way of sales molasses. It is observed that this sugar factory sold out molasses such, very little returns income to the sugar factory. It is also observed sample sugar factory effectively implemented marketing policy of molasses sales quantity in the study period. Hence closing balance of molasses quantity and its income shows low comparatively sales in the study period. It is found turnover ratio (12.19:1) a high inventory ratio indicate that maximum sales turnover obtained by investing minimum possible funds in the inventory.

Table No. 5.10 Warana sugar factory Molasses sales data

Year	Sales in the Year			Closing Balance	
	M.T	Rate Per Tone Rs.	Rs.	M.T	Rs.
1	2	3	4	5	6
2005-06	36,417	3,931	14,31,55,227	19,028	7,47,99,068
2006-07	36,758	3,876	14,24,74,008	22,457	8,70,43,332
2007-08	35,650	3,186	11,35,80,900	21,988	7,00,53,768
2008-09	40,449	5,277	21,34,49,373	23,441	12,36,98,157
2009-10	39,210	5,200	20,38,92,000	16,707	8,68,76,400
2010-11	48,426	4,760	23,05,07,760	16,007	7,61,93,320
2011-12	50,008	5,200	26,00,41,600	19,514	10,14,72,800
2012-13	47,523	5,504	26,15,66,592	18,972	10,44,21,888
Total	**3,34,441**	**36,934**	**1,56,86,67,460**	**1,58,114**	**72,45,58,733**
Mean	**41,805**	**4,617**	**19,60,83,433**	**19,764**	**9,05,69,842**
S.D.	**5913.45**	**844.31**	**56579032.60**	**2683.56**	**18168370.09**
C.V.	**14.15**	**18.29**	**28.85**	**13.58**	**20.06**

Source: Annual Report and Field Visit

The table no.5.10 shows Warana sugar factory molasses sales data. The mean value of molasses sales is 41,805 M.T. The higher C.V. (14.15) value indicate more fluctuations in the quantity of molasses sales. The above table also shows rate per ton of molasses in a study period. The mean value of molasses rate per ton is Rs.4, 617. The rate per ton of molasses lowest rate Rs.3,186 the year 2007-08 and highest rate Rs.5,504 in the year 2012-13. The higher C.V. (18.29) value indicate more fluctuation

in the rate per ton of molasses. It is also shows total income sales in the study period. Its mean value is Rs.19,60,83,433. The higher C.V (28.85) value indicate more variations in the total income sales of molasses. It is also shows closing balance of the quantity of molasses sales. The mean value of quantity of molasses closing balance 19,764 M.T. And its C.V. (13.58) value indicate more variation in quantity of molasses closing balance. The mean value of closing balance price is Rs.9,05,69,842. And its higher C.V. (20.06) value shows higher fluctuation in the closing sales price of molasses.

It is interpreted that molasses sales data is very ups and downs sales quantity and rate per ton of molasses in the study period. It gives income by way of sales molasses. It is observed that this sugar factory sold out molasses such, very good returns income to the sugar factory. It is also observed sample sugar factory effectively implemented marketing policy of molasses sales quantity in the study period. Hence closing balance of molasses quantity and its closing value shows comparatively lower sales income in the study period. It is found turnover ratio (2.16:1) a high inventory ratio indicate that maximum sales turnover obtained by investing minimum possible funds in the inventory.

Table No.5.11 Rajaram sugar factory Molasses sales data

Year	Sales in the Year			Closing Balance	
	M.T	Rate Per Tone Rs.	Rs.	M.T	Rs.
1	2	3	4	5	6
2005-06	9,422	4,584	4,31,90,448	8,336	3,82,12,224
2006-07	14,249	2,867	4,08,51,883	9,326	2,67,37,642
2007-08	21,356	1,904	4,06,61,824	3,533	67,26,832
2008-09	9,965	4,665	4,64,86,725	6,145	2,86,66,425
2009-10	15,145	5,451	8,25,55,395	7,114	3,87,78,414
2010-11	18,731	3,864	7,23,76,584	4,607	1,78,01,448
2011-12	13,755	4,024	5,53,50,120	6,321	2,54,35,704
2012-13	17,994	4,745	8,53,81,530	5,768	2,73,69,160
Total	**1,20,617**	**32,104**	**46,68,54,509**	**51,150**	**18,23,58,689**
Mean	**15,077**	**4,013**	**5,83,56,814**	**6,394**	**2,60,51,241**
S.D.	**4171.95**	**1142.57**	**18943351**	**1879.372**	**10423677.19**
C.V.	**27.67**	**28.47**	**32.46**	**29.39**	**40.01**

Source: Annual Report and Field Visit

It is studied that molasses is another very important by-product in a sugar factory. It gives income by way of sale of this by-product. The table no.5.11 shows Rajaram sugar factory molasses sales data. The mean value of molasses sales is15,077 M.T. The higher C.V. (27.67) value indicate more fluctuations in the quantity of molasses sales. The above table also shows rate per ton of molasses in a study period. The mean value of molasses rate per ton is Rs.4,013. The rate per ton of molasses lowest rate Rs.1,904 the year 2007-08 and highest rate Rs.5,451 in the year 2009-10. The higher C.V. (28.47) value indicate more fluctuation in the rate per ton of molasses. It is also shows total income sales in the study period. Its mean value is Rs.5,83,56,814. The higher C.V (32.46) value indicate more variations in the total income sales of molasses. It is also shows closing balance of the quantity of molasses sales. The mean value of quantity of molasses closing balance 6,394 M.T. And its C.V. (29.39) value indicates more variation in quantity of molasses closing balance. The mean value of closing price is Rs.260, 51,241.And its higher C.V. (40.41) value shows higher fluctuation in the closing sales price of molasses.

It is interpreted that molasses sales data is very ups and downs sales quantity and rate per ton of molasses in the study period. It gives income by way of sales molasses. It is observed that this sugar factory sold out molasses such, very good returns income to the sugar factory. It is observes sample sugar factory effectively implementes marketing policy of molasses sales quantity in the study period. Hence closing balance of molasses quantity and itsvalue shows comparatively lower to mean value of sales in the study period. It is found turnover ratio (2.24:1) a high inventory ratio indicate that maximum sales turnover obtained by investing minimum possible funds in the inventory.

Table No.5.12 Molasses sales coefficient of variation

Name of Factory	Metric Tons	Rate per tons Rs.	Sales income in Rs.
1	**2**	**3**	**4**
Datta	17.60	30.31	36.67
Kumbhi	22.84	27.39	36.49
Gadinglhaj	25.68	41.94	49.25
Warana	14.15	18.29	28.25
Rajaram	27.67	28.47	32.46

By considering table no.5.12 molasses sales coefficient of variation. It is found Warana has lower coefficient of variation of molasses sales in M.T., molasses rate per tons and sales income and Rajaram has higher coefficient of variation in molasses sales metric tons and Gadhinglaj has higher coefficient of variation in molasses rate per tons and sales income in Rs. Highest coefficient of variation indicate that higher variability in molasses sales metric tons, rate per tons and sales income in Rs. And low coefficient of variation means low variability in molasses sales quantity, rate per tons and sales income in Rs. Higher variability in molasses sales data is not good indication in the industry.

Table No.5.13 Datta sugar factory Statement of Ratified Sprit Sales

Year	Sales in the Year			Closing Balance	
	Litres in Lakh	Rate Per Liter Rs.	Rs. In Lakh	Litres in Lakh	Rs. In lakh
1	2	3	4	5	6
2005-06	57.48	24.71	1420.34	18.88	466.52
2206-07	111.70	22.53	2516.61	10.64	239.72
2007-08	71.20	19.87	1414.81	8.61	171.08
2008-09	86.60	26.55	2299.37	13.84	367.45
2009-10	61.50	30.72	1889.52	21.11	648.50
2010-11	68.20	25.96	1771.67	21.42	556.06
2011-12	73.80	30.52	2253.24	4.99	152.29
2012-13	16.7	33.3	556.11	30.08	1001.66
Total	**547.18**	**214.16**	**14121.67**	**129.57**	3603.30
Mean	**68.40**	**26.77**	**1765.21**	**16.20**	**450.41**
S.D.	**26.95**	**4.52**	**633.27**	**8.20**	**286.04**
C.V.	**39.40**	**16.87**	**35.88**	**50.64**	**63.51**

Source: Annual Report and Field Visit

The table no.5.13 shows rectified sprit sales in the study period. It is a distillery main by-product. The mean value of rectified sprit sales is 68.40 lakh. The higher C.V.(39.40) value indicate more fluctuation in the quantity of rectified spirit sales. It is also show rate per litter of rectified spirit. The mean value of rate per litre of rectified sprit is 26.47 and its higher C.V. (16.87) value shows more fluctuation in the rate per litre of rectified spirit. It is also shows this table total sales income of rectified sprit. The mean value of total rectified sprit sales income is Rs.1765.21 in

lakh and these higher C.V. (35.88) value shows higher fluctuation in total rectified sales income. It is also above table indicated closing balance of rectified sprit in the study period. The mean value of quantity of rectified sprit closing balance is 16.20 lakh litres and these C.V. (50.64) value show more fluctuation in the quantity of rectified sprit closing balance. The table also show total closing balance of rectified sprit value. Its C.V. value indicated higher fluctuation in the closing balance of rectified sprit value.

It is interpreted rectified sprit is very important by-product in distillery department. It is gives main source income by way of rectified spirit sales. Rectified sprit assured very important place in the country's economy. It is a vital raw material for a number of chemicals. Rectified sprit is basically used for three purpose i.e. Industrial alcohol production, potable alcohol production and fuel ethanol. It is observed that rectified sales as such a large income source of distillery department in this sugar factory. It is also observed lower closing balance shows in rectified sprit in relation to sales. It is found turnover ratio (3.91:1) a high inventory ratio indicate that maximum sales income turnover obtained by investing minimum possible funds in the inventory.

Table No.5.14 showing Datta sugar factory SDS and ODS sales data.

Year	S.D.S.Sales in the Year			O.D.S. Sales in the Year	
	Liters in Lakh	Rate Per Liter Rs.	Rs. In Lakh	Liters in Lakh Rs.	Rs. In Lakh
1	2	3	4	5	6
2005-06	29.81	18.50	521.60	1.94	42.02
2206-07	20.33	20.01	406.91	1.20	27.30
2007-08	58.17	14.81	869.56	0.41	7.74
2008-09	5.39	24.75	133.52	0.60	15.12
2009-10	5.03	21.50	108.14	0.00	0.00
2010-11	14.01	17.53	245.68	0.00	0.00
2011-12	0.00	0.00	0.00	0.00	0.00
2012-13	19.32	28.93	558.92	0.00	0.00
Total	**152.06**	**146.03**	**2844.33**	**4.15**	**92.18**
Mean	**19.01**	**18.25**	**355.54**	**0.52**	**11.52**
S.D.	**18.59**	**8.58**	**289.03**	**0.72**	**15.75**
C.V.	**97.81**	**47.01**	**81.29**	**137.84**	**136.72**

Source: Annual Report and Field Visit

The table no.5.14 shows Datta sugar factory distillery by products SDS and ODS sales. The mean value of SDS sales is 19..01 lakh litres, the mean value of rate per litre is Rs.18.25 and total sales in the study period its mean value is Rs.355.54 lakh. In the study period higher C.V. values indicate higher fluctuation in the SDS sales in all elements. The above table also shows ODS sales. ODS sales in the study period is comparatively less quantity.

It is interpreted when market demand of SDS and ODS in those conditions this products produced or supply by the distillery. Because of closing balance is not found in the study period.

Table No. 5.15 Datta sugar factory Statement of Fousil Oil Sales

Year	Sales in the Year			Closing Balance	
	Liters in Lakh	Rate Per Liter Rs.	Rs. In Lakh	Litres in Lakh	Rs. In Lakh
1	2	3	4	5	6
2005-06	0.39	13.31	4.57	0.07	0.89
2206-07	0.21	13.22	2.77	0.20	2.33
2007-08	0.17	13.33	2.26	0.16	2.13
2008-09	0.21	14.32	3.08	0.26	5.66
2009-10	0.26	20.00	5.20	0.25	5.29
2010-11	0.22	19.90	4.38	0.36	7.24
2011-12	0.40	20.51	8.20	0.05	1.13
2012-13	0.28	27.07	7.85	0.06	1.62
Total	**1.86**	**141.66**	**38.31**	**1.41**	**26.29**
Mean	**0.23**	**17.71**	**4.79**	**0.18**	**3.29**
S.D.	**0.13**	**5.01**	**2.23**	**0.11**	**2.41**
C.V.	**54.59**	**28.29**	**46.55**	**63.54**	**73.38**

Source: Annual Report and Field Visit

The table no.5.15 shows Datta sugar factory distillery by products fusil oil sales. The mean value of fusil oil sales is 0.23 lakh litres, the mean value of rate per litre is Rs.17.71 and total sales in the study period its mean value is Rs.4.79 lakh. In the study period higher C.V. values indicate higher fluctuation in the fusil oil sales in all elements.

It is interpreted that fusil oil is less marketable product in distillery department because distillery department not produced more quantity.

Table No.5.16 Showing Datta sugar factory Statement of Ethonol Sales

Year	Sales in the Year			Closing Balance	
	Liters in Lakh	Rate Per Liter Rs.	Rs. In Lakh	Liters in Lakh	Rs. In Lakh
1	**2**	**3**	**4**	**5**	**6**
2005-06	0.60	21.00	12.60	0.00	0.00
2206-07	0.00	0.00	0.00	0.00	0.00
2007-08	5.80	22.39	129.86	0.91	20.37
2008-09	13.72	24.52	336.41	2.82	69.15
2009-10	8.21	25.73	211.24	0.25	6.43
2010-11	9.14	27.00	246.78	1.69	45.63
2011-12	36.80	27.00	993.60	1.22	32.94
2012-13	4.2	27.00	113.40	0.15	4.05
Total	**78.47**	**174.64**	**2043.90**	**7.04**	**178.57**
Mean	**9.81**	**21.83**	**255.49**	**0.88**	**22.32**
S.D.	**11.80**	**9.10**	**319.29**	**1.00**	**25.17**
C.V.	**120.34**	**41.70**	**124.97**	**113.76**	**112.77**

Source: Annual Report and Field Visit

The table no.5.16 shows ethanol sales in the study period. The mean value of ethanol sales is 9.81 lakh litres. The higher C.V. (120.34) value indicate more variability in the quantity sales of ethanol. The table also show ethanol price of per litres. The mean value of rate per litre of ethanol is Rs. 21.83. The higher C.V. (41.70) value indicate more fluctuation in the price of ethanol. The table also shows the mean value of total sales income of ethanol is Rs.255.49 lakh. The higher C.V. (124.97) value shows higher variability in the total sales income of ethanol. The table shows closing balance of ethanol and this closing balance shows lower in the study period.

It is interpreted that ethanol is very important by-product in the sugar factory. It is main source income by way of ethanol sales. The price of ethanol would be determined by the Bio fuel Steering Committee and decided by the NBCC (National Bio fuel Coordination Committee) of India. In the study period the sugar factory because of ethanol last six year well returns by way marketing of ethanol product.

Table No. 5.17 Kumbhi sugars factory Statement of Rectified Sprit Sales

Year	Sales in the Year			Closing Balance in the Year		
	Liters in Lakh	Rate Per Liter Rs.	Rs. In Lakh	Liters in Lakh	Rate Per Liter Rs.	Rs. In Lakh
1	**2**	**3**	**4**	**5**	**6**	**7**
2005-06	11.76	22.88	269.17	9.91	22.88	226.89
2206-07	14.58	22.85	326.85	15.93	22.85	354.93
2007-08	0.00	18.80	0.00	14.22	18.80	267.35
2008-09	23.84	22.26	530.88	14.52	22.26	323.38
2009-10	30.80	26.54	817.80	13.51	26.54	358.69
2010-11	0.00	21.98	0.00	9.21	28.48	262.81
2011-12	0.00	30.34	0.00	13.15	30.34	398.97
2012-13	0.00	31.31	0	5.79	30.31	176.88
Total	**80.98**	**196.96**	**1944.70**	**96.24**	**202.46**	**2369.90**
Mean	**10.12**	**24.62**	**243.09**	**12.03**	**25.31**	**296.24**
S.D.	**12.24**	**4.37**	**306.40**	**3.40**	**4.23**	**75.25**
C.V.	**120.89**	**17.75**	**126.05**	**28.28**	**16.73**	**25.40**

Source: Annual Report and Field Visit

The table no.5.17 shows rectified sprit sales of Kumbhi distillery by-product in the study period. The mean value quantity of rectified sprit sales is 10.12. The higher C.V. (120.89) value indicated higher variability in the quantity of rectified sprit sales. The table also shows the mean value of rate per litter of rectified sprit is Rs.24.62. The higher C.V. (17.75) value shows more variation in the rate per litres of rectified sprit. The table also indicate total sales income of rectified sprit sales. The mean value of rectified sales income is Rs.243.09 lakh. And these higher C.V. (126.05) value indicate variability in the total income by way of rectified sales. The table also sows closing balance of rectified sprit and these balance shows higher stock in relation to sales. .

It is interpreted that rectified sprit assured very important place in the country's economy. It is a vital raw material for a number of chemicals. Rectified sprit is basically used for three purpose i.e. Industrial alcohol production, potable alcohol production and fuel ethanol. It is observed that rectified sales as such a large income (306.40 lakh) source of distillery department in this sugar factory.

Table No. 5.18 Kumbhi Sugar Factory Distillery by Products- S.D.S. & O.D.S. Sales

Year	S.D.S.Sales in the Year			O.D.S.Sales in the Year		
	Litres in Lakh	Rate Per Litre Rs.	Rs. In Lakh	Litres in Lakh	Rate Per Litre Rs.	Rs. In Lakh
1	**2**	**3**	**4**	**5**	**6**	**7**
2005-06	34.99	17.44	610.29	0.66	19.07	12.76
2206-07	31.66	18.55	587.26	0.39	20.73	8.16
2007-08	43.35	14.60	633.04	0.16	17.19	2.76
2008-09	20.94	18.01	377.20	0.54	20.94	11.36
2009-10	7.71	21.77	167.93	0.81	24.47	19.99
2010-11	52.24	24.09	1254.72	1.26	28.77	36.52
2011-12	40.52	26.11	1056.14	1.53	25.92	10.31
212-13	33.05	35.99	1090.31	0.20	30.48	6.096
Total	**264.46**	**176.56**	**5776.89**	**5.55**	**187.57**	**101.86**
Mean	**33.06**	**22.07**	**722.11**	**0.69**	**23.45**	**14.55**
S.D.	**13.76**	**6.77**	**377.12**	**0.49**	**4.73**	**10.98**
C.V.	**41.61**	**30.65**	**52.22**	**70.60**	**20.19**	**75.46**

Source: Annual Report and Field Visit

The table no.5.18 indicated Kumbhi distillery by-product SDS and ODS sales. The mean value quantity of SDS and ODS sales is 33.06 and 0.69 respectively. The higher C.V. value of SDS (41.61) and ODS (70.60) shows higher fluctuation in quantity of SDS and ODS. The table also shows rate per litres of SDS and ODS, its mean value of SDS (22.07) and ODS (23.45). The higher C.V. value SDS (30.65) and ODS (20.19) shows higher fluctuation in the rate per litres of SDS and ODS. The mean value of total sales income of SDS (722.11) and ODS (14.55) and also indicate higher C.V. value of SDS (52.22) and ODS (75.46) shows more fluctuation in the total sales income of SDS and ODS.

It is interpreted that rectified sprit, SDS and ODS sales is important by-product of Kumbhi distillery. It is gives incomes by way of sales these product. It observed that SDS is very important income source of this sugar factory. Hence the factory management SDS product more produce and efficiently sales these product. It is found turnover ratio (49.62:1) a high inventory ratio indicate that maximum sales income turnover obtained by investing minimum possible funds in the inventory.

Table No. 5.19 Gadhinglaj Sugar factory Rectified Sprit

Year	Sales in the Year			Closing Balance in the Year		
	Litres in Lakh	Rate Per Litre Rs.	Rs. In Lakh	Litres in Lakh	Rate Per Litre Rs.	Rs. In Lakh
1	2	3	4	5	6	7
2005-06	8.33	24.88	207.26	19.54	19.96	452.49
2206-07	0.00	0.00	0.00	20.74	18.53	384.57
2007-08	0.00	27.83	0.00	22.10	19.15	423.31
2008-09	9.00	25.00	176.85	14.36	17.68	253.98
2009-10	20.00	19.65	520.75	23.77	19.81	471.05
2010-11	0.00	30.00	0.00	13.75	25.75	354.08
2011-12	0.00	30.00	0.00	0.69	30.00	20.70
2012-13	0.00	30.00	0.00	0.22	30.00	68.96
Total	**37.33**	**187.36**	**904.86**	**115.17**	**180.88**	**2429.14**
Mean	**4.67**	**23.42**	**113.11**	**14.40**	**22.61**	**303.64**
S.D.	**7.33**	**10.12**	**186.34**	**9.28**	**5.17**	**173.70**
C.V.	**157.11**	**43.20**	**164.75**	**64.48**	**22.85**	**57.20**

Source: Annual Report and Field Visit

The table no. 5.19 shows rectified sprit sales of Gadhinglaj distillery by-product in the study period. The mean value quantity of rectified sprit sales is 4.67. The higher C.V. (157.11) value indicated higher variability in the quantity of rectified sprit sales. The table also shows the mean value of rate per litter of rectified sprit is Rs.23.42. The higher C.V. (43.20) value shows more variation in the rate per litres of rectified sprit. The table also indicate total sales income of rectified sprit sales. The mean value of rectified sales income is Rs.113.11 lakh. And these higher C.V. (164.75) value indicate variability in the total income by way of rectified sales.

It is interpreted that rectified sprit sales is important by-product of Gadhinglaj distllery. It is gives incomes by way of sales these product. The table also sows closing balance of rectified sprit and these balance shows higher stock in relation to sales.

Table no.5.20 Gadhinglaj Sugar factory Special Denature Sprit Sale

Year	Sales in the Year		
	Liters in Lakh	Rate Per Liter Rs.	Rs. In Lakh
1	2	3	4
2005-06	12.87	18.78	239.32
2206-07	31.71	21.88	694.00
2007-08	45.81	16.75	767.71
2008-09	28.83	19.73	569.08
2009-10	3.96	19.81	78.55
2010-11	49.50	19.89	984.56
2011-12	53.50	23.00	1230.50
2012-13	15.70	26.21	411.497
Total	**241.88**	**166.05**	**4563.72**
Mean	**30.24**	**20.76**	**651.96**
S.D.	**18.37**	**2.90**	**401.34**
C.V.	**60.76**	**13.95**	**61.56**

Source: Annual Report and Field Visit

The table no.5.20 shows Gadhinglaj sugar factory distillery by products SDS sales. The mean value of SDS sales is 30.24 lakh litres, the mean value of rate per litre is Rs.13.95 and total sales in the study period its mean value is Rs.651.96 lakh. In the study period higher C.V. values indicate higher fluctuation in the SDS sales in all elements.

It is interpreted that when market demand of SDS, in those conditions this products produced or supply by the distillery. The rectified sprit convert into SDS by-product of Gadhinglaj distllery. It is gives incomes by way of sales these product. In the market SDS is more demand when distillery produced SDS. Hence the the table no.20 shows mean value of SDS sales in Rs.651.96 lakh gives more income in relation to rectified sprit.

Table No. 5.21 Warana distillery by-product of Rectified Sprit Sales

Year	Sales in the Year			Closing Balance in the Year		
	Litres in Lakh	Rate Per Litre Rs.	Rs. In Lakh	Litres in Lakh	Rate Per Litre Rs.	Rs. In Lakh
1	2	3	4	5	6	7
2005-06	0.00	21.32	0.00	1.14	21.32	24.14
2206-07	0.00	19.09	0.00	2.64	19.09	50.35
2007-08	46.51	19.07	887.06	3.06	19.07	58.52
2008-09	56.38	26.14	1473.85	12.31	26.14	321.92
2009-10	71.25	30.08	2143.20	16.84	30.08	506.75
2010-11	60.94	24.59	1498.51	6.00	24.59	147.58
2011-12	96.36	32.82	3162.53	16.31	32.82	535.62
2012-13	86.04	34.81	2995.05	14.4	34.81	501.26
Total	**417.48**	**207.92**	**12160.20**	**72.70**	**207.92**	**2146.14**
Mean	**52.19**	**25.99**	**1520.03**	**9.09**	**25.99**	**268.27**
S.D.	**35.92**	**6.10**	**1212.20**	**6.56**	**6.10**	**223.98**
C.V.	**68.84**	**23.47**	**79.75**	**72.22**	**23.47**	**83.49**

Source: Annual Report and Field Visit

The shows rectified sprit sales in the study period. It is a distillery main by-product. The table no.5.21 shows the mean value of rectified sprit sales is 52.19 lakh. The higher C.V. (68.84) value indicate more fluctuation in the quantity of rectified spirit sales. It is also show rate per litter of rectified spirit. The mean value of rate per litre of rectified sprit is Rs.25.99 and its higher C.V. (23.47) value shows more fluctuation in the rate per litre of rectified spirit. It is also shows this table total sales income of rectified sprit. The mean value of total rectified sprit sales income is Rs.1520.30 in lakh and these higher C.V. (79.75) value shows higher fluctuation in total rectified sales income. It is also above table indicated closing balance of rectified sprit in the study period. The mean value of quantity of rectified sprit closing balance is 9.09 lakh litres and these C.V. (72.22) value show more fluctuation in the quantity of rectified sprit closing balance. The table also show total closing balance of rectified sprit value. Its C.V. value indicated higher fluctuation in the closing balance of rectified sprit value.

It is interpreted that rectified sprit is very important by-product in distillery department. It is gives main source income by way of rectified spirit sales. Rectified

sprit assured very important place in the country's economy. It is a vital raw material for a number of chemicals. Rectified sprit is basically used for three purpose i.e. Industrial alcohol production, potable alcohol production and fuel ethanol. It is observed that rectified sales as such a large income source of distillery department in this sugar factory. It is also observed lower closing balance shows in rectified sprit in relation to sales income.

Table No. 5.22 Warana Special Denature Sprit Sales

Year	Sales in the Year		
	Litres in Lakh	**Rate Per Litres Rs.**	**Rs. In Lakh**
1	**2**	**3**	**4**
2005-06	11.52	18.55	213.73
2206-07	31.76	18.50	587.49
2007-08	1.30	18.54	24.17
2008-09	3.41	15.80	53.87
2009-10	9.02	23.80	214.87
2010-11	12.07	18.22	219.95
2011-12	18.08	27.40	488.88
2012-13	34.31	30.74	1054.89
Total	**121.47**	**171.55**	**2857.85**
Mean	**15.18**	**21.44**	**357.23**
S.D.	**12.20**	**5.28**	**342.21**
C.V.	**80.33**	**24.62**	**95.79**

Source: Annual Report and Field Visit

The the table no.5.22 shows Warana sugar factory distillery by products SDS sales. The mean value of SDS sales is 15.18 lakh litres, the mean value of rate per litre is Rs.21.14 and total sales in the study period its mean value is Rs.357.23 lakh. In the study period higher C.V. values indicate higher fluctuation in the SDS sales in all elements.

It is interpreted that above analysis when market demand of SDS, in those conditions this products produced or supply by the distillery. Because of closing balance is not shown in the study period. . The rectified sprit convert into SDS by-product of Warana distllery. It is gives incomes by way of sales these product. In the market SDS is more demand when distillery produced SDS. Hence the the table no.22

shows mean value of SDS sales in Rs.342.21 lakh gives less income in relation to rectified sprit. The distillery apply the policy of diversification product sales.

Table No.5.23 Warana E.N.A. Sales

Year	Sales in the Year		
	Liters in Lakh	**Rate Per Liter Rs.**	**Rs. In Lakh**
1	**2**	**3**	**4**
2005-06	0.00	0.00	0.00
2206-07	0.00	0.00	0.00
2007-08	49.25	21.17	1042.62
2008-09	27.45	28.72	788.36
2009-10	12.20	32.87	401.01
2010-11	9.10	25.52	232.23
2011-12	60.60	37.22	2255.53
2012-13	0.7	33.5	23.45
Total	**159.30**	**179.00**	**4743.20**
Mean	**19.91**	**22.38**	**592.90**
S.D.	**23.64**	**14.67**	**774.51**
C.V.	**118.71**	**65.58**	**130.63**

Source: Annual Report and Field Visit

The table no.5.23 shows Warana sugar factory ENA plant by products ENA sales. The mean value of ENA sales is 19.91 lakh litres, the mean value of rate per litre is Rs.22.38 and total sales income in the study period its mean value is Rs.592.90 lakh. In the study period higher C.V. values indicate higher fluctuation in the ENA sales in all elements.

It is interpreted that above analysis when market demand of ENA, in those conditions this products produced or supply by the distillery. Because of closing balance is not shown in the study period. The rectified sprit convert into ENA by-product of Warana distllery. It is gives incomes by way of sales these product. In the market ENA is more demand when distillery produced ENA. Hence the the table

no.23 shows mean value of ENA sales in Rs. 592.90 lakh gives less income in relation to rectified sprit. The distillery apply the policy of diversification product sales.

Table No. 5.24 Warana Ethanol Sales

Year	Sales in the Year			Closing Balance in the Year		
	Litres in Lakh	Rate Per Liter Rs.	Rs. In Lakh	Litres in Lakh	Rate Per Liter Rs.	Rs. In Lakh
1	**2**	**3**	**4**	**5**	**6**	**7**
2005-06	11.79	19.34	228.05	0.32	19.34	6.28
2206-07	0.00	0.00	0.00	0.00	0.00	0.00
2007-08	20.80	19.48	405.31	8.13	19.48	158.51
2008-09	12.21	21.00	256.43	1.20	21.00	25.25
2009-10	1.16	24.76	28.90	0.003	24.76	0.87
2010-11	19.69	26.30	527.89	1.35	26.30	35.60
2011-12	17.35	27.29	473.48	3.20	27.29	87.32
2012-13	4.75	27	128.38	0	27	0
Total	**87.75**	**165.17**	**2048.44**	**14.20**	**165.17**	**313.83**
Mean	**10.97**	**20.65**	**256.06**	**1.78**	**20.65**	**39.23**
S.D.	**8.20**	**8.97**	**199.17**	**2.79**	**8.97**	**56.55**
C.V.	**74.77**	**43.43**	**77.79**	**157.15**	**43.43**	**144.15**

Source: Annual Report and Field Visit

The table no.5.24 shows ethanol sales in the study period. The mean value of ethanol sales is 10.97lakh litres. The higher C.V. (74.77) value indicate more variability in the quantity sales of ethanol. The table also show ethanol price of per litres. The mean value of rate per litre of ethanol is Rs. 20.65. The higher C.V. (43.43) value indicate more fluctuation in the price of ethanol. The table also shows the mean value of total sales income of ethanol is Rs.256.06 lakh. The higher C.V. (77.79) value shows higher variability in the total sales income of ethanol. The table shows closing balance of ethanol and this closing balance shows lower in the study period.

It is interpreted that ethanol is very important by-product in the sugar factory. It is main source income by way of ethanol sales. The price of ethanol would be determined by the Bio fuel Steering Committee and decided by the NBCC (National Bio fuel Coordination Committee) of India. In the study period the sugar factory

because of ethanol six year well returns by way marketing of ethanol product except two years. . The rectified sprit convert into ethanol by-product of Warana distllery. It is gives incomes by way of sales these product. In the market ethanol is more demand when distillery produced ethanol. Hence the the table no.24 shows mean value of ethanol sales in Rs.256.06 lakh gives less income in relation to rectified sprit. The distillery apply the policy of diversification product sales.

Table No. 5.25 Warana Lignoslfonate(Sales)

Year	Lignoslfonate Sales in M.T.	Rate Per tone Rs.	Total Income
1	**2**	**3**	**4**
2005-06	40	8,725	3,49,000
2206-07	345	6,994	24,12,930
2007-08	612	10,955	67,04,460
2008-09	630	10,208	64,31,040
2009-10	590	17,777	1,04,88,430
2010-11	472	19,239	90,80,808
2011-12	462	20,366	94,09,092
2012-13	142	23,377	33,19,534
Total	**3,293**	**1,17,641**	**4,81,95,294**
Mean	**412**	**14,705**	**60,24,412**
S.D.	**220.74**	**6173.10**	**3662987.70**
C.V.	**53.63**	**41.98**	**60.80**

Source: Annual Report and Field Visit

The table no.5.25 shows Lignoslfonate sales in the study period. The mean value of Lignoslfonate sales is 412 M.T. The higher C.V. (53.63) value indicate more variability in the quantity sales of Lignoslfonate. The table also show Lingnoslfonatye price of per metric tons. The mean value of rate per ton of Lingnoslfonate is Rs.14,705. The higher C.V. (41.98) value indicate more fluctuation in the price of Lingnoslfonate. The table also shows the mean value of total sales income of Lingnoslfonate is Rs.60,24,412 lakh. The higher C.V. (60.68) value shows higher variability in the total sales income of Lingnoslfonate. The higher variability in lingnoslfonate sles data is not good indication .

It is interpreted that lingnoslfonate is very important by-product in the sugar factory pulp department. The pulp department is not produced Lingnoslfonate efficiently. Because not available sufficient sales quantity, therefore very little returns by way of sales.

Table No. 5.26 Warana Pulp Department (Sales)

Year	Pulp M.T.	Rate Per tone Rs.	Total Income Rs.
1	2	3	4
2005-06	125	12,080	15,10,000
2206-07	868	12,820	1,11,27,760
2007-08	992	12,816	1,27,13,472
2008-09	932	17,490	1,63,00,680
2009-10	885	19,620	1,73,63,700
2010-11	946	19,978	1,88,99,188
2011-12	797	21,327	1,69,97,619
2012-13	548	21,281	1,16,61,988
Total	**6,093**	**1,37,412**	**10,65,74,407**
Mean	**762**	**17,177**	**1,33,21,801**
S.D.	**291.50**	**3999.26**	**5571445.74**
C.V.	**38.27**	**23.28**	**41.82**

Source: Annual Report and Field Visit

The table no.5.26 shows pulp sales in the study period. The mean value of pulp sales is 762 M.T. The higher C.V. (38.27) value indicate more variability in the quantity sales of pulp. The table also show pulp price of per metric tons. The mean value of rate per ton of pulp is Rs.17, 177. The higher C.V. (23.28) value indicate more fluctuation in the price of pulp. The table also shows the mean value of total sales income of pulp is Rs.1,33,21,801 lakh. The higher C.V. (41.82) value shows higher variability in the total sales income of pulp.

It is interpreted that pulp is very important by-product in the sugar factory pulp department. The pulp department is not produced pulp efficiently. Because not available sufficient sales quantity, therefore very little returns by way of sales.

Table No. 5.27 showing Datta sugar factory compost fertilizer sales.

Year	Sales in the Year			Closing Balance in the Year	
	M.T.	Rate Per Tone Rs.	Rs. In Lakh	M.T.	Rs. In lakh
1	2	3	4	5	6
2005-06	10801	250.00	27.00	17673	44.18
2206-07	17413	262.50	45.70	10371	27.22
2007-08	19568	212.50	41.58	14749	31.34
2008-09	56878	182.50	103.80	6045	11.03
2009-10	40600	125.00	50.75	7691	9.61
2010-11	40642	137.50	55.88	3870	5.32
2011-12	63240	200.00	126.48	0	0
2012-13	44175	262	115.73	0	0
Total	**249142.00**	**1632.00**	**566.92**	**60399.00**	**128.70**
Mean	**35591.71**	**204.00**	**70.87**	**7549.88**	**16.09**
S.D.	**20289.27**	**53.61**	**38.24**	**6459.67**	**16.24**
C.V.	**57.01**	**26.28**	**53.96**	**85.56**	**100.97**

Source: Annual Report and Field Visit

The table no.5.27 indicates compost fertilizer sales data of Datta sugar factory. The mean value quantity of compost fertilizer sales is 35591.71 metric tons. The higher C.V. (57.01) value shows more fluctuation in the quantity of compost fertilizer sales. The table also shows rate per tons of compost fertilizer sales. The mean value rate per tons of compost fertilizer is Rs.204. The higher C.V. (26.28) value indicated higher fluctuation in the rate per ton of compost fertilizer. The table also shows total sales income, its mean value is Rs.70.87 lakh and its higher C.V. (53.96) indicated more fluctuation in the compost fertilizer sales. The table also indicated closing balance of compost fertilizer sales. It is indicated lower closing balance in the study period.

It is interpreted that Compost fertilizer is made from the mixing of distillery spent wash and press mud. It is lower important by-product in the sugar factory. The above analysis interpreted compost fertilizer is sold to farmers in lower rate and substantial amount of income can be generated by the sugar factory. In the cooperative pattern composting fertilizer more demands from the farmers. Because of composting product farmers improve soil physicals properties, retains soil moisture

and reduce the erosion hazard. In conjunctions with composting fertilizer recorded higher sugarcane yield and improve sugar recovery.

Table No. 5.28 Kumbhi sugar factory Statement of Composts Fertilizer Sales

Year	Sales in the Year		
	M.T.	Rate Per Tonne Rs.	Rs. In Lakh
1	2	3	4
2005-06	20996	62.70	13.16
2206-07	18664	60.06	11.21
2007-08	18144	98.80	17.56
2008-09	28156	86.75	24.42
2009-10	22852	77.61	17.73
2010-11	21260	206.00	43.79
2011-12	17135	221.00	43.79
2012-13	20746	216.00	44.81
Total	**167953**	**1028.92**	**216.47**
Mean	**20994**	**128.62**	**27.06**
S.D.	**3450**	**72.16**	**14.66**
C.V.	**16.43**	**56.10**	**54.16**

Source: Annual Report and Field Visit

The table no.5.28 indicates compost fertiliser sales of Kumbhi sugar factory. The mean value of quantity of compost fertiliser sales is 20,994 metric tons. The higher C.V. (16.43) value shows higher fluctuation in the quantity of compost fertilizer sales. The table also shows rate per tons of compost fertiliser and its mean value is 128.62.The higher C.V. (56.10) value shows higher fluctuation in the rate per tons of compost fertilizer. The table also shows total sales income of compost fertilizer. The mean value of total compost fertilizers sales income is RS.27.06 lakh and the higher C.V. (54.16) shows higher fluctuation in the compost fertilizer sales income.

It is interpreted that compost fertiliser is less important by-product in the factory. It gives little returns from the sales of compost fertiliser. In the Kumbhi factory commanding area composting fertilizer most demanded from the sugarcane farmers. This factory composting fertilizer plant operating no profit no losses bases. Because of this factory rate per tons of compost fertilize lower determined. Use these

compost fertiliser farmers improved soils physicals properties, retain soil moistures and reduce the erosion hazard.

Table No. 5.29 Showing Gadhingalaj Sugar factory compost fertilizer sales

Year	Sales in the Year			Closing Balance	
	M.T.	Rate Per Tone Rs.	Rs. In Lakh	M.T.	Rs. In Lakh
1	2	3	4	5	6
2005-06	3185	200.00	6.37	4241	6.37
2206-07	7570	200.00	15.42	4797	9.59
2007-08	7609	200.00	15.21	5967	11.93
2008-09	10196	203.00	20.76	237	0.47
2009-10	3513	250.00	8.78	5013	12.53
2010-11	6153	250.00	15.39	6589	14.91
2011-12	7885	312.00	24.60	3178	9.91
2012-13	4087	314	12.83	1102	3.46
Total	**50198.00**	**1929.00**	**119.36**	**31124.00**	**69.17**
MEAN	**6274.75**	**241.13**	**14.92**	**3890.50**	**8.65**
S.D.	**2490.03**	**49.31**	**5.90**	**2249.76**	**4.88**
C.V.	**39.68**	**20.45**	**39.53**	**57.83**	**56.41**

Source: Annual Report and Field Visit

The table no.5.29 indicates compost fertiliser sales of Gadhinglaj sugar factory. The mean value of quantity of compost fertiliser sales is 6274.75 metric tons. The higher C.V. (39.68) value shows higher fluctuation in the quantity of compost fertilizer sales. The table also shows rate per tons of compost fertiliser and its mean value isRs.241.13.The higher C.V. (20.45) value shows higher fluctuation in the rate per tons of compost fertilizer. The table also shows total sales income of compost fertilizer. The mean value of total compost fertilizers sales income is RS.14.92 lakh and the higher C.V. (39.93) shows higher fluctuation in the compost fertilizer sales income. The table also indicated closing balance of compost fertilizer. It is indicated mean value of closing balance quantity is 3890.50 metric tons in the study period and its C. V. Is (57.83) show that higher variability in the quantity of closing balance.

It is interpreted that the Gadhingalaj factory commanding area composting fertilizer most demanded from the sugarcane farmers. This factory composting fertilizer plant operating no profit no losses bases. Because of this factory rate per

tons of compost fertilize lower determined. Use these compost fertiliser farmers improved soils physicals properties, retain soil moistures and reduce the erosion hazard.

Table No. 5.30 Warana sugar factory Statement of Composts Fertilizer Sales

Year	Sales in the Year		
	M.T.	Rate Per Tone Rs.	Rs. In Lakh
1	2	3	4
2005-06	21204	240.00	50.88
2206-07	34309	391.00	134.14
2007-08	22178	178.00	39.47
2008-09	33556	241.00	80.86
2009-10	11926	209.00	24.92
2010-11	7375	119.00	8.77
2011-12	29128	316.00	92.04
2012-13	31217	367	114.56
Total	**190893.00**	**2061.00**	**545.69**
Mean	**23861.63**	**257.63**	**68.21**
S.D.	**10065.01**	**93.86**	**44.33**
C.V.	**42.18**	**36.43**	**64.99**

Source: Annual Report and Field Visit

The table no.5.30 indicates compost fertilizer sales data of Warana sugar factory. The mean value quantity of compost fertilizer sales is 23,861.63 metric tons. The higher C.V. (42.18) value shows more fluctuation in the quantity of compost fertilizer sales. The table also shows rate per tons of compost fertilizer sales. The mean value rate per tons of compost fertilizer is Rs.257.63 The higher C.V. (36.43) value indicated higher fluctuation in the rate per ton of compost fertilizer. The table also shows total sales income, its mean value is Rs.68.21 lakh and its higher C.V. (68.99) indicated more fluctuation in the compost fertilizer sales.

It is interpreted the Warana factory commanding area composting fertilizer most demanded from the sugarcane farmers. This factory composting fertilizer plant operating no profit no losses bases. Because of this factory rate per tons of compost fertilize lower determined. Use these compost fertiliser farmers improved soils physicals properties, retain soil moistures and reduce the erosion hazard.

Testing of Hypothesis No.3: The functional areas of management like production, marketing, finance and HR are weak in the by-products sample units. The functional area marketing is tested. (Reference table no.5.1 to 5.30)

b) Marketing:

This Hopothesis tested as follows:

Mean=7141.09,

S.D.=36341.5

$t = x - \mu \div \sigma/\sqrt{5}$

t *=7141.09-100* $\div 36341.5/\sqrt{29}$

t= 7041.09/6768.58

t=1.04

Table vlue at 5% level of significant is 1.70

t = 1.04 < table value is 1.70

Hence Researcher accepte this hopthesis.

The 't' value from t distribution table is 1.70 and observed calculated value is t=1.04 less than table value hence Null hypothesis is accepted and researcher conclude the difference is not significant .

Table No.5.31 Composting fertilizer sales coefficient of variation

Factory Name	M.T.	Rate per tons Rs.	Income in Lakh Rs.
1	**2**	**3**	**4**
Datta	57.01	26.28	53.96
Kumbhi	16.43	56.10	54.16
Gadhinglaj	39.68	20.45	39.53
Warana	42.18	36.43	64.99

By considering table no.5.31 composting fertilizer sales coefficient of variation it is found all the sugar factories C.V. value is high. Highest coefficient of variation indicate that higher variability in composting sales quantity, rate per tons and total income and low coefficient of variation means low variability in respective element. Higher variability in composting sales is not good indication in the factory.

Table No. 5.32 showing Datta sugar factory Manpower Utilization In Distillery, Ethanol and Compost Fertilizer Department

Particulars	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
1	2	3	4	5	6	7	8	9
A)Permanent Staff								
Skilled	24	23	23	21	32	31	30	30
Semi-Skilled	4	3	3	2	2	2	2	2
Unskilled	43	39	37	37	36	36	36	36
Total (A)	**71**	**65**	**63**	**60**	**70**	**69**	**68**	**68**
B) Seasonal Staff	12	12	11	10	10	9	9	9
Total (A) + (B)	**83**	**77**	**74**	**70**	**80**	**78**	**77**	77
Salary and Wages Paid For This Department (Rs. In Lakh)	72.8	67.62	75.47	76.57	78.1	143.81	148.00	155.3

Source: Field Work

From the table no.5.32 showing man power utilization in Datta sugar factory in the study period. There is decreasing trend up to the year 2008-09 and then next year it is increasing the manpower and also next three years is slightly decreasing trend. The manpower utilization is classified in two categories i.e. permanent and seasonal staff. Permanent staff is classified in skilled, semi-skilled and unskilled and seasonal staff is only unskilled. It is also observed that seasonal workers are lower comparatively permanent staff. Also above table show salary and wages paid to this department. First year is decreasing trend and then little increasing trend up to 2009-10 then in the year 2010-11 direct jumping salary and wages policy in factory. In that year the management should apply new salary and wages policy. The human resource management are basically related with overall manpower planning. The functions in sugar factory production seasonal in nature and also in by-product unit.

It is interpreted that above data manpower utilization in by-product department shows workers are divided in two categories i.e. permanent and seasonal workers. Permanent staff is higher than seasonal workers. The management gives information regarding employee's selection process and training policy of employees.

The objectives of selection process is to determine whether an applicant's meets the qualification for specific job and to chose the applicant who is most likely to perform in that job. Majority of employee's selection was done without any test. Only supervisory staffs are selected by using oral test or interview test. The methods used for employees training is on the job and lecture method. So that beneficial utilisation of maximum efficiency of work force.

Table No. 5.33 Showing Kumbhi Manpower Utilization In Distillery and Compost Fertilizer Department

Particulars	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
A) Permanent Staff								
Skilled	3	3	3	3	3	2	3	3
Semi-Skilled	2	2	2	2	2	2	2	2
Unskilled	7	7	6	6	6	5	5	5
Administrative								
Managerial	1	1	1	1	1	1	1	1
Supervisory	14	14	13	12	12	12	12	12
Clerical	2	2	2	2	2	3	3	3
Total (A)	**29**	**29**	**27**	**26**	**26**	**25**	**26**	**26**
B) Seasonal Staff	53	53	53	52	52	48	48	48
Total (A) + (B)	**82**	**82**	**80**	**78**	**78**	**73**	**74**	**74**
Salary and Wages Paid For This Department (Rs. In Lakh)	50.61	67.04	66.86	98.46	102	126.2	125.71	132.28

Source: Field Work

The table no.5.33 shows man power utilization in Kumbhi Distillery and compost fertiliser plant in the study period. There is decreasing trend up to the year 2011. The manpower utilization classified in two categories i.e. permanent and seasonal staff. Permanent staff is classified in skilled, semi-skilled and unskilled and Administrative staff include managerial, supervisory and clerical and seasonal staff is only unskilled workers. It is also observed that seasonal workers are higher comparatively permanent staff. Also above table show salary and wages paid to this department. There is little increasing trend up to 2008 then in the year 2009-10 direct

jumping salary and wages policy in factory. In that year the management should apply new salary and wages policy.

It is interpreted that seasonal workers are higher than the permanent staff. Management gives information about selection of employees, in these process employees' selections was done without any test. The workers give trainings for effective production of by-product department. Majority of supervisors and workers were gives only on the job training. The available worker force increasing work efficiency, training is essential.

Table No. 5.34 Showing Gadhinglaj Sugar factory Manpower Utilization In Distillery and Compost Fertilizer Department

Particulars	2005 - 06	2006 - 07	2007 - 08	2008 - 09	2009-10	2010 - 11	2011-12	2012-13
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
A) Permanent Staff								
Skilled	10	10	10	10	10	10	10	10
Unskilled	2	2	2	2	2	2	2	2
Administrative	5	5	5	5	5	6	6	6
Total (A)	**17**	**17**	**17**	**17**	**17**	**18**	**18**	**18**
B) Seasonal Staff								
Semi-Skilled	8	8	8	8	8	8	8	8
Unskilled	27	26	26	26	25	24	24	24
Clerk	1	1	1	1	1	1	1	1
Total (B)	**36**	**35**	**35**	**35**	**34**	**33**	**33**	**33**
Total (A) + (B)	**53**	**52**	**52**	**52**	**51**	**51**	**51**	**51**
Salary and Wages Paid For This Department (Rs. In Lakh)	46.84	42.05	51.14	60.31	69.44	81.54	84.77	73.67

Source: Field Work

The table no.5.34 shows man power utilization in Gadhinglaj Distillery and compost fertiliser plant in the study period. The manpower utilization classified in two categories i.e. permanent and seasonal staff. Permanent staff is classified in skilled, unskilled and Administrative and seasonal staff is semiskilled, unskilled workers and clerk. It is also observed that seasonal workers are higher comparatively permanent staff. Also above table show salary and wages paid to this department. There is little increasing trend up to 2008 then in the year 2009-10 direct jumping

salary and wages policy in factory. In that year the management should apply new salary and wages policy.

It is interpreted that seasonal workers are higher than the permanent staff. Management gives information about selection of employees, in these process employees' selections was done without any test. The workers give trainings for effective production of by-product department. Majority of supervisors and workers were gives only on the job training. The available worker force increasing work efficiency, training is essential.

Table No. 5.35 Showing Warana Sugar factory Manpower Utilization In Distillery, Ethanol, E.N.A., Pulp and Compost Fertilizer Department

Particular	**2005 - 06**	**2006 - 07**	**2007 - 08**	**2008 - 09**	**2009 - 10**	**2010 - 11**	**2011- 12**	**2012 - 13**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
A) Permenent Staff								
Skilled	54	56	58	57	57	55	55	54
Semi-Skilled	8	11	11	10	10	9	9	9
Unskilled	41	42	42	38	38	36	35	34
Total (A)	**103**	**109**	**111**	**105**	**105**	**100**	**99**	**97**
B) Seasonal Staff	35	38	39	39	37	40	42	43
Total (A) + (B)	**138**	**147**	**150**	**144**	**142**	**140**	**141**	**140**
Salary and Wages Paid For This Department (Rs. In Lakh)	72.94	71.87	89.39	102.86	140.24	127.07	249.69	182.45

Source: Field Work

The table no.5.35 shows man power utilization in Warana sugar factory in the study period. There is increasing trend up to the year 2007-08 and then next period it is decreasing the manpower. The manpower utilization classified in two categories i.e. permanent and seasonal staff. Permanent staff is classified in skilled, semi-skilled and unskilled and seasonal staff is only unskilled. It is also observed that seasonal workers are lower comparatively permanent staff. Also table no.5.35 show salary and wages paid to this department. The human resource management are basically related with

overall manpower planning. The functions in sugar factory production seasonal in nature and also in by-product unit.

It is interpreted that above data manpower utilization in by-product department shows workers are divided in two categories i.e. permanent and seasonal workers. Permanent staff is higher than seasonal workers. The management gives information regarding employee's selection process and training policy of employees. The objectives of selection process is to determine whether an applicant's meets the qualification for specific job and to chose the applicant who is most likely to perform in that job. Majority of employee's selection was done without any test. Only supervisory staffs are selected by using oral test or interview test. The methods used for employees training is on the job and lecture method. So that beneficial utilisation of maximum efficiency of work force.

Testing of Hypothesis No.3: The functional areas of management like production, marketing, finance and HR are weak in the by-products sample units.The functional area manpower utilization is tested. (Reference table no.5.32 to 5.35)

d)Manpower utilization:

This Hopothesis tested as follows:

Mean=87.25,S.D.=2.46

$t = x - \mu \div \sigma\sqrt{7}$

t *=87.25-42÷ 2.86*$/\sqrt{4}$

t= 31.59

Table vlue at 5% level of significant is 2.35

t = 31.59 > table value is 2.35

Hence Researcher reject this hopthesis.

The 't' value from t distribution table is 2.35 and observed calculated value is t= 31.59 is more than the table value, hence set hypothesis has rejected .

Table No. 5.36 Showing Datta sugar factory Financial Performance at a Glance (Rs. In Lakh)

Sr. No.	Description	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
1	Authorised Share Capital	3500.00	3500.00	3500.00	3500.00	3500.00	3500.00	3500.00	7000.00
2	Paid up Share Capital	2100.13	2352.15	2366.66	2396.31	2412.93	2437.56	3372.84	4168.04
3	Deposits	1338.01	865.8	793.27	768.07	55.71	64.93	53.93	10.10
4	Net Worth	1987.05	2114.84	1902.31	2306.18	2587.28	3116.43	4824.3	7273.73
5	Fixed assets	11527.42	11759.59	11806.96	12029.11	14061.55	14432.61	15070.01	16201.41
6	Current Assets	16138.28	11400.36	8181.11	18092.33	20902.43	20258.16	23098.55	26588.90
7	Current Liabilities	5691.09	4773.51	6817.24	6981.09	10766.47	12445.35	16448.53	18464.62
8	Loans (Secured and Unsecured)	13654.22	10378.53	5127.54	14792.57	15060.87	12639.32	11717.46	14176.94
9	Investment	379.63	382.63	382.63	382.63	20.92	20.92	20.92	20.92
10	Loans and Advances	707.6	1135.31	1027.64	1289.12	1373.82	2062.91	3313.2	5211.95
11	Inventory	15993.55	11086.15	8035.23	17939.76	20756.28	20235.11	22965.38	24931.22

Source: Annual Report

Table No.5.37. Showing Statement of Changes in Working Capital of Shree Datta S.S. K. Ltd. (Rs. In Lakh)

Description	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Current Assets (A)	16138.28	11400.36	8181.11	18092.33	20902.43	20258.16	23098.55	26588.9
Current Liabilities (B)	5691.09	4773.51	6817.24	6981.09	10766.47	12445.35	16448.53	18464.62
Working Capital (A-B)	10447.19	6626.85	1363.87	11111.24	10135.96	7812.81	6650.02	8124.28
Increse in Working Capital	**0**			**9747.37**				**1474.26**
Decrese in Working Capital		**3820.34**	**5262.98**		**975.28**	**2323.15**	**1162.79**	

Source: Annual Report

Table No. 5.38 Showing Kumbhi sugar factory Financial Performance at a Glance (Rs. In Lakh)

Sr. No.	Description	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
1	**Authorised Share Capital**	782.00	1290.00	1290.00	1290.00	1290.00	1290.00	2580.00	2580.00
2	**Paid up Share Capital**	745.56	1001.34	1146.82	1226.31	1242.06	1243.73	1590.55	2207.22
3	**Deposits**	560.84	439.57	356.72	332.37	426.18	591.3	555.1	342.83
4	**Net Worth**	1060.95	1562.06	1028	1245.63	1319.08	1846.79	2128.77	2226.88
5	**Fixed assets**	3732.24	3919.05	5915.85	6088.48	6368.51	6662.92	7701.12	12427.14
6	**Current Assets**	9922.01	7887.18	7215.42	9791.28	12591.15	13946.64	14134.06	20945.80
7	**Current Liabilities**	5317.15	3213.84	3726.78	5184.01	5713.22	5953.52	5931.94	9702.66
8	**Loans (Secured and Unsecured)**	6850.19	7942.66	6853.34	7631.95	9923.68	10514.18	11812.01	20679.83
9	**Investment**	206.61	208.01	216.81	225.99	234.87	249.91	276.34	289.52
10	**Loans and Advances**	597.56	666.52	1312.68	1089.88	1102.94	1083.1	1539.42	2780.67
11	**Inventory**	9643.27	7790.18	7133.96	9606.58	12437.37	13748.45	14061.21	20619.84

Source: Annual Report

Table No.5.39 Showing Statement of Changes in Working Capital of Kumbhi sugar factory (Rs. In Lakh)

Description	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Current Assets (A)	9922.01	7887.18	7215.42	9791.28	12591.15	13946.64	14134.06	20945.8
Current Liabilities (B)	5317.15	3213.84	3726.78	5184.01	5713.22	5953.52	5931.94	9702.66
Working Capital (A-B)	4604.86	4673.34	3488.64	4607.27	6877.93	7993.12	8202.12	11243.14
Increse in Working Capital	**0**	**68.48**		**1118.63**	**2270.66**	**1115.19**	**209**	**3041.02**
Decrese in Working Capital			**1184.7**					

Source: Annual Report

Table No. 5.40 Showing Gadhinglaj sugar factory Financial Performance at a Glance (Rs. in lakh)

Sr. No.	Description	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
1	**Authorised Share Capital**	1412.50	1662.50	1662.50	1662.50	1662.50	1662.50	3325.00	3325
2	**Paid up Share Capital**	781.68	796.68	902.73	953.93	1056.98	1165.46	1771.34	1934.05
3	**Deposits**	553.25	553.18	801.81	801.73	801.52	801.35	658.71	658.79
4	**Net Worth**	-975.34	-959.86	-888.7	-1865	-1633	-2301.62	-1432.28	-2265.12
5	**Fixed assets**	4618.87	4688.44	4890.55	4977.45	5004.64	516.16	6407.46	6407.28
6	**Current Assets**	7771.78	6910.39	7568.41	5487.96	9256.81	10084.88	4990.16	5254.51
7	**Current Liabilities**	3110.24	3042.55	4045.49	4091.21	4506.56	5635.06	7647.52	8125.32
8	**Loans (Secured and Unsecured)**	6441.12	6829.7	7461.28	5786.07	8725.83	8836.1	2624.92	2194.79
9	**Investment**	114.28	115.28	128.28	140.75	154.26	164.27	171.17	17.15
10	**Loans and Advances**	916.43	766.56	1843.01	1425.65	1343.03	1240.68	1467.89	941.52
11	**Inventory**	7378.69	6825	7440.8	5378.72	9165.04	9823.86	4634.22	4928.49

Source: Annual Report

Table No.5.41 Showing Statement of Changes in Working Capital of Gadhingalaj sugar factory (Rs. In Lakh)

Description	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Current Assets (A)	7771.78	6910.39	7568.41	5487.96	9256.81	10084.88	4990.16	5254.51
Current Liabilities (B)	3110.24	3042.55	4045.49	4091.21	4506.56	5635.06	7647.52	8125.32
Working Capital (A-B)	4661.54	3867.84	3522.92	1396.75	4750.25	4449.82	-2657.36	-2870.81
Increse in Working Capital	**0**				**3353.5**			
Decrese in Working Capital		**793.7**	**344.92**	**2126.17**		**300.43**	**-2657.36**	**-2870.81**

Source: Annual Report

Table No.5.42 Showing Warana sugar factory Financial Performance at a Glance (Rs. In Lakh)

Sr. No.	Description	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
1	Authorised Share Capital	1125.00	1125.00	1125.00	1125.00	1125.00	4500.00	4500.00	4500.00
2	Paid up Share Capital	1095.18	1095.3	1095.1	1094.76	1094.46	2051.22	2055.10	2054.85
3	Deposits	3076.25	2989.04	3029.95	3728.25	3990.69	3951.85	4726.73	4090.07
4	Net Worth	2648.97	1598.97	2032.13	2464.26	3256.58	19845.11	19272.79	19454.54
5	Fixed assets	14386.2	16358.6	18100.09	20459.97	27147.68	44678.91	46894.43	48930.16
6	Current Assets	28979.32	25246.64	30170.31	34380.61	41776.3	43440.73	62461.84	63147.82
7	Current Liabilities	15373.29	13096.95	14303.15	18742.74	14364.19	15608.1	26352.44	25927.07
8	Loans (Secured and Unsecured)	26901.38	27236.67	34699.94	34602.07	48242.29	52569.92	65464.19	63726.21
9	Investment	239.96	239.96	259.76	244.13	241.37	248.33	254.38	254.38
10	Loans and Advances	4380.97	11048.99	14212.58	13379.52	10310.44	13169.91	18079.16	14573.61
11	Inventory	26629.47	22575.68	27247.22	32972.58	40801.26	43201.05	60202.23	60892.40

Source: Annual Report

Table No.5.43 Showing Statement of Changes in Working Capital of Warana sugar factory (Rs. In Lakh)

Description	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Current Assets (A)	28979.32	25246.64	30170.31	34380.61	41776.3	43440.73	62461.84	63147.82
Current Liabilities (B)	15373.29	13096.95	14303.15	18742.74	14364.19	15608.1	26352.44	25927.07
Working Capital (A-B)	13606.03	12149.69	15867.16	15637.87	27412.11	27832.63	36109.4	37220.75
Increase in Working Capital	**0**		**3717.47**		**11774.24**	**420.52**	**8276.77**	**1111.35**
Decrease in Working Capital		**1456.34**		**229.29**				

Source: Annual Report

Table No.5.44 Showing Rajaram sugar factory Financial Performance at a Glance (Rs. In Lakh)

Sr. No.	Description	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
1	Authorised Share Capital	1950.00	1950.00	1950.00	1950.00	1950.00	1950.00	3900.00	3900.00
2	Paid up Share Capital	726.81	718.01	721.79	722.9	732.73	780.87	1159.45	1253.57
3	Deposits	1213.1	1212.53	1212.63	1098.81	888.86	683.69	564.23	677.80
4	Net Worth	71.7	-483.62	-154.61	114.48	530.94	668.79	1121.41	1534.02
5	Fixed assets	2435.68	2483.08	2510.34	2700.39	2742.52	2989.27	3006.26	3419.16
6	Current Assets	6295.54	5387.69	3164.01	6829.4	8833.94	7806.68	8046.6	15586.39
7	Current Liabilities	1654.79	1463.48	2003.03	2732.77	2757.66	3328.05	2956.12	5154.88
8	Loans (Secured and Unsecured)	4880.71	4512.87	2451.29	4677.83	6556.35	5369.57	5197.22	10512.96
9	Investment	169.96	56.00	56.00	201.18	252.18	122.93	217.12	211.11
10	Loans and Advances	329.68	360.2	1538.44	612.53	733.42	1065.19	548.37	654.63
11	Inventory	6140.44	5057.91	3084.54	6543.2	7915.1	7717.7	7814.98	15358.03

Source: Annual Report

Table No.5.45 Showing Statement of Changes in Working Capital of Rajaram sugar factory (Rs. In Lakh)

Description	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Current Assets (A)	6295.54	5387.69	3164.01	6829.4	8833.94	7806.68	8046.6	15586.39
Current Liabilities (B)	1654.79	1463.48	2003.03	2732.77	2757.66	3328.05	2956.12	5154.88
Working Capital (A-B)	7950.33	6851.17	5167.04	9562.17	11591.6	11134.73	11002.72	10431.51
Increase in Working Capital				**4395.13**	**2029.43**			
Decrease in Working Capital		**1099.16**	**1684.13**			**456.87**	**132.01**	**571.21**

Source: Annual Report

Table No.5.46 Current Ratio:

Year	Datta	Kumbhi	Gadinghalaj	Warana	Rajaram	Average
1	**2**	**3**	**4**	**5**	**6**	**7**
2005-06	2.83	1.86	2.49	1.88	3.80	2.57
2006-07	2.38	2.45	2.27	1.92	3.68	2.54
2007-08	1.20	1.93	1.87	2.10	1.57	1.73
2008-09	2.59	1.88	1.34	1.83	2.49	2.02
2009-10	1.94	2.20	2.05	2.90	3.20	2.45
2010-11	1.62	2.34	1.78	2.78	2.34	2.17
2011-12	1.40	2.38	0.65	2.37	2.27	1.81
2012-13	1.40	2.15	0.64	2.43	3.02	1.93
Average	1.92	2.14	1.63	2.27	2.80	**2.15**

Current Ratio:-Current ratio is also known as 'Solvency Ratio' as it indicates solvency position of the firm. It is also known as 'Working Capital Ratio' as represents working capital. For measuring short-term solvency of Cooperative sugar factories current ratio of these factories are calculated. It is satisfactory current ratio should be 2:1, means the current assets should be at least twice the current liabilities. Current assets comprises those assets like cash in hand and bank balance, stock or inventories sugar bags and by-products, bills receivable and short term investment which are held by the factories for the purpose of immediate conversion into cash hormonally which will be converted within a year. The current liabilities comprises those liabilities like creditors, bills payables arrears etc.

The table no.5.46 shows the average current ratio of sample co-operative sugar factories were Datta-1.92:1, Kumbhi-2.14:1, Gadingalhaj-1.62:1, Warana-2.27:1 and Rajaram-2.79:1 respectively. With reference to above table no.5.46 mentioned table and other observation the researcher has found that only one sugar factories i.e. Gadingalhaj sugar factory shortage of working capital. This factory indicates had not been able to meet the current liabilities out of its current assets. Datta sugar factory normally low current ratio and Kumbhi, Warana, and Rajaram sugar factories satisfactory current ratio.

All sugar factories should matins 2:1 current ratio for making prompt payment against current liabilities and sugar factories should try to minimize the current

liabilities. All sample sugar factories more attention to current assets and double it to its current liabilities if possible.

Table no.5.47 Debt Equity Ratio:

Year	Datta	Kumbhi	Gadinghalaj	Warana	Rajaram	Average
1	**2**	**3**	**4**	**5**	**6**	**7**
2005-06	6.87	6.45	-6.60	10.15	68.07	16.99
2006-07	4.90	5.08	-7.11	17.03	-9.33	2.11
2007-08	2.69	6.66	-8.39	17.07	-15.85	0.44
2008-09	6.41	6.12	-3.10	14.04	40.86	12.87
2009-10	5.82	7.52	-5.34	14.81	12.34	7.03
2010-11	4.05	5.69	-3.83	2.64	8.02	3.31
2011-12	2.42	5.54	-1.83	3.39	4.63	2.83
2012-13	1.94	9.28	-0.96	3.27	6.86	4.078
Average	4.39	6.54	-4.65	10.3	14.45	**6.20**

Debt Equity Ratio: This ratio explains the comparative proportions of outsiders funds and shareholders fund invested in the organisation. Outsiders liabilities include short term as well as long term liabilities. Greater debt equity ratio indicate that the creditors investment in the business is more than the owners. On the contrary a very low debt equity ratio may mean that the borrowing capacity of the firm is not utilized fully.

The lower debt equity ratio means that the owners by way of equity shares and reserves etc. Invest the large amount. This larger amount of net worth i.e. owners capital provides protection to outsiders. It means that greater security is available to the creditors. But in the analysis of the sample sugar factories, it is found that average debt equity ratio was more, it is average ratio is 6.20:1 it indicates that more amount of borrowed capital as compared to own capital. All sample sugar factories shows debt equity ratio were Datta-4.39:1, Kumbhi-6.54:1, Gadinghalaj- (-4.65:1), Warana-10.30:1 and Rajaram-14.45:1 respectively.

This is the ratio of internal or shareholders fund and external capital. It is indicated Datta, Kumbhi, Warana and Rajarm sugar factories very high debt equity ratio. Gahinghalj sugar factory mines debt equity ratio shows it means this factory not borrowing capacity. Greater debt equity ratio indicate that the creditors investment in the business is more than the owners.

For better working and efficiency debt equity ratio is 1:1, is required. All the sample sugar factories should minimize debt equity ratio and all sugar factories should increases their own capital.

Gadinghalaj: This factory is net worth mines in whole study period because this factory not matins Current ratio also last two years in study period very low current ratio hence this factory not meet day to day tranctions. Also Debt equity ratio is also is mines shows in whole period it is found this units financial problem. In the process of decontrol non performing this units or small units not survive, they have closed or such units need to be given on lease or merged with bigger units.

Testing of Hypothesis No.3:The functional areas of management likeproduction,marketing, finance and HR are weak in the by-products sample units.The functional area Finance is tested. (Reference table no. 5.46, 5.47)

a) ***Finance:*** **On the basis current ratio.**

This Hopothesis tested as follows:
Mean=2.15, S.D.=0.43

$t = x - \mu \div \sigma/\sqrt{n}$

t =2.15-2 $\div 0.43/\sqrt{5}$
t= 0.15÷0.19

t=0.78

Table vlue at 5% level of significant is 2.13

t = 0.78 < table value is 2.13

Hence Researcher accepte this hopthesis.

The 't' value from t distribution table is 2.13 and observed calculate value is t=0.78 less than table value hence set hypothesis has accepted.

a) ***Finance:*** **On the basis Debt Equity ratio.**

This Hopothesis tested as follows:
Mean=6.20, S.D.=7.17

$t = x - \mu \div \sigma/\sqrt{5}$

t =6.20-2 $\div 7.17/\sqrt{5}$
t= 3.10$\div 3.21$

t=0.96

Table vlue at 5% level of significant is 2.13

t = 0.96 < table value is 2.13

Hence Researcher accepte this hopthesis.

The 't' value from t distribution table is 2.13 and observed calculate value is t=0.96 less than table value hence set hypothesis has accepted.

Table No.5.48 Datta Statement of Net Income from Sugar, By Products and Others(Rs. In Lakh)

Sr.No.	Particular	Year							
		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
1	Net Sugar Income	18583.58	15368.03	16077.43	20080.6	37756.17	37866.88	43584.7	45067.28
2	Net By Product Income (Bagasse, molasses, Compost fertilizers, Co-gen.)	1239.75	1147.93	1241.45	2769.35	2727.91	2419.33	2720.36	2964.17
3	Other Income	909.13	342.35	959.72	2053.28	346.3	830.63	1528.86	926.7
4	Distillery Profit	234.73	835.55	981.68	517.72	14.63	236.39	727.33	61.32
	Total Income	**20967.19**	**17693.86**	**19260.28**	**25420.95**	**40845.01**	**41353.23**	**48561.25**	**49019.47**

Source: Annual Report

Table No.5.49 % of Income to Total Income in Rs.

Sr.No.	Particular	Year							
		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
1	Net Sugar Income	88.63	86.86	83.47	78.99	92.44	91.57	89.75	91.94
2	Net By Product Income (Bagasse, molasses, Compost fertilizers)	5.91	6.49	6.45	10.89	6.68	5.85	5.60	6.05
3	Other Income	4.34	1.93	4.98	8.08	0.85	2.01	3.15	1.89
4	Distillery Profit	1.12	4.72	5.10	2.04	0.04	0.57	1.50	0.13
	Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Datta	**Net By Product Income % + Distillery Profit %**	**7.03**	**11.21**	**11.54**	**12.93**	**6.71**	**6.42**	**7.10**	**6.17**

On the bases on table no. 5.48

Table No.5.50 Kumbhi Kasari Statement of Net Income from Sugar, By Products and Others(Rs. In Lakh)

Sr.No.	Particular	Year							
		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
1	Net Sugar Income	11167.02	8339.21	9880.47	12599.39	17977.49	20061.77	17555.71	22169.54
2	Net By Product Income (Bagasse, molasses, Compost fertilizers)	539.47	404.15	499.03	805.7	932.67	972.37	749.38	1362.04
3	Other Income	84.58	110.72	112.13	169.81	149.02	300.19	355.71	77.27
4	Distillery Profit	125.94	442.83	296.56	313.16	68.87	326.59	443.89	143.92
Total Income		**11917.01**	**9296.91**	**10788.19**	**13888.06**	**19128.05**	**21660.92**	**19104.69**	**23752.77**

Source: Annual Report

Table No.5.51 % of Income to Total Income in Rs.

Sr.No.	Particular	Year							
		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
1	Net Sugar Income	93.71	89.70	91.59	90.72	93.98	92.62	91.89	93.33
2	Net By Product Income (Bagasse, molasses, Compost fertilizers)	4.53	4.35	4.63	5.80	4.88	4.49	3.92	5.73
3	Other Income	0.71	1.19	1.04	1.22	0.78	1.39	1.86	0.33
4	Distillery Profit	1.06	4.76	2.75	2.25	0.36	1.51	2.32	0.61
Total		**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Kumbhi	**Net By Product Income % + Distillery Profit %**	**5.58**	**9.11**	**7.37**	**8.06**	**5.24**	**6.00**	**6.25**	**6.34**

On the bases on table no.5.50

Table No.5.52 Gadhinglaj Statement of Net Income from Sugar, By Products and Others(Rs. In Lakh)

Sr.No.	Particular	Year							
		2005-06	**2006-07**	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13**
1	Net Sugar Income	6816.46	4307.43	6989.34	6850.12	12434.42	11353.25	9122.72	6376.72
2	Net By Product Income (Bagasse, molasses, Compost fertilizers)	379.11	325.98	146.3	350.77	790.37	422.05	358.33	284.76
3	Other Income	108.23	43.47	227.42	100.56	31.37	121.81	119.07	134.00
4	Distillery Profit	106.46	206.83	283.88	101.18	32.6	208.82	251.54	47.31
Total Income		**7410.26**	**4883.71**	**7646.94**	**7402.63**	**13288.76**	**12105.93**	**9851.66**	**6842.79**

Source: Annual Report

Table No.5.53 % of Income to Total Income in Rs.

Sr.No.	Particular	Year							
		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
1	Net Sugar Income	91.99	88.20	91.40	92.54	93.57	93.78	92.60	93.19
2	Net By Product Income (Bagasse, molasses, Compost fertilizers)	5.12	6.67	1.91	4.74	5.95	3.49	3.64	4.16
3	Other Income	1.46	0.89	2.97	1.36	0.24	1.01	1.21	1.96
4	Distillery Profit	1.44	4.24	3.71	1.37	0.25	1.72	2.55	0.69
Total		**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Gadhingalaj	**Net By Product Income % + Distillery Profit %**	**6.55**	**10.91**	**5.63**	**6.11**	**6.19**	**5.21**	**6.19**	**4.85**

On the bases table no.5.52

Table No.5.54 Warana Statement of Net Income from Sugar, By Products and Other income(Rs. In Lakh)

Sr. No.	Particular	Year							
		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
1	Net Sugar Income	34503.37	31635.24	31405.18	42839.29	52337.05	59355.93	57246.25	51892.64
2	Net By Product Income (Bagasse, molasses, Press Mud)	1741.65	1816.82	3123.3	4765.03	2460.45	1791.55	4354.73	4417.16
3	Other Income	1243.83	1285.97	4702.65	3125.38	1352.61	1028.63	1353.42	2511.79
4	Affiliated Business income	189.97	286.49	782.8	1308.63	2838.25	387.66	386.77	458.98
5	Distillery Profit	90.52	346.63	445.82	147.27	-	92.39	1042.00	305.28
6	Paper Mill Profit	-	-	-	-	-	-	-	-
	Total Income	**37769.34**	**35371.15**	**40459.75**	**52185.6**	**58988.36**	**62656.16**	**64383.17**	**59585.85**

Source: Annual Report

Table No.5.55 % of Income to Total Income in Rs.

Sr.No.	Particular	Year							
		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
1	Net Sugar Income to Total Income	91.35	89.44	77.62	82.09	88.72	94.73	88.91	87.09
2	Net By Product Income(Bagasse, molasses, Press- Mud)	4.61	5.14	7.72	9.13	4.17	2.86	6.76	7.41
3	Other Income to Total Income	3.29	3.64	11.62	5.99	2.29	1.64	2.10	4.22
4	Affilated Business income	0.50	0.81	1.93	2.51	4.81	0.62	0.60	0.77
5	Distillery Profit	0.24	0.98	1.10	0.28	0.00	0.15	1.62	0.51
6	Paper Mill Profit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Warana	**Net By Product Income % to total income + Distillery Profit**	**4.85**	**6.12**	**8.82**	**9.41**	**4.17**	**3.01**	**8.38**	**7.93**

On the bases table no. 5.54

Table No.5.56 Rajaram Statement of Net Income from Sugar, By Products and Others(Rs. In Lakh)

Sr.No.	Particular	Year							
		2005-06	**2006-07**	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13**
1	Net Sugar Income	6243.88	5406.87	6690.38	7185.24	11604.85	12447.88	13750.63	14695.48
2	Net By Product Income (Bagasse, molasses, Press-Mud)	416.68	341.04	489.23	833.61	938.85	902.92	851.48	1146.31
3	Other Income	155.33	41.52	48.18	58.88	56.11	149.97	160.89	227.1
	Total Income	**6815.89**	**5789.43**	**7227.79**	**8077.73**	**12599.81**	**13500.77**	**14763.00**	**16068.89**

Source: Annual Report

Table No.5.57 % of Income to Total Income in Rs.

Sr.No.	Particular	Year							
		2005-06	**2006-07**	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13**
1	Net Sugar Income to Total Income	91.61	93.39	92.56	88.95	92.10	92.20	93.14	91.45
2	Net By Product Income (Bagasse, molasses, Press- Mud) to Total Income	6.11	5.89	6.77	10.32	7.45	6.69	5.77	7.13
3	Other Income to Total Income	2.28	0.72	0.67	0.73	0.45	1.11	1.09	1.41
	Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Rajaram	**Net By Product Income % to total income**	**6.11**	**5.89**	**6.77**	**10.32**	**7.45**	**6.69**	**5.77**	**5.77**

On the bases table no.5.56

Table No.5.58 Average Net by-product income including distillery profit in percentage

Year	Datta	Kumbhi	Gadinghalaj	Warna	Rajaram	Average
1	**2**	**3**	**4**	**5**	**6**	**7**
2005-06	7.03	5.58	6.55	4.85	6.11	6.02
2006-07	11.21	9.11	10.91	6.12	5.89	8.65
2007-08	11.54	7.37	5.63	8.82	6.77	8.03
2008-09	12.93	8.06	6.11	9.41	10.32	9.37
2009-10	6.71	5.24	6.19	4.17	7.45	5.95
2010-11	6.42	6.00	5.21	3.63	6.69	5.59
2011-12	7.10	6.25	6.19	8.38	5.77	6.74
2012-13	6.17	6.34	4.85	7.93	5.77	6.21
Average	8.64	6.74	6.45	6.66	6.85	**7.07**

The table no.5.58 indicate average net by-product income including distillery profit in percentage. The average net by-product income including distillery profit in all sample sugar factories 7.07 percent. The average net by-product income including distillery profit of Datta-8.64 percent, Kumbhi-6.74 percent, Gadinghalaj-6.45 percent, Warana-6.66 and Rajaram-6.85 percent. The highest net by-product income including distillery profit was found in Datta-8.64 percent and lowest in Gadingalaj-6.45 percent.

For better financial and economical performance all sugar factories and its distillery units increased net by-product income including distillery profit about 10 percent.

Table no.5.59 Distillery profit (Rs. In Lakh)

Year	Datta	Kumbhi	Gadinghalaj	Warna	Average
1	**2**	**3**	**4**	**5**	**6**
2005-06	234.73	125.94	106.46	90.52	139.41
2006-07	835.55	442.83	206.83	346.63	457.96
2007-08	981.68	296.56	283.88	445.82	501.99
2008-09	517.72	313.16	101.18	147.27	269.83
2009-10	14.63	68.87	32.6	-8.07	27.01
2010-11	236.39	326.59	208.82	92.39	216.05
2011-12	727.33	443.89	251.54	1042.00	616.19
2012-13	61.32	143.92	47.31	305.28	139.46
Average	451.16	270.22	154.82	307.73	**295.99**

The table no.5.59 indicates distillery profit of the sample sugar factories. The average profit of all sample sugar factories Rs.295.99 lakh. The average distillery profit of Datta-Rs.-451.16 lakh , Kumbhi-Rs.270.22 lakh**,** Gadinghalaj-Rs.154.82 lakh and Warana-Rs.307.73 lakh. The highest (Rs.451.16 lakh) profit from distillery was found in Datta and lowest (Rs.154.82 lakh) profit from distillery was found in Gadinghalaj. The considerable variation is found in distillery profit because of their different capacity.

The distillery capacity of Datta 180 lakh litter and ethanol capacity is 90 lakh litter, total capacity is 270 lakh litre, Kumbi distillery capacity is 90 lakh litter, Gadinghalaj distiller capacity is 75 lakh litter and Warana Distillery capacity is 180 lakh litre ,Ethanol plant is 90 lakh and ENA planat 165 lakh litre total capacity of Warana plant is 435 lakh litre.

Because of variation in the distillery capacity and attached ethanol and ENA plant the profit from distillery in these sugar factories ware varied.

It is noted that distillery is one of the important income source centre in sample sugar factories. By producing ethanol and ENA plant sugar factories can earn considerable amount of income when market demand. Because of Distillery and Ethanol plant Datta Distillery doing very well at present in this sample sugar factories in relation to average profit making and Warana is second unit. The profit and total Capacity of distillery ratio is calculated in percentage is also as follow.Datta-451.16/270*100=167.09 percent, Kumbhi-270.22/90*100=300.00 percent ,Gadinghalaj-154.82/75*100=206.72 percent, Warana-307.73/435*100=70.72 percent.

Because of above calculation with capacity utilization to distillery profit is found Kumbhi highest capacity utilization in its small plant and lowest total capacity utilization is found in Warana.

Fro better financial and economical performance Datta distilleries and its ethanol plant and Warana distilleries and its ethanol and ENA plants should efficiently use their capacity utilization. And also it will reduce cost of production and increase income from distilleries by-products.

Table No.5.60 Datta sugar factory- Distillery department cost sheet (Rs. In Lakh)

Particular	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
1	2	3	4	5	6	7	8	9
Direct material	1262.53	1005.76	620.33	1670.79	1703.96	1241.31	2099.27	1346.58
Direct wages	72.80	67.42	75.47	78.10	76.57	143.81	147.94	155.2
Direct expenses	153.42	201.14	211.37	389.11	293.67	209.95	378.15	118.66
Prime Cost	**1488.75**	**1274.32**	**907.17**	**2138.00**	**2074.20**	**1595.07**	**2625.36**	**1620.44**
Add-Factory/works cost	133.95	194.32	243.67	230.76	210.88	221.56	279.36	167.84
Factory Cost	**1622.7**	**1468.64**	**1150.84**	**2368.76**	**2285.08**	**1816.63**	**2904.72**	**1788.28**
Add-Administrative overheads	25.6	17.91	31.37	17.09	33.72	22.37	68.24	33.44
Cost of Production	**1648.3**	**1486.55**	**1182.21**	**2385.85**	**2318.80**	**1839.00**	**2972.96**	**1821.72**
Add- Selling and Distribution overheads	96.61	46.58	1.45	14.02	23.52	47.59	23.46	1.47
Cost of sales	**1744.91**	**1533.13**	**1183.66**	**2399.87**	**2342.32**	**1886.59**	**2996.42**	**1823.19**
Add-Profit (After Tax)	234.73	835.55	981.68	517.71	14.63	236.39	727.33	61.32
Sales Value	**1979.64**	**2368.68**	**2165.34**	**2917.58**	**2356.95**	**2122.98**	**3723.75**	**1884.51**
Cost of production Per Unit								
Cost of Production	164830000	148664000	118221000	238585000	231880000	183900000	297296000	182172000
Rectified Sprit production	9753000	12530000	13479000	11485000	7987000	9179000	9229000	8557000
Cost of production Per Unit	16.90	11.86	8.77	20.77	29.03	20.03	32.21	21.29

Source: Annual Report

Table No.5.61 Kumbhi sugar factory- Distillery department cost sheet (Rs. In Lakh)

Particular	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
1	2	3	4	5	6	7	8	9
Direct material	307.37	293.72	138.47	353.27	518.86	549.84	469.51	390.97
Direct wages	50.61	67.04	66.86	98.46	102.00	126.2	125.71	132.28
Direct expences	22.03	30.80	27.18	31.71	49.91	44.34	37.59	42.57
Prime Cost	**380.01**	**391.56**	**232.51**	**483.44**	**670.77**	**720.38**	**632.81**	**565.82**
Add-Factory/works cost	20.08	19.38	21.13	29.11	28.14	30.00	32.18	29.02
Factory Cost	**400.09**	**410.94**	**253.64**	**512.55**	**698.91**	**750.38**	**664.99**	**594.84**
Add-Administrative overheds	14.66	18.22	33.90	20.66	22.87	21.58	30.77	33.52
Cost of Production	**414.75**	**429.16**	**287.54**	**533.21**	**721.78**	**771.96**	**695.76**	**628.36**
Add- Selling and Distribution overheds	2.56	1.63	0.46	1.96	0.74	0.73	1.67	2.09
Cost of sales	**417.31**	**430.79**	**288**	**535.17**	**722.52**	**772.69**	**697.43**	**630.45**
Add-Profit	125.94	442.83	296.56	313.16	68.99	326.59	443.89	143.92
Sales Value	**543.25**	**873.62**	**584.56**	**848.33**	**791.51**	**1099.28**	**1141.32**	**774.37**
Cost of Production Per Unit								
Cost of Production	41475000	42916000	28754000	53321000	72178000	77196000	69576000	62836000
Rectified Sprit production	3964000	52,16,000	4205000	4581000	3818000	4962000	4485000	3726000
Cost of production Per Unit	10.46	8.23	6.84	11.64	18.90	15.56	15.51	16.86

Source: Annual Report

Table No.5.62 Gadhinglaj sugar factory- Distillery department cost sheet (Rs. In Lakh)

Particular	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
1	2	3	4	5	6	7	8	9
Direct material	336.34	250.12	160.54	226.88	573.44	403.27	425.12	220.08
Direct wages	46.84	42.05	51.14	60.31	69.44	81.54	84.77	73.67
Direct expences	26.89	26.97	45.75	34.38	45.85	49.52	34.91	13.08
Prime Cost	**410.07**	**319.14**	**257.43**	**321.57**	**688.73**	**534.33**	**544.8**	**306.83**
Add-Factory/works cost	44.53	34.68	37.68	82.33	84.95	77.18	49.86	13.83
Factory Cost	**454.6**	**353.82**	**295.11**	**403.90**	**773.68**	**611.51**	**594.66**	**320.66**
Add-Administrative overheds	8.51	9.08	7.16	9.48	11.83	10.77	21.58	19.33
Cost of Production	**463.11**	**362.9**	**302.27**	**413.38**	**785.51**	**622.28**	**616.24**	**339.99**
Add- Selling and Distribution overheds	9.7	9.44	12.08	8.81	7.47	0.00	0.00	0.00
Cost of sales	**472.81**	**372.34**	**314.35**	**422.19**	**792.98**	**622.28**	**616.24**	**339.99**
Add-Profit (After Tax)	106.46	206.83	383.88	101.18	32.9	208.82	251.54	47.31
Sales Value	**579.27**	**579.17**	**698.23**	**523.37**	**825.88**	**831.10**	**867.78**	**387.3**
Cost of production Per Unit								
Cost of Production	46311000	36290000	31435000	41338000	78551000	62228000	61624000	33999000
Rectified Sprit production	3079000	4571000	4015000	2334000	3891000	4673000	3013707	1509581
Cost of production Per Unit	15.04	7.94	7.83	17.71	20.19	13.32	20.45	22.52

Source: Annual Report

Table No.5.63 Warana sugar factory- Distillery department cost sheet (Rs in Lakh)

Particular	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
1	2	3	4	5	6	7	8	9
Direct material	1056.86	598.95	844.00	1434.62	1565.95	1129.15	2222.16	2615.81
Direct wages	72.94	71.87	89.39	102.86	140.24	127.07	249.69	182.45
Direct expences	63.95	221.54	636.23	422.46	424.43	445.52	520.61	247.03
Prime Cost	**1193.75**	**892.36**	**1569.62**	**1959.94**	**2130.62**	**1701.74**	**2992.46**	**3045.29**
Add-Factory/works cost	108.31	157.37	221.81	177.11	156.51	174.76	297.28	230.89
Factory Cost	**1302.06**	**1049.73**	**1791.43**	**2137.05**	**2287.13**	**1876.5**	**3289.74**	**3276.18**
Add-Administrative overheds	13.40	12.78	17.86	23.06	12.08	9.1	16.79	11.5
Cost of Production	**1315.46**	**1062.51**	**1809.29**	**2160.11**	**2299.21**	**1885.60**	**3306.53**	**3287.68**
Add- Selling and Distribution overheds	14.09	11.5	7.16	56.08	30.91	33.07	35.89	17.97
Cost of sales	**1329.55**	**1074.01**	**1816.45**	**2216.19**	**2330.12**	**1918.67**	**3342.42**	**3305.65**
Add-Profit	90.52	346.63	445.82	147.27	-8.07	92.39	1042	305.28
Sales Value	**1420.07**	**1420.64**	**2262.27**	**2363.46**	**2322.05**	**2011.06**	**4384.42**	**3610.93**
Cost of Production Per Unit								
Cost of Production	131546000	106251000	180929000	216011000	229921000	188560000	330653000	328768000
Rectified Sprit production	7231000	7448000	13336000	10264000	9547000	11492000	15186000	14672000
Cost of production Per Unit	18.19	14.27	13.57	21.05	24.08	16.41	21.77	22.41

Source: Annual Report

Table No.5.64 Warana Pulp Cost Sheet (Rs. In Lakh)

Particular	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
1	2	3	4	5	6	7	8	9
Direct material	53.51	25.46	44.59	82.57	74.41	74.54	81.77	62.93
Direct wages	83.67	83.25	123.72	129.6	162.74	144.79	132.77	174.93
Direct expences	8.99	96.35	117.17	180.93	147.49	196.66	212.76	141.89
Prime Cost	**146.17**	**205.06**	**285.48**	**393.1**	**384.64**	**415.99**	**427.3**	**379.75**
Add-Factory/works cost	20.09	68.46	98.93	142.53	114.53	117.71	217.95	230.06
Factory Cost	**166.26**	**273.52**	**384.41**	**535.63**	**499.17**	**533.7**	**645.25**	**609.81**
Add-Administrative overheds	4.42	5.4	6.88	7.35	3.84	2.14	13.22	2.55
Cost of Production	**170.68**	**278.92**	**391.29**	**542.98**	**503.01**	**535.84**	**658.47**	**612.36**
Add- Selling and Distribution overheds	0.5	0.15	2.14	4.70	4.2	4.57	5.41	3.71
Cost of sales	**171.18**	**279.07**	**393.43**	**547.68**	**507.21**	**540.41**	**663.88**	**616.07**
Add-Profit / Loss	-100.81	-110.54	-150.48	-222.53	-170.28	-214.85	-374.11	-437.58
Sales Value	**271.99**	**389.61**	**543.91**	**770.21**	**677.49**	**755.26**	**1037.99**	**1053.65**
Cost of Production Per Unit								
Cost of Production	17068000	27892000	39143000	54298000	50301000	53584000	65847000	61236000
Pulp M.T. production	180	1,244	2162	2345	2550	2466	2448	1184
Cost of production Per Unit	94822.22	22421.22	18105.00	23154.80	19725.88	21729.12	26898.28	51719.59

Source: Annual Report

Cost sheet Distillery:

Table No.5.60 Datta sugar factory: The table number shows cost sheet of Datta distillery and Ethanol department combined statement prepared. The cost sheet shows elements of cost i.e. Prime Cost, Factory Cost, Cost of Production and Total cost and Cost of sales. This cost sheet sows cost of production ranged between Rs.1182.21 lakh as minimum in the year 2007-08 and Rs.2972.96 lakh maximum during the year 2011-12. The main element of cost of production is direct material i.e. molasses. When molasses prices were increased, that year cost of production was increased in the study period. Cost sheet also shows distillery profit after tax. The profit ranged between Rs.14.63 lakh as minimum during the year 2009-10 and maximum Rs.981.68 lakh in the yer 2007-08. The table also shows cost of production per unit of alcohol and ethanol. The cost of production ranged between Rs.8.77 per litre in the year 2007-08 and 32.21 as maximum during the year 2011-12.

Table No.5.61 Kumbhi sugar factory: The table number shows cost sheet of Kumhi distillery. The cost sheet shows elements of cost i.e. Prime Cost, Factory Cost, Cost of Production and Total cost and Cost of sales. This cost sheet sows cost of production ranged between Rs.247.54 lakh as minimum in the year 2007-08 and Rs.771.86 lakh maximum during the year 2010-11.The main element of cost of production is direct material i.e. molasses. When molasses prices were increased, that year cost of production was increased in the study period. Cost sheet also shows distillery profit after tax. The profit ranges between Rs.68.90 lakh as minimum during the year 2009-10 and maximum Rs.443.89 kakh in the year 2011-12. The table also shows cost of production per unit of alcohol.The cost of production ranges between Rs.6.84 per litre in the year 2007-08 and 18.90 as maximum during the year2009-10.

Table No.5.62 Gahingalaj sugar factory: The table number shows cost sheet of Gahingalaj distillery. The cost sheet shows elements of cost i.e. Prime Cost, Factory Cost, Cost of Production and Total cost and Cost of sales. This cost sheet sows cost of production ranged between Rs.302.27 lakh as minimum in the year 2007-08 and Rs.785.51 lakh maximum during the year 2009-10. The main element of cost of production is direct material i.e. molasses. When molasses prices were increased, that year cost of production was increased in the study period. Cost sheet also shows distillery profit after tax. The profit ranges between Rs.32.90 lakh as minimum during the year 2009-10 and maximum Rs.383.88 lakh in the year 2007-08. The table also

shows cost of production per unit of alcohol. The cost of production ranged between Rs.7.83 per litre in the year 2007-08 and 22.52 as maximum during the year 2009-10.

Table No.5.63 Warama sugar factory: The table number shows cost sheet of Warana distillery and Ethanol, ENA department combined statement prepared. The cost sheet shows elements of cost i.e. Prime Cost, Factory Cost, Cost of Production and Total cost and Cost of sales. This cost sheet sows cost of production ranged between Rs.1062.51 lakh as minimum in the year 2006-07 and Rs.3306.93 lakh maximum during the year 2011-12. The main element of cost of production is direct material i.e. molasses. When molasses prices were increased, that year cost of production was increased in the study period. Cost sheet also shows distillery profit after tax. The profit ranges between Rs.90.52 lakh as minimum during the year 2005-06 and maximum Rs1042 lakh in the year 2011-12. The table also shows cost of production per unit of alcohol and ethanol and ENA. The cost of production ranged between Rs.13.57 per litre in the year 2006-07 and 22.41 as maximum during the year 2011-12.

It is interpreted that analysis of Distillery, Ethanol and ENA plant combined cost sheet taken into account of Datta, Kumbhi, Gadingalaj and Waran sugar factory. It is found that the cost of production of alcohol, ethanol and ENA production is higher fluctuate in the study period. Because the cost of production of alcohol, ethanol ENA also more ups and down in the study period. It is found lowest working days in distilleries, ethanol and ENA plant and under utilization of plant capacity which leads to higher cost of production of alcohol. Also molasses is the main raw material used for the production of alcohol. When lower sugarcane molasses availability and consequent higher molasses prices affect the cost of production.

Concept of cost Analysis of By-products:

It is found that the sample sugar factories from sugarcane sugar factory producing sugar is main product and also the same process to produce three by-product i.e. Bagasse, Molasses and press mud. When by-product conditions are prevailing in an sugar factory a problem arises to allocate the joint cost among the by-products and Main products.

a) Joint cost are those costs which are common to the processing of by-products up to the point of separations. After the point of separation the products can be separately indentified and post separation costs can be readily attributed to individual products. Cost common to by-products before the point of separation of their

indentify present a problem of allocation. Joint costs are incurred as a lump-sum for the combination and not separately for the individual products.

b) In sample sugar factories sugarcane is the raw material and output are sugar (main product) and bagasse, molasses, and press mud are the by-products. A by-products is of minor commercial importance. The relationship between by-product and main product changes within economic and industrial conditions or with advancement of science.

c) In sample co-operative sugar factories found that the methods used of accounting of by-products there is no cost methods or sale value method under this method sales value of by-product is credited to profit and loss account and no credit is given in the cost accounts. The credit is profit and loss account is treated as by-product income.

Table No.5.65 Distillery By-products average cost of production

Year	Datta	Kumbhi	Gadinghalaj	Warna	Average
1	**2**	**3**	**4**	**5**	**6**
2005-06	16.9	10.46	15.04	18.19	15.15
2006-07	11.86	8.23	7.94	14.27	10.58
2007-08	8.77	6.84	7.83	13.57	9.25
2008-09	20.77	11.64	17.71	21.05	17.79
2009-10	29.03	18.9	20.91	24.08	23.23
2010-11	20.03	15.56	13.32	16.41	16.33
2011-12	32.21	15.51	20.45	21.77	22.49
2012-13	21.29	16.86	22.52	22.41	20.77
Average	20.11	13.00	15.72	18.97	**16.95**

The above table indicates distillery by-products average cost of production in per litre of the sample sugar factories. The average cost of production of distillery by-products were Datta-Rs.20.11, Kumbhi-Rs.13, Gadinghalaj-15.72 and Warana-18.97. The average cost of production of all sample sugar factories is Rs.16.95. The highest cost of production (Rs.20.11) was found in Datta and lowest cost of production (Rs.13) was found in Kumbhi sugar factory.

Because of variation in the Distillery, Ethanol and ENA plant capacity the cost of production from distillery by-products in these sugar factories were varied. Also very low utilization of Datta Ethanol plant and Warana Ethanol and ENA plant increased cost of products in these two units.

For better financial performance of sugar factories Datta distillery one old plant taking in hand modernization and also Ethanol plant efficiently used their capacity and Warana Ethanol and ENA plant should efficiently used their capacity utilization. And also it will reduce cost of production and increase income from distillery by-products.

Testing of hypothesis: No.1. Co-operative sugar factories are suffering from the losses due to high cost of production and low productivity in relation to by-product units. (Reference table no. 5.60, 5.61, 5.62, 5.63, 5.65)

a) High cost of production –

This Hopothesis tested as follows:
Mean=16.95,S.D.=3.22
$t = x - \mu \div \sigma/\sqrt{n}$
t =16.95-22.56/ 3.22$/\sqrt{4}$

t= -2.80

Table vlue at 5% level of significant is 2.35

t = -2.80 < table value is 2.35

Hence Researcher accepte this hopthesis.

The 't' value from t distribution table is 2.35 and observed calculate value is t= -2.80 less than table vlue hence set hypothesis has accepted and researcher conclude the difference is not significant and is is due to sampling fluctuations.

Table No.5.66 Warana pulp and lignosolfonate cost of production and average cost of production and profit /loss Rs. In lakh .

Year	Cost of production PMT Rs.	Profit/Loss Rs. In Lakh
1	**2**	**3**
2005-06	94822.22	-100.81
2006-07	22424.22	-110.54
2007-08	18105.00	-150.48
2008-09	23154.80	-222.53
2009-10	19725.88	-170.28
2010-11	21729.12	-214.85
2011-12	26898.28	-314.11
2012-13	51719.59	-437.58
Average	34822.39	-215.148

The above table shows the cost of production of Waran pulp and lignosolfonate plant and also the Profit and loss in the study period. The average cost of production is Rs.34822.39 lakh per metric tons. The lowest cost of production is Rs.18,105 lakh per metric ton and highest cost of production is Rs94822.22 lakh per metric tons. It shows that very high fluctuation in the cost of production of this plant.

5.2 SWOT Analysis of the Sugar Industry and Its By-products industry:

Strengths:

- India is second largest producer of sugar after Brazail in the World.
- A rural agro based industry with a potential of generating employment opportunity.
- Indian sugar industry development of various by-products industries.
- The proper utilization of the various by-products i.e. bagasse, molasses, and press mud.
- Sugar industry can be used for producing fuel ethanol which is considered as eco-friendly substitute for costly crude oil.
- Sugar industry is capable for generating power which we are facing acute shortage and deficit.
- Sugar industry is tax contributor to the Government.
- This sector have been the focal point of socio economic development of the rural India.
- Sugar industries are capable of exporting sugar every year to earn valuable foreign exchange.

Weakness:

- The sugar factories are more than 30 years old and still using the old technology.
- Uncertainty of availability of ample cane. Cane availability still depends of nature and weather predications.
- Government policy is not firm for blending of ethanol.
- Lack of professionalism.

Opportunity:

- High value of by-products for downstream industries.
- Technology up gradation, new advance technology available for the by-product utilization.

- Fuel ethanol and surplus power production through cogeneration provides two by-product related opportunities.
- The country need to produce around 350 lakh metric ton for its future domestic requirements. Increases in the sugar production is primarily through productivity improvement .

Threats:

- Sugar factories are controlled by politicians which affects the growth.
- Monsoons could affect the industry leads to low production.
- The high capital costs of co-generation power plants and associated essential modernisation, liability to raise, required equity and loans from financial instructions in time, off-season fuel linkage etc.

5.3 Conclusion:

The present study focus on marketing, finance and human resource departments of sample sugar factories. It is studied that bagasse and molasses is very important by-product in a sugar factory. It gives income by way of sale of this by-product. It is observed that all sample sugar factory sold out bagasse and molasses as such, very good returns income to the sugar factory. In distillery department rectified sprit is very important by-product in distillery department. It is also gives main source income by way of rectified spirit sales. Rectified sprit assured very important place in the country's economy. It is a vital raw material for a number of chemicals. Rectified sprit is basically used for three purpose i.e. Industrial alcohol production, potable alcohol production and fuel ethanol. In the disteliery department ethanol is another very important by-product in the sugar factory. It is main source income by way of ethanol sales. The price of ethanol would be determined by the Bio fuel Steering Committee and decided by the NBCC (National Bio fuel Coordination Committee) of India. In the study period the Datta and Warama sugar factory because of ethanol, well returns by way marketing of ethanol product. The rectified sprit convert into ENA by-product of Warana distllery. It is gives incomes by way of sales these product. In the market ENA is more demand when distillery produced ENA. In Warana paper mill produced Lingnoslfonate and pulp only, this product important by-product in the sugar factory pulp department. The pulp department is not produced Lingnoslfonate and pulp efficiently. Because not available sufficient sales quantity, therefore very little returns by way of sales.

The human resource management are very important functional area of sample sugar factories basically related with overall manpower planning. The functions in sugar factory production seasonal in nature and also in by-product unit. The by-product department researcher study the human resource magement function. The researcher also study the financial position of the sample sugar factories. The researcher is caluated current ratio and debt equity ratio for study the financial position of sample sugar factories. Current ratio is also known as 'Solvency Ratio' as it indicates solvency position of the firm. It is also known as 'Working Capital Ratio' as represents working capital. For measuring short-term solvency of Cooperative sugar factories current ratio of these factories are calculated. The table no.5.41 shows the average current ratio of sample co-operative sugar factories were Datta-1.92:1, Kumbhi-2.14:1, Gadingalhaj-1.62:1, Warana-2.27:1 and Rajaram-2.79:1 respectively. With reference to above table no.5.41 mentioned table and other observation the researcher has found that only one sugar factories i.e. Gadingalhaj sugar factory shortage of working capital. The table no.5.58 indicate average net by-product income including distillery profit in percentage. The average net by-product income including distillery profit in all sample sugar factories 7.07 percent. It is noted that distillery is one of the important income source centre in sample sugar factories. By producing ethanol and ENA plant sugar factories can earn considerable amount of income when market demand. Because of Distillery and Ethanol plant Datta Distillery doing very well at present in this sample sugar factories in relation to average profit making and Warana is second unit. The profit and total Capacity of distillery ratio is calculated in percentage is also as follow.Datta-451.16/270*100=167.09 percent, Kumbhi-270.22/90*100=300.00 percent,Gadinghalaj-154.82/75*100=206.72 percent, Warana-307.73/435*100=70.72 percent. The researcher study the Distillery, Ethanol and ENA plant combined cost sheet taken into account of Datta, Kumbhi, Gadingalaj and Waran sugar factory. It is found that the cost of production of alcohol, ethanol and ENA production is higher fluctuate in the study period. Because the cost of production of alcohol, ethanol ENA also more ups and down in the study period. It is found lowest working days in distilleries, ethanol and ENA plant and under utilization of plant capacity which leads to higher cost of production of alcohol.

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CHAPTER-VI
Suggestive Models for Sugar By-product Industries

Chapter Design

This chapter has covered the appropriate suggestive models for By-products mix models relation to the production, marketing, financial and human resource.

6.0 Introduction :

India is currently one of the largest producer of cane sugar in the world. Sugarcane is an agro-energy crop and India is the homeland of this crop. It is the second largest agro based industry located in rural areas. It provides direct and indirect employment of millions of farmers, farm workers and factory workers. The sugar industries have primary importance not only from the view point of the utility of the millinons of consumers but its importance to large cane growers, manufactures and the Government is equally great. Due to their crucial role in the interaction of agricultural sector, industrial sector and consumer, sugar factories are expected to perform both in terms of physical and financial indicators. Any inefficiency on their part would adversely affect of the sugarcane growers, manufactures, consumers and even the Government also.

However, the poor and weak performance of sugar factories are cause for worry, as they have failed to produce the desired results, there by defeating confidence reposed in sugar co-operatives by planners, administrators and cane growers. They are facing several problems in the areas of finance, cost of production, manpower utilization. Sugar co-operative factories have to change their work culture and attain quantitative efficiency to face the challenges posed by globalisation and . Now it is becoming increasingly clear that sugar factories cannot survive only on the basis of sugar cane to sugar. Unless the sugar factories diversify by setting up value addition industries based on the by-product of sugarcane.

6.1 Sugarcane 'Product Mix' or 'By-product Mix':

To increase the profitability of sugar industries the concept of sugarcane 'Product Mix' or 'By-product Mix'. The sugar factory with several product lines has a product mix. A product mix means consists of all the product lines and items that a particular seller offers for sale. The feature of By-product mix sugar complex are, it is zero waste plant were all by-product generated are further processed into saleable final product. Bagasse, molasses and press-mud is the primary by-product in sugar factory. The sugar factories is beginning to diversity into multiple by-product to enhanced the value addition for every metric ton of cane that is crushed.

A sugar factory product mix has four important dimensions it means width, length, depth and consistency. Product mix width referrers to the number of different product lines the sugar factory carries. Product mix length refers to the total number of items the sugar factory carries within its product lines. Product mix depth refers to the number of version offered of each product in the line. And finally the consistency of the product mix refers to how closely related to various product lines are in end use production requirements distribution channels.

6.2 Suggestive Model for sugar industry :

Some similarity points taken into account for suggestive model all sugar factory in the following:

1. To utilize the full sectioned capacity of sugar factory plant and by-product units.
2. The new marketing strategy of sugar and all by-products need to utilize the modern technique such as forward trading in its local markets, notational markets and international markets. Through this mechanism sugar factory and its by products units can make long term contract and sale the sugar and by-products in advance.
3. The Branding of sugar and by-products in terms of quality and reliability of supply.
4. Apply professional management, quick decisions policy, training to employees, employees selection method is based on need based.
5. To make corporate buyers liquid sugar syrups.

6. Retail marketing is also option in sugar and by-products.

Model: I Small capacity sugar factory plant (2000 TCD to 2500 TCD)

1. Distillery of 30 KL.
2. Ethanol plant 30KL Based on Molasses or Sugar cane.
3. Co-generation unit of 15 M.W.
4. Bio-composting Plant.
5. Bio-Gas plant for internal use.

Model: II Medium Size Sugar factory plant (3000 TCD to 5000 TCD)

1. Distillery of 30 KL.
2. Ethanol plant 30 KL Based on Molasses or Sugar cane.
3. Extra Neutral Alcohol plant-30 KL
4. Co-generation plant of 15 M.W. to 20 M.W.
5. Bio-composting Plant.
6. Bio-Gas plant for internal use.

Model: III Large Scale Sugar factory plant (7000 TCD to 7500 TCD)

1. Distillery of 60 KL.
2. Ethanol plant 30 KL Based on Molasses or Sugar cane.
3. Extra Neutral Alcohol plant-30 KL
4. Co-generation plant of 30 M.W. to 45 M.W.
5. Bio-composting Plant With earth worm plant.
6. Bio-Gas plant for internal use.

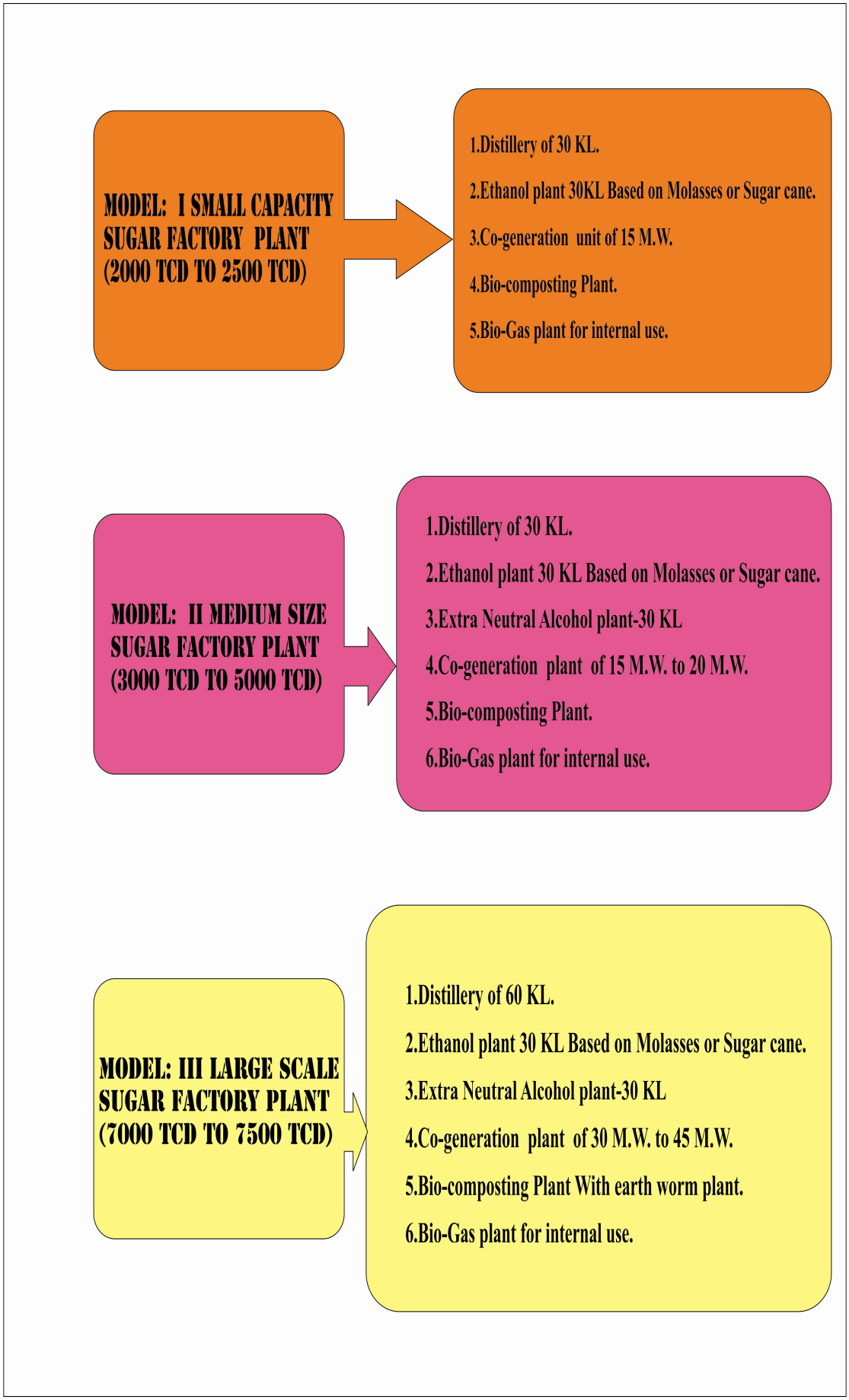

MODEL: I SMALL CAPACITY SUGAR FACTORY PLANT (2000 TCD TO 2500 TCD)
1.Distillery of 30 KL.
2.Ethanol plant 30KL Based on Molasses or Sugar cane.
3.Co-generation unit of 15 M.W.
4.Bio-composting Plant.
5.Bio-Gas plant for internal use.
MODEL: II MEDIUM SIZE SUGAR FACTORY PLANT (3000 TCD TO 5000 TCD)
1.Distillery of 30 KL.
2.Ethanol plant 30 KL Based on Molasses or Sugar cane.
3.Extra Neutral Alcohol plant-30 KL
4.Co-generation plant of 15 M.W. to 20 M.W.
5.Bio-composting Plant.
6.Bio-Gas plant for internal use.
MODEL: III LARGE SCALE SUGAR FACTORY PLANT (7000 TCD TO 7500 TCD)
1.Distillery of 60 KL.
2.Ethanol plant 30 KL Based on Molasses or Sugar cane.
3.Extra Neutral Alcohol plant-30 KL
4.Co-generation plant of 30 M.W. to 45 M.W.
5.Bio-composting Plant With earth worm plant.
6.Bio-Gas plant for internal use.

Table No. 6.1: By-products mix models relation to the production, marketing, financial and human resource in the sample sugar factory.

Sr.No.	Particulars	Datta	Kumbhi	Gadingalaj	Warana	Rajaram	Total	Average
1	2	3	4	5	6	7	8	9
1	Total average Capacity sugar factory.	7000	3000	2200	7500	2000	21700	4340
2	Total average sugarcane Crushed in M. T.	11.08	5.36	3.23	12.51	3.68	35.86	7.172
3	Total average sugar produced in quintals	13.85	6.96	3.93	15.9	4.44	45.08	9.01
4	Average Bagase produced in M.T.	3.19	1.56	0.95	3.6	1.03	10.33	2.06
	Average Bagase avalable to sales in M.T.	26062	13414	7001	87297	13693	147467	29493.40
	Average bagase sales in M.T	19300	10683	3380	65413	13393	112169	22433.80
	Average bagase sales in price in lackh Rs.	169.31	106.62	33.05	704.3	156.07	1169.35	233.87
5	Average Molasses produced in thousand M.T.	42	18.65	12.12	42.22	15	129.99	25.99
	Average Molasses sales in thousand M.T	39.96	17.67	12.23	41.8	15.07	126.73	25.34
	Average Molasses sales in price in lackh Rs.	1517.66	562.51	325.68	1960.83	583.56	4950.24	990.04
6	Average Compost produced in thousand M.T.	37.17	21.74	7.95	23.39	0	90.25	18.05
	Average Compost sales in thousand M.T	35.59	20.99	6.27	23.86	0	86.71	17.34
	Average Compost sales in price in lackh Rs.	70.87	27.06	14.92	68.21	0	181.06	36.21

Contd. table…

7	Total average Capacity Distillery plant.	60000	30000	25000	60000	N.A.	175000	43750
8	Average rectified sprit produce in lakh lit.	100.15	42.34	38.16	107	N.A.	287.65	71.91
	Average rectified sprit sales in lakh lit.	68.4	10.12	4.67	52.19	N.A.	135.38	33.84
	Average rectified sprit closing balance in lakh lit.	16.2	12.03	14.4	25.99	N.A.	68.62	17.15
	Average rectified sprit sales price in lakh Rs.	1765.21	243.09	113.11	1520.03	N.A.	3641.44	910.36
9	Average SDS sprit produce in lakh lit.	18.59	33.44	30.34	15.63	N.A.	98	24.50
	Average SDS sprit sales in lakh lit.	19.01	32.06	30.24	15.18	N.A.	96.18	24.12
	Average SDS sprit sales price in lakh Rs..	355.54	722.11	651.96	357.23	N.A.	2086.84	521.71
10	Average ODS sprit produce in lakh lit.	0.49	0.7	0	0	N.A.	1.19	0.29
	Average ODS sprit sales in lakh lit.	0.48	0.69	0	0	N.A.	1.17	0.29
	Average ODS sprit sales price in lakh Rs..	11.52	14.55	0	0	N.A.	26.07	6.51
11	Average Fusil oil produce in lakh lit.	0.24	0.01	N.A.	N.A.	N.A.	0.25	0.06
	Average fusil oilt sales in lakh lit.	0.23	0	0	0	N.A.	0.23	0.05
	Average Fusil oil sales price in lakh Rs..	4.79	0	0	0	N.A.	4.79	1.19

Contd. table…

12	Total average Capacity Ethanol plant.	30000	N.A.	N.A.	30000	N.A.	60000	30000
	Average ethanol produce in lakh lit.	9.24	N.A.	N.A.	9.78	N.A.	19.02	9.51
	Average ethanol sales in lakh lit.	9.81	N.A.	N.A.	10.97	N.A.	20.78	10.39
	Average ethanol closing balance in lakh lit.	0.88	N.A.	N.A.	1.78	N.A.	2.66	1.33
	Average ethanol sales price in lakh Rs..	255.49	N.A.	N.A.	225.06	N.A.	480.55	240.27
13	Total average Capacity ENA plant.	N.A.	N.A.	N.A.	55000	N.A.	55000	55000
	Average ENA produce in lakh lit.	N.A.	N.A.	N.A.	20.12	N.A.	20.12	20.12
	Average ENA sales in lakh lit.	N.A.	N.A.	N.A.	19.91	N.A.	19.91	19.91
	Average ENA closing balance in lakh lit.	N.A.	N.A.	N.A.	0	N.A.	0	0
	Average ENA sales price in lakh Rs..	N.A.	N.A.	N.A.	592.99	N.A.	592.99	592.99
14	Total average Capacity pulp plant 20 TCD (Yearly-6000M.T.)	N.A.	N.A.	N.A.	20	N.A.	20	20
	Average Pulp produced in M.T.	N.A.	N.A.	N.A.	775	N.A.	775	775
	Average Pulp sales in M.T	N.A.	N.A.	N.A.	762	N.A.	762	762
	Average Pulp sales in price in lackh Rs.	N.A.	N.A.	N.A.	133.21	N.A.	133.21	133.21
15	Total average Capacity lignosululphonate plant 8 TCD (Yearly-2400M.T.)	N.A.	N.A.	N.A.	8	N.A.	8	8

Contd. table…

	Average lignosululphonate produced in M.T.	N.A.	N.A.	N.A.	1039	N.A.	1039	1039
	Average lignosululphonate sales in M.T	N.A.	N.A.	N.A.	950	N.A.	950	950
	Average lignosululphonate sales in price in lackh Rs.	N.A.	N.A.	N.A.	60.24	N.A.	60.24	60.24
16	Average Manpower utilization in by-product department	77	77	51	142	N.A.	347	86.75
17	Finalcial position in sugar factory relation to by product department							
	Net Sugar Income	29298.08	14968.83	8267.67	45151.87	9753.15	107439.6	21487.92
	Net By Product Income (Bagasse, molasses, Press Mud)	2153.78	783.06	382.2	3058.83	740.01	7117.88	1423.57
	Other Income	987.12	169.92	110.74	2075.53	85.92	3429.23	685.84
	Affiliated Business income	0	0	0	829.94	0	829.94	165.98
	Distillery Profit	451.16	270.22	154.82	396.56	0	1272.76	254.55
	Paper Mill Profit	0	0	0	0	0	0	0
18	Average Total Income	32890.14	16192.03	8915.43	51512.73	10579.08	120089.4	4002.98
19	Average Cost of production Distillery, Ethanol,and ENA per litre in Rs.	20.11	13	15.72	18.97	N.A.	67.8	16.95
20	Average Cost of production pulp and lignosulfonate per M.T.	N.A	N.A	N.A	34822.4	N.A.	34822.4	34822.39
21	Average loss pulp and lignosulfonate	N.A	N.A	N.A	-215.15	N.A.	-215.15	-215.148

Contd. table…

22	Total average cost of production distillery , ethanol and ENA in Rs. In lakh.	1956.93	560.31	489.72	2140.79	N.A.	5147.75	1286.93
23	Total investment in fixed assets sugar factory in lakh Rs	5065.06	5793.43	3288.12	22100.58	2785.83	39033.02	7806.66
24	Total investment in fixed assets Distillery in lakh Rs	1158.8	1439.89	1310.44	4147.6	N.A	8056.73	2014.18
25	Total investment in fixed assets Ethanol in lakh Rs	140.12	N.A	N.A	106.82	246.94	246.82	123.47
26	Total investment in fixed assets paper mill in lakh Rs	N.A	N.A	N.A	1027.29	N.A	1027.29	1027.29

Source: Field work

Note:- N.A. - Not applicable i.e. These sugar factories have not producing.

It is observed that from the table no.6.1 the average capacity of sample sugar factories. The total crushing capacity of the all sugar factory is 21700 TCD and average all sugar factory crushing capacity is 4340 TCD. The table no. 6.1, Sr. no. 1. shows cane crushed and sugar produced during the study period all sample sugar factory. It shows Sr. no.2 total average sugarcane crushed in the study period is Datta-11.08, Kumbhi-5.36, Gadhingalaj-3.23, Warana-12.51 and Rajaram-3.68 lakh metric tons, all sample units total cane crushed is 35.86 lakh tons and all sample average is 7.17 lackh metric tons. It also shows Sr.no.3 total average sugar produced in the study period is Datta-13.85, Kumbhi-6.96, Gadhingalaj-3.93, Warana-15.90 and Rajaram-4.44 lakh metric tons, all sample units total sugar produced is 45.08 lakh tons and all sample average is 9.01 lakh quintals.

It also shows table no.6.1, Sr.No.4 total average bagasse produced in lakh M.T. in the study period is Datta-3.19, Kumbhi-1.56, Gadhingalaj-0.95, Warana-3.6 and Rajaram-1.03 lakh metric tons, all sample units total produced is 10.33 lakh tons and all sample average is 2.066 lakh metric tons. It also shows table no.6.1, Sr.No.4 total average bagasses available to sales in the study period is Datta-26062, Kumbhi-13414, Gadhingalaj-7001 Warana-87297 and Rajaram-13693 metric tons, all sample units total bagasse available to sale is 147467 metric tons and all sample average is 29493.4 metric tons. It also shows table no.6.1, Sr.No.4 total average bagasses sales in the study period is Datta-19300, Kumbhi-10683, Gadhingalaj-3380, Warana-65413 and Rajaram-13693 metric tons, all sample units total bagasse sale is 112169 metric tons and all sample average is 22433.8 metric tons. It also shows table no.6.1, Sr.No.4 total average bagasses sales in the study period is Datta-Rs.169.31, Kumbhi-Rs.106.62, Gadhingalaj-Rs.33.05, Warana-Rs.704.30 and Rajaram-Rs.156.07 in lakh, all sample units total bagasse sales is Rs.1169.35 in lakh and all sample average is Rs.233.87 lakh.

It also shows table no.6.1, Sr.No.5 total average molasses produced in thousand M.T. in the study period is Datta-42, Kumbhi-18.65, Gadhingalaj-12.12, Warana-42.22 and Rajaram-15 thousand metric tons, all sample units total molasses's produced is 129.99 thousand tons and all sample average is 25.99 thousand metric tons. It also shows table no.6.1, Sr.No.5 total average molasses sales thousand M.T. in the study period is Datta-36.96, Kumbhi-17.67, Gadhingalaj-12.23, Warana-41.80 and Rajaram-15.07 thousand metric tons, all sample units total molasses sale is 126.73 thousand metric tons and all sample average is 25.346 thousand metric tons. It also

shows table no.6.1, Sr.No.5 total average molasses sales in the study period is Datta-Rs.1517.66, Kumbhi-Rs.562.51, Gadhingalaj-Rs.325.68, Warana-Rs.1960.56 and Rajaram-Rs.583.56 in lakh, all sample units total molasses sales is Rs.4950.24 in lakh and all sample average is Rs.990.048 lakh.

It also shows table no.6.1, Sr.No.6 total average compost produced in thousand M.T. in the study period is Datta- 37.17, Kumbhi-21.74, Gadhingalaj-7.95, and Warana-23.39, thousand metric tons, all sample units total molasses's produced is 90.25 thousand tons and all sample average is 18.05 thousand metric tons. It also shows table no.6.1, Sr.No.6 total average compost sales thousand M.T. in the study period is Datta-35.59, Kumbhi-20.99, Gadhingalaj-6.27 and Warana-23.86, thousand metric tons, all sample units total molasses sale is 86.71, thousand metric tons and all sample average is 17.342, thousand metric tons. It also shows table no.6.1, Sr.No.5 total average compost sales in the study period is Datta-Rs.70.87, Kumbhi-Rs. 27.06, Gadhingalaj-Rs. 14.92, and Warana-Rs. 68.21 in lakh, all sample units total compost sales is Rs181.06 in lakh and all sample average is Rs. 36.212 lakh.

It also shows table no.6.1, Sr.No.8 average rectified sprit of distillery plant produced in lakh liter in the study period is Datta-100.15, Kumbhi-42.34, Gadhingalaj-38.16 and Warana-107 lakh liter, all sample units total rectified sprit produced is 287.65 lakh liter and all sample average is 71.9125 lakh liter. It also shows table no.6.1, Sr.No.8 total average rectified sprit sales in the study period is Datta-68.4, Kumbhi-10.12, Gadhingalaj-4.67 and Warana-52.19 lakh liter, all sample units total average rectified sprit sale is 135.38 lakh liter and all sample average is 33.84 lakh liter. It also shows table no.6.1, Sr.No.8 total average rectified sprit closing balance in the study period is Datta-16.2, Kumbhi-12.03 Gadhingalaj-14.4 and Warana-25.99 lakh liter, all sample units total rectified sprit sale is 68.62 lakh liter and all sample average is 17.155 lakh liter. It also shows table no.6.1, Sr.No.8 total average rectified sprit sales in the study period is Datta-Rs.1765.21, Kumbhi-Rs.243.09, Gadhingalaj-Rs.113.11 and Warana-Rs.1520.03 in lakh, all sample units total rectified sprit sales is Rs. 3641.44 in lakh and all sample average is Rs. 910.36 lakh.

It also shows table no.6.1, Sr.No.9 average SDS of distillery plant produced in lakh liter in the study period is Datta-18.59, Kumbhi-33.44, Gadhingalaj-30.34 and Warana-15.63 lakh liter, all sample units total SDS produced is 98 lakh liter and all sample average is 24.5 lakh liter. It also shows table no.6.1, Sr.No.9 total average SDS sales in the study period is Datta-19.01 Kumbhi-32.06 Gadhingalaj-30.24 and Warana-

15.18 lakh liter, all sample units total average SDS sale is 135.38 lakh liter and all sample average is 33.84 lakh liter. It also shows table no.6.1, Sr.No.9 total average SDS sales in the study period is Datta-Rs.355.54, Kumbhi-Rs.722.11, Gadhingalaj-Rs.651.96 and Warana-Rs.357.23 in lakh, all sample units total SDS sales is Rs. 2086.84 in lakh and all sample average is Rs. 521 lakh.

It also shows table no.6.1, Sr.No.10 average ODS of distillery plant produced in lakh liter in the study period is Datta-0.49, Kumbhi-0.7, Gadhingalaj and Warana is not produced ODS, all sample units total ODS produced is 1.98 lakh liter and all sample average is 0.29 lakh liter. It also shows table no.6.1, Sr.No.10 total average ODS sales in the study period is Datta-0.48, Kumbhi-0.69 all sample units total average ODS sale is 1.17 lakh liter and all sample average is 0.29 lakh liter. It also shows table no.6.1, Sr.No.10 total average ODS sales in the study period is Datta-Rs.11.52, Kumbhi-Rs.14.55, all sample units total ODS sales is Rs. 26.07 in lakh and all sample average is Rs. 6.51 lakh.

It also shows table no.6.1, Sr.No.11 average fusil oil of distillery plant produced in lakh liter in the study period is Datta-0.24, Kumbhi-0.01, Gadhingalaj and Warana is not produced fusil oil, all sample units total fusil oil produced is 0.25 lakh liter and all sample average is 0.0625 lakh liter. It also shows table no.6.1, Sr.No.11 total average fusil oil sales in the study period is Datta-0.23 , all sample units total average fusil oil sale is 0.23 lakh liter and all sample average is 0.057 lakh liter. It also shows table no.6.1, Sr.No.11 total average fusil oil sales in the study period is Datta-Rs.4.79, all sample units total fusil sales is Rs.4.79 in lakh and all sample average is Rs. 1.19 lakh.

It also shows table no.6.1, Sr.No.12 average Ethanol plant produced in lakh liter in the study period is Datta-9.24,and Warana-9.78 lakh liter, all sample units total ethanol produced is 19.02 lakh liter and all sample average is 9.51 lakh liter. It also shows table no.6.1, Sr.No.12 total average ethanol sales in the study period is Datta-9.81, and Warana-10.97 lakh liter, all sample units total average ethanol sale is 20.78 lakh liter and all sample average is 10.39 lakh liter. It also shows table no.6.1, Sr.No.12 total average ethanol closing balance in the study period is Datta-0.88, and Warana-1.78 lakh liter, all sample units total ethanol closing balance is 2.66 lakh liter and all sample average is 1.33 lakh liter. It also shows table no.6.1, Sr.No.12 total average ethanol sales in the study period is Datta-Rs.255.49 and Warana-Rs.225.06 in lakh,

all sample units total ethanol sales is Rs. 480.55 in lakh and all sample average is Rs. 240.27 lakh.

It also shows table no.6.1, Sr.No.13 average ENA plant produced in lakh liter in the study period is Warana-20.12 lakh liter, other sample units not produced ENA. It also shows table no.6.1, Sr.No.13 total average ethanol sales in the study period is Warana-19.91 lakh liter.. It also shows table no.6.1, Sr.No.13 total average ethanol sales in the study period is Warana-Rs.592.99 in lakh.

It also shows table no.6.1, Sr.No.14 average pulp plant produced in metric tons in the study period is Warana-775 metric tons other sample units not produced pulp. It also shows table no.6.1, Sr.No.14 total average pulp sales in the study period are Warana-762 metric tons. It also shows table no.6.1, a Sr.No.14 total average pulp sale in the study period is Warana-Rs.133.21 in lakh.

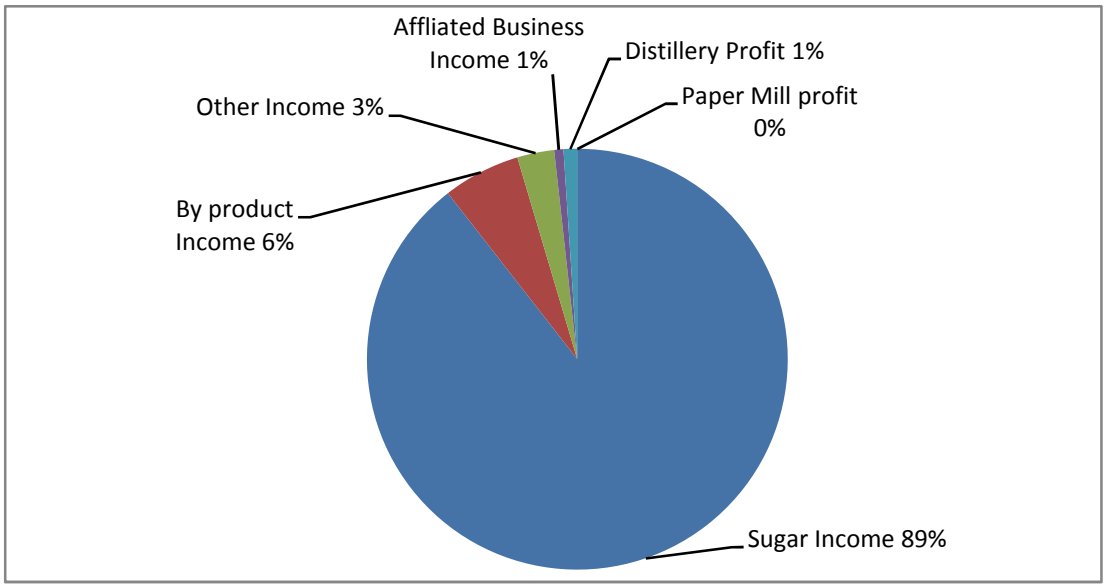
It also shows table no.6.1, Sr.No.15 Average lignosululphonate plant produced in metric tons in the study period are Warana-1039 metric tons other sample units not produced lignosululphonate. It also shows table no.6 Sr.No.15 total average lignosululphonate sales in the study period are Warana-950 metric tons. It also shows table no.6.1, a Sr.No.15 total average lignosululphonate sale in the study period is Warana-Rs.60.24 in lakh.

The table no.6.1, Sr.no.16 shows average man power utilization in by-product department Datta-77, Kumbhi-77, Gadingalaj-51 and Warana-142 in the study period. The total manpower utilization in by-product department is 347 and average manpower utilization is 86.

The table no.6.1, Sr. no.17 shows financial position in sugar factory and relation to by-product department. Average net sugar income in lakh are Datta-Rs.29298.08, Kumbhi-Rs.14968.83, Gadingalaj-Rs.8267.67, Warana- Rs.45151.87 and Rajaram-Rs.9753.15 in the study period and average all sample unit is Rs. 21487.92 lakh. Average net by-product income in lakh are Datta-Rs.2153.78, Kumbhi-Rs.783.06, Gadingalaj-Rs.382.2, Warana- Rs.3058.83 and Rajaram-Rs.740.01 in the study period and average all sample unit is Rs.1423.57 lakh. Average net average distillery profit in lakh are Datta-Rs.451.16, Kumbhi-Rs.270.22, Gadingalaj-Rs.154.82 and Warana- Rs.396.56 in the study period and average all sample unit is Rs.254.55 lakh. Sr. no.18 shows, Average net total income in lakh are Datta-Rs.32890.14, Kumbhi-Rs.16192.03, Gadingalaj-Rs.8915.43, Warana-

Rs.51512.73 and Rajaram-Rs.10579.08 in the study period and average all sample unit is Rs. 21487.92 lakh.

Pie digram No.6.1 Sr. No.17 shows all sample sugar factory average income by way of factory sugar income, factory by-product income, Other Income, Affiliated Business income, Distillery Profit.



The above table no. 6.1, Sr. no.19 shows average cost of production of distillery, ethanol and ENA per liter in Datta-Rs.20.11, Kumbhi-Rs.13, Gadhingalj Rs.15.72 and Warana-18.97 and all sample sugar factory total cost of Rs.67.80 and all sample sugar factory average cost of production of distillery Rs.16.95, Sr. no. 20 shows average cost of production pulp and lignosulfonate per M.T. of Rs. 34822.39 and Sr. no. 21 shows average loss of pulp and lignosulfonate project is Rs.215.14 and Sr.no.22 shows total average cost of production of by-products department are Datta-1956.93, Kumbhi-560.30, Gadhingalj-Rs.489.31 and Warana-Rs.2140.79 and all sample sugar factory total cost of Rs.5147.75 and all sample sugar factory average cost of production of distillery Rs.1286.93 in lakh.

The above table no. 6.1, Sr. no.23 shows total investment in fixed asset Datta-Rs.5065.06, Kumbhi-Rs.5793.43, Gadhingalj-Rs.3288.12 and Warana-Rs.2785.83 and Rajaram-Rs.2758.83 and all sample sugar factory total investment of Rs.39033.02 and average all sample sugar factory investment in fixed assets Rs.7806.60. The above table no. 6.1, Sr. no.24 shows total investment in fixed asset in distillery Datta-Rs.1158.80, Kumbhi-Rs.1439.89, Gadhingalj-Rs.1310.44 and Warana-Rs.4747 lakh

and all sample sugar factory total investment in distillery of Rs.8056.73 and average all sample sugar factory investment in fixed assets Rs.2014.18 lakh. Sr. no.25 shows total investment in fixed assets in ethanol unit Datta-Rs.140.12 and Warana Rs.106.82 lakh and total investment in fixed asset in ethanol unit Rs.246.82 and average investment Rs.123.47 lakh. Sr.no.26 shows average total investment in fixed assest in paper mill Rs.1027.29 lakh.

6.3 Conclusion:

Sugar industry is cyclic and is susceptible to the vagaries of nature. Moreover it is subject to various controls which restrict its profitability. These factors make it necessary to develop the concept of sugar mill By-product Mix Model which should consist of in addition to sugar i.e. distillery plant, ethanol plant, Extra Neutral Alcohol Plant, Co-generation plant all these plant to supplement the profitability of parent unit and take care of any fluctuation in the operation of sugar factory. The table no.6.1, Sr. no.17 shows financial position in sugar factory and relation to by-product department. An average net sugar income in lakh is Datta-Rs.29298.08, Kumbhi-Rs.14968.83, Gadingalaj-Rs.8267.67, Warana- Rs.45151.87 and Rajaram-Rs.9753.15 in the study period and average all sample unit is Rs. 21487.92 lakh. Average net by-product income in lakh are Datta-Rs.2153.78, Kumbhi-Rs.783.06, Gadingalaj-Rs.382.2, Warana- Rs.3058.83 and Rajaram-Rs.740.01 in the study period and average all sample unit is Rs.1423.57 lakh. Average net average distillery profit in lakh are Datta-Rs.451.16, Kumbhi-Rs.270.22, Gadingalaj-Rs.154.82 and Warana- Rs.396.56 in the study period and average all sample unit is Rs.254.55 lakh.

On the basis Table no.5.59 it is noted that distillery is one of the important income source centre in sample sugar factories. By producing ethanol and ENA plant sugar factories can earn considerable amount of income when market demand. Because of Distillery and Ethanol plant Datta Distillery doing very well at present in these sample sugar factories in relation to average profit making and Warana is second unit. The profit and total Capacity of distillery ratio is calculated in percentage is also as follow.Datta-451.16/270*100=167.09 percent, Kumbhi-270.22/90* 100=300.00 percent Gadinghalaj-154.82/75*100=206.72 percent, Warana-307.73/435 *100=70.72 percent.

Because of this calculation with capacity utilization to distillery profit is found Kumbhi highest capacity utilization in its small plant and lowest total capacity utilization is found in Warana. Fro better financial and economical performance Datta distilleries and its ethanol plant and Warana distilleries and its ethanol and ENA plants should efficiently use their capacity utilization. And also it will reduce cost of production and increase income from distilleries by-products.

The table no.5.58 indicates average net by-product income including distillery profit in percentage. The average net by-product income including distillery profit in all sample sugar factories 7.07 percent. The average net by-product income including distillery profit of Datta-8.64 percent, Kumbhi-6.74 percent, Gadinghalaj-6.45 percent, Warana-6.66 and Rajaram-6.85 percent. The highest net by-product income including distillery profit was found in Datta-8.64 percent and lowest in Gadingalaj-6.45 percent. For better financial and economical performance all sugar factories and its distillery units increased net by-product income including distillery profit about 10 percent.

Testing of hypotheses no.4. By-Products production mix is not up to the mark in sample units. (Rejected this hypothesis on the basis table no.6.1, 5.59, and 5.58)

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CHAPTER - VII
CONCLUSION AND SUGGESTIONS

Chapter Design

The chapter has covered conclusion and Suggestions parts on the basis of Research study and derived models.

7.1 Conclusion:

It is concluded that sugarcane is a renewable, natural agricultural resources because it provides sugar, besides bio fuel, fiber, fertilizer and myriad of by- products with ecological sustainability.

1. It is summarized sugarcane is the most versatile crop which provides tremendous potential to the sample sugar factory to manufacture main product sugar and also produce the main by-products of sugar industry are bagasse, molasses and press mud. (Ref. T. N. 4.1, 4.2, 4.3, 4.4, 4.5)
2. It is concluded that all the sample sugar factories total production of bagasses, molasses and press mud is mainly depends upon quantity of sugarcane crushed for the manufacture of sugar and the available quantity of sugarcane to the factory and crushing capacity of the factory. (Ref. T. N. 1.5, 1.7, 1.9, 1.11, 1.13)
3. It is concluded that all the sample sugar factories bagasse production depending on the fiber content of cane, maturity of cane, the methods of harvesting, and the efficiency or capacity of the sugar plant and bagasse percentage on cane crushed. (Ref. T. N. 1.5, 1.7, 1.9, 1.11, 1.13, 4.1, 4.2, 4.3, 4.4, 4.5)
4. It is summarized that all the sample sugar factories molasses production, depends on the total quantity of sugarcane crushed, capacity of the sugar plant, quality of sugarcane, the quality of juice obtained, the type of juice clarification, boiling techniques adopted and molasses percentage on cane crushed. (Ref. T. N. 1.5, 1.7, 1.9, 1.11, 1.13, 4.1, 4.2, 4.3, 4.4, 4.5)
5. It is concluded that all the sample sugar factories the quantity of press mud depends on the extent of impurities (non-sugar) present in juice, the process of clarification adopted and cane crushed and capacity of the plant. (Ref. T. N. 1.5, 1.7, 1.9, 1.11, 1.13, 4.1, 4.2, 4.3, 4.4, 4.5)

6. It is observed that bagasse is very commonly used as fuel in boilers in sample sugar factories for production of steam. The steam is used in the processing of sugarcane to sugar in the factory and also steam is also used by-products department for processing. Datta sugar factory started co-generation project on bagasses based to produce electrical power i.e. cogeneration. Electricity used sugar factory and by-products department and also sugar mills colony. The surplus power from sugar factory is sold State Electricity Board in its GRID for distribution. Warana sugar factory bagasses are used as raw material for its pulp plant for the production of pulp. All the sample sugar factories surplus available bagasse is sold out and gets income. (Ref. T. N. 4.29, 4.30)
7. It is summarized that all the sample sugar factories molasses in the second important by-products. All these sugar factories give income by way of selling molasses. It is also concluded that major constituent of molasses is sugar is more precisely "Sucrose" with varying proportions of glucose and fructose. In sample sugar factories Datta, Kumbhi, Gadinglaj, and Warana sugar factoies molasses can be converted into many value added products produced by distillery plant, ethanol and ENA plant. Because of this factory important advantage of generating reasonable profits. (Ref. T. N. 4.13, 4.15, 4.17, 4.18)
8. It is concluded press mud is another important by-products of sample sugar factories. All these sample sugar factories givers income by way of sale of press mud. Recently Datta, Kumbhi, Gadingalaj and Warana sugar factory press mud used by the factory by composting technique. Composting of press mud with the distillery effluent (spent wash) to increase the manorial values of press mud. All these sugar factories compost can be sold to the farmers and substantial amount of income can be generated. (Ref. T. N. 5.30)
9. Effective and efficient working of any sugar factories distilleries depend on a large extent of the abundant supply of molasses. The high C.V. values (table no.4.13, 4.15, 4.17, 4.18) of molasses used in all sample distilleries indicate more fluctuation in the molasses used. Sufficient supply of sugarcane molasses depends on total quantity of sugarcane crushed, capacity of the sugar factory, molasses percentage on cane crushed and market price of molasses. (Ref. T. N. 1.5, 1.7, 1.9, 1.11, 1.13)

10. The capacity utilization is the most important factor in reducing the production cost, optimum capacity utilization results in reducing the use of oil, lubricant and process chemicals etc. The capacity utilization has its impact on their technical and financial performance. The better utilization of the rated capacity in an index of better performance. In the study period three sample sugar factories distilleries shows higher C.V. value Datta-23.20, Kumbhi-19.16, and Gadhinglaj-16.04, and Warana-11.46 indicate more variations in the capacity utilization. (Ref. T. N. 4.13, 4.15, 4.17, 4.18)
11. It is indicated that in sample sugar factories by-product department i.e. distilleries, Ethanol plant, ENA plant its shows overall performance is not up to the mark. The distilleries of sample units capacity utilization based on 300 days, but all the sample distilleries average working days on 199-days only. And also average capacity utilization of distilleries only 59.43 and Datta Ethanol plant only average working 35 days and average capacity utilization 10.27% and Waran Ethanol plant average working days is 47 and average capacity utilization on 11.50% and ENA plant average working days only 29 and mean value of capacity utilization only 10.30%. it shows that all sample units underutilization of the plant. (Ref. T. N. 4.23, 4.24, 4.20, 4.21,4.22)
12. The total alcohol production depends on large extent on the average recovery of alcohol per metric tons of molasses and total molasses used in the distilleries plant. In the study period all sample distilleries total alcohol production show high C.V. value indicate more fluctuation in these elements. Also the average recovery of alcohol per meteric ton of molasses all the sugar factories distilleries shows lower C.V. value (table indicates more stability in the average recovery. Alcohol recovery is the most vital economy indicator of any sugar factories of distilleries. Recent development yield per ton of molasses ranges from 240 liters to 280 liters. (Ref. T. N. 4.13, 4.15, 4.17, 4.18)
13. Molasses has been used in India to produce rectified spirit and alcohol of about 90% purity for producing liquor for human consumption and for producing various chemicals. However with technological development in the recent past, molasses has been effectively used to produce bio-ethanol for blending with petrol as a fuel. (Ref. T. N. 4.20, 4.21, 4.22)

14. The distillery industry today consists broadly of two parts; one is potable liquor and the industrial alcohol anhydrous ethanol for blending with petrol. The potable industry producing Indian Made Foreign Liquor and Country Liquor has a study but limited demand with a growth rate of about 7-10 percentage per annum. The industrial alcohol industry on the other hand is showing a decline trend because of high prices of molasses which is irregularity used as subtract for production of alcohol. The alcohol production is now being utilized in the ratio of approximately 52 percent for potable and the balance 48 percent for industrial and ethanol for blending with petrol use.
15. It was accepted by the Government in 2006, that a mandatory 5% ethanol blending with petrol (EBP) programme and now 10% accepted would directly benefit the sugarcane farmers by assuring the sugar industry a stable and reasonable return for the molasses and then passing a significant part of the same to the farmers.
16. Since the EBP program me was conceived to directly benefit the sugarcane farmers, the ministry of Petroleum and Oil Marketing Companies (POMC) put a specific condition in September 2010, for procurement of ethanol for blending with petrol. As these conditions ethanol should be produced from domestic molasses only. It therefore required that molasses or alcohol cannot be imported by the ethanol producers and the ethanol will have to be produced only from molasses and not sugarcane juice or food grains.
17. Ethanol and alcohol production in India depends largely on availability of sugarcane molasses. Sugarcane production in India is cyclical, ethanol production also varies with sugar and sugarcane production and therefore does not assure optimum supply levels needed to meet the demand at any given time. Lower sugar molasses availability and consequent higher molasses prices affect the cost of production of ethanol.
18. It is studied that by the researcher that in sample co-operative sugar factories attached by-products units systematic planning were not found. Because of causes arises in the way of machinery failure, lack of business mind, not sufficient provide steam and electricity to the by-product units hence by-products units of sample sugar factories are not working efficiently and economically.

19. It is also found that the researcher that in sample by-products units not received quality certification its own products and not received brand name. Also not work out Research and Development department separately in the sample sugar factory and its by-products units. Because of this reason sample sugar factories and its units not awareness in this new policies.
20. Research and development programme namely quality production, training , demonstration and marketing functions not found in sample by-products units.
21. Table no.4.23 all the sample sugar factories average working duration is199 days and all the sample sugar factories its higher C.V. value indicate more fluctuation in the production days. The working duration of the distilleries largely depends on availabilities of molasses and molasses supply and demand depend on market price of molasses, rectified sprit, and extra natural alcohol. (Ref. T. N. 4.13, 4.15, 4.17, 4.18)
22. Effective and efficient working of any sugar factories distilleries depend on a large extent of the abundant supply of molasses. The high C.V. values of molasses used in all sample distilleries indicate more fluctuation in the molasses used. Sufficient supply of sugarcane molasses depends on total quantity of sugarcane crushed, capacity of the sugar factory, molasses percentage on cane crushed and market price of molasses. (Ref. T. N. 4.13, 4.15, 4.17, 4.18)
23. It is studied by the researcher that in sample co-operative sugar factories attached by-products units systematic planning were not found. Because of causes arises in the way of machinery failure, lack of business mind, not sufficient provide steam and electricity to the by-product units hence by-products units of sample sugar factories are not working efficiently and economically.
24. It is also found the researcher that in sample by-products units not received quality certification its own products and not received brand name. Also not work out Research and Development department separately in the sample sugar factory and its by-products units. Because of this reason sample sugar factories and its units not awareness in this new policies.

25. Research and development programme namely quality production, training , demonstration and marketing functions not found in sample by-products units.
26. Sample distilleries attached to sugar factory good solution as filler material in the form of press mud (raw material) is readily available for composting plant. This plant negligible power requirement and zero effluent discharge to inland watercourses.
27. The sample sugar factory attached compost plant produced is rich organic and inorganic nutrients and also micronutrients. It can be further enriched with micronutrients to improve its manure value. Because compost can be sold to farmers and substantial amount of income can be generated.
28. Bio-composting is most suitable for distilleries attached with sample sugar factories. Composting fertilizers demanded from farmers is excellent. Four sample sugar factories operated no loss and no profit basis these plant. (Ref. T.N.4.28)
29. It is indicated that availability of press mud may pose a major constraint in sample sugar factory distilleries. The transportation of press mud from nearby sugar factory or supplementing with alternate filler material such as trash, bagasse or other suitable agro-residues etc. may overcome this difficulty. During rainy season aerobic composting may have to be discontinued. (Ref. T.N.4.28)
30. The sample sugar factory distilleries indicated that zero discharge can be achieved through bio-composting project is carried out under truly aerobic conditions. No odour or fly nuisance. The finished product is entirely free from any repulsive odour. It offers destruction of the effluent, high product value with quick payback, dry bag able product and easy to handle and transport. (Ref. T.N.4.28)
31. Warama sugar factory for getting benefit from by-product karakhana has installed bagasse based pulp and paper mill. Warana sugar factory study period paper mill department let out to other private owner. Only study period pulp department is working under the control Karkhana management. Also the factory Sodium Lignosulphonate is produced from black liquor in sugar factory it is another by-product of the sugar factory. (Ref. T.N.4.29)

32. Warana Pulp department 20 TCD per day plant annual production capacity is on 300-days is (6000 M.T.) and lignosulphonate project 8 TCD per day plant annual production capacity is (2400 M.T.) but these two plat utilized very low capacity used. Because of this plant shows high cost of production increased in the study period. (Ref. T.N.4.29)
33. Datta sugar factory Co-generation project on BOOT helps non-requirement of equity and loans, as well as liability to repay, very limited risk. Also benefited steam and power supply to sugar factory, distillery and colony, (Table no.4.30 shows power consumed by sugar factory and distillery in the year 2011-12 is 300.24 lakhs units and year 2012-13 is592.00 lakhs units.) during season and off-season, free of any cost.
34. Because of co-generation project savings in office and management cost, improved crushing, improved quality and availability of power in commend areas, additional revenue to farmer shareholders by way of royalty and improved commercial viability of sugar factories.
35. Researcher found the main by-products of bagasses marketing in the sample co-operative sugar factories its sales data indicate C.V. value is high shows (table no.5.6) that higher fluctuation in the quantity of bagasses, rate per ton of bagasses and total sales income. Also found that the sample sugar factories Datta (3.28:1), Kumbhi (12.30:1), Warana (2.97:1) and Rajaram (not seen closing balance) its turnover of bagasses sales shows higher it is indicated that maximum sales turnover is obtained by investing minimum possible funds in the inventory which is a sign of better performance of the sales bagasse. Gadhingalaj (0.98:1) sugar factory found it low turnover ratio of bagasse sales, it shows this sugar factory marketing policy is not effectively implemented.
36. It is found that the price of bagasses will depends on the supply and demand position in crushing period. During the year, when there is bumper crop of sugarcane and abundant supplies of sugarcane are made available to the sugar factories, large quantities of bagasse will be saved. In these circumstances naturally the price of bagasse will go down due to availability of surplus bagasse in large quantities. During the years of lean crop of sugarcane due to less crushing the bagasse saved also be less and hence the price of bagasse will be high.

37. The marketing of by-product molasses in the sample cooperative sugar factories sales data C.V.(table no 5.12) is higher found, its indicated higher fluctuation in the quantity of molasses sales, rate per ton of molasses and total incomes from sale of molasses. Also researcher found that the sample sugar factories molasses turnover ratio is high, it is indicated that maximum sales turnover is obtained by investing minimum possible funds in the inventory which is a sign of better performance of the sales molasses. (Ref. T.N.5.12)
38. Researcher found that the 10th June 1993 the Central Government on India relaxed control movement on molasses and started decontrol policy in relation to molasses. From this year the price of molasses in India generally fluctuated from time to time, depending on the policy of the Central Government and State Government and supply and demand position of molasses.
39. It is found that researcher sample co-operative sugar factories are not use new marketing technique for sale of by-products of distilleries. The sugar factories are only using tender method for selling off by-products and ethanol selling only Indian Oil Marketing Companies contracted price. Also researcher found that the alcohol market research, and competitors study has not followed by sample cooperative sugar factories. Because all these reason are affecting on sample cooperative sugar factories and distilleries profit and financial returns.
40. It is found that the State and Central government has put number of restrictions and procedural hurdles as on sample cooperative sugar factories its by-products such as non issued of export permits for interstate transport of molasses and ethanol, delays in issuing no-objections certificates(NOC), higher taxes and levies across different states have impacted the ethanol blending programme, rules and regulations, including a high excise tax of Rs.750 per ton of molasses, which works out to 25 to 30 percent ad valorem, whereas on industrial alcohol the central excise duty is 12.36 percent ad valorem and interstate (octroi) taxes applicable to potable alcohol for industrial use are equally applicable to ethanol for blending with gasoline, there by severely constraining its availability and utilization for ethanol blending programme. All these reasons are affecting on sample cooperative sugar factories and its by-products units by way sales, increased cost of finished product, low profitability.

41. It is found that the researcher sample cooperative sugar factories and its by-products not working its own marketing department and advertising system is used only news papers and periodicals for the by-products sales and also not used brand name for its alcohol products, not offering price discount on sales. Because all these reason affects on its by-products sales and income.
42. It is also found cost of production of lingnoslfonate and pulp department is very high because because lingnoslfonate and pulp department suffer loss in sales in study period. (Ref. T.N. 5.66)
43. The sample sugar factories composting has come to be accepted as one of the good solutions to the problem of distillery effluent treatment. Because of composting technique applied by the factory achieve zero liquid discharge.
44. Above data of composting sales data indicates sample sugar factories composting fertilizer sold to farmers and very small income can be generated by the factory. It shows the ratio of the mean value of Composting sales to the mean value of cane crushed lakh metric tone by the factory Datta:70.87/11.08=Rs.6.39, Kumbhi-27.06/5.36=5.04, Gadubghlaj-14.92/3.23=4.61 and Warana-68.99/ 12.51=5.51 it found very small returns by way of composting per metric ton cane crushed. (Ref. T.N. 5.27, 5.28, 5.29, 5.30)
45. Composting fertilizer more demand from the factory command area farmers. Because of the factory very low rate of per tons of composting fixed by the factory. (Ref. T.N. 5.27, 5.28, 5.29, 5.30)
46. It is found in sample sugar factories and by-products department manpower power recruitment system unsatisfactory. It is observed that majority of employees are recruited direct by management. “The creation of employment in the command area of the factory” is the motto of sample co-operative sugar factories, past recruitment policy was right for the mixed economy conditions. But now sample co-operative sugar factories have to face free economy policy, international competition ect. It is therefore there is no any alternative to follow scientific recruitment policy.
47. In sample sugar factories supervisory staff was selected only on the interview test and the selection of workers without any test. It is found that in sample sugar factories and by-products department manpower selection method unsatisfactory. In the sample sugar factory majority of manpower utilized

local rural area and directors relatives therefore the workers not work seriously in the factory. Also researcher found that the manpower selection process used in sample co-operative sugar factories and its by-products department is not proper because it is mostly influenced and the bases for selection process are not considered seriously.

48. In the sample co-operative sugar factories and its by-products department manpower lack of training and development programme. It is found that in sample sugar factories supervisors and workers were given only on the job training, lecture method and VSI training programme. For increasing work efficiency and more accuracy training is essential for manpower and newly recruited workers. Majority of work force had not given single trainings, hence increasing work efficiency and adopt modernization, periodic refreshing trainings should be given to all employees.
49. The table no.5.46 shows the average current ratio of sample co-operative sugar factories were Datta-1.92:1, Kumbhi-2.14:1, Gadingalhaj-1.62:1, Warana-2.27:1 and Rajaram-2.79:1 respectively and all sugar factories average-2.15.1. The mentioned table and other observation the researcher has found that only one sugar factories i.e. Gadingalhaj sugar factory shortage of working capital. This factory indicates had not been able to meet the current liabilities out of its current assets. Datta sugar factory normally low current ratio and Kumbhi, Warana, and Rajaram sugar factories satisfactory current ratio.
50. It is concluded that the sample sugar factories, it is found that average debt equity ratio was more, it is average ratio is 6.20:1 it indicates that more amount of borrowed capital as compared to own capital. All sample sugar factories shows debt equity ratio were Datta-4.39:1, Kumbhi-6.54:1, Gadinghalaj- (-4.65:1), Warana-10.30:1 and Rajaram-14.45:1 respectively. This is the ratio of internal or shareholders fund and external capital. It is indicated Datta, Kumbhi, Warana and Rajarm sugar factories very high debt equity ratio. Gahinghalj sugar factory mines debt equity ratio shows it means this factory not borrowing capacity. Greater debt equity ratio indicates that the creditor's investment in the business is more than the owners.(Ref. T.N. 5.47)

51. On the basis Table no.5.59 it is noted that distillery is one of the important income source centre in sample sugar factories. By producing ethanol and ENA plant sugar factories can earn considerable amount of income when market demand. Because of Distillery and Ethanol plant Datta Distillery doing very well at present in these sample sugar factories in relation to average profit making and Warana is second unit. The profit and total Capacity of distillery ratio is calculated in percentage is also as follow.Datta-451.16/270*100=167.09 percent, Kumbhi-270.22/90*100=300.00 percent, Gadinghalaj-154.82/75*100=206.72 percent, and Warana-307.73/435*100=70.72 percent. Because of this calculation with capacity utilization to distillery profit is found Kumbhi highest capacity utilization in its small plant and lowest total capacity utilization is found in Warana. Fro better financial and economical performance Datta distilleries and its ethanol plant and Warana distilleries and its ethanol and ENA plants should efficiently use their capacity utilization. And also it will reduce cost of production and increase income from distilleries by-products.
52. The table no.5.58 indicates average net by-product income including distillery profit in percentage. The average net by-product income including distillery profit in all sample sugar factories 7.07 percent. The average net by-product income including distillery profit of Datta-8.64 percent, Kumbhi-6.74 percent, Gadinghalaj-6.45 percent, Warana-6.66 and Rajaram-6.85 percent. The highest net by-product income including distillery profit was found in Datta-8.64 percent and lowest in Gadingalaj-6.45 percent. For better financial and economical performance all sugar factories and its distillery units increased net by-product income including distillery profit about 10 percent.

7.2 Suggestions:

1. It is suggested that sugar factories cannot survive only on the basis of sugarcane to sugar. To reduce the cost of production of sugars by utilization the by-products of the sugar factory in a more profitable manner.
2. It is suggested that to produce more products from sugarcane instead of just one product i.e. sugar, which means integral utilization of sugarcane and their derivatives.

3. It is suggested that by introducing energy conservation measures in the sugar factories to reduce steam consumption and thereby reduce the consumption of bagasses as fuel, resulting in surplus bagasse for diversion to the other by-products industries.
4. Higher percentage of molasses is more sugar percentage is going in molasses. It is direct loss of sugar. Therefore final molasses purity should be as low as possible. The molasses purity below 30% is considered as satisfactory.
5. It is suggested that low rate of press mud on cane crushed maintain through the proper cleaning of sugarcane, removing cane binding material before process, using mud setting modern pots and technology in the sugar factory.
6. It is suggested that using press mud to produce bio-gas which is clean and cheap fuel. It contains 65-75 percent methane. It can be produced using the press mud in a bio-gas plant through a process is called "Digestion" Thus press mud helps in obtaining both fuel and manure from the same quantity of press mud. It is a non-convention energy source. The Central and State Government encouraging this programmes.
7. It is suggested that increased working days of distilleries through availability of molasses in a sufficient quantity. And also the sample sugar factory increased molasses through increased quantity of sugarcane crushed, more capacity utilization of sugar factory, available quality sugarcane and increased sugar production.
8. Need to achieve maximum utilization of plant capacity By-products department depends on its sugar factory, hence firstly sample sugar factory must use its capacity 100% and above. Because of By-products department sufficient molasses available for the production of alcohol. Then the by-product department tries to achieve maximum utilization its plants. The underutilization of plant capacity had increased the cost of alcohol, ethanol, ENA and other by-products in distillery. Therefore the sample sugar mills should implement the sugarcane development programs continuously so as to have adequate and regular supply of sugarcane and also to adopt preventive measure for avoiding the mechanical and electrical faults. Underutilization of plant capacity which leads to higher

cost of alcohol production. Therefore the by-products departments should concentrate more on efficient utilization of plant capacity.

9. The Central Government and State Government remove the further difficulties such as procedural hurdles such as non-issuance of export permit for interstate transport of ethanol, delays in issuing no-objection certificate (NOC), higher taxes and levies across different State have impacted the EBP. Rules and regulation, including a high excise tax of Rs.750 per ton on molasses, which works out to 25 to 30 percent and valorem, industrial alcohol the central excise duty is 12.36 percent and valorem, and interstate (octroi) applicable to potable alcohol for industrial use are to equally applicable to potable alcohol for industrial use are equally applicable to ethanol for blending with gasoline there by several constraining its availability and utilization for EBP.
10. In the sample sugar factories three (Kumbhi, Gadhinglaj,and Rajaram) unit is a small plant hence these factory increased plant capacity and get the benefit of the Government of India is offering subsidized loans (through Sugarcane Development Fund) to sugar mills for setting up on an ethanol production unit. The loans provide again this scheme up to a maximum of 40 percent of the project cost.
11. It is suggested that small sugar plant have made expansion in the capacity of factory and by-product unit, modernization their technology and machinery and set up facilities to better utilization of their by-products bagasse and molasses, generate power and produce ethanol respectively. All these activities implemented through Sugar Development Fund in making sugar factories and its by-products department more viable and improving sugarcane varieties in several areas which give better yield and recovery as well as make the mills more efficient.
12. It is suggested that alternate agro waste such as bagasses, sugarcane trash, coconut coir etc. also can be used in combination with press mud (about 20:80 ratio of alternate agro waste to press mud). This can be practiced in distilleries having shortage of press mud so as to meet the material balance.

13. As per the Central Pollution Controls Board guidelines distilleries having bio-composting system are allowed to work only for 270 days. This will allow the distilleries to work for about 330-days.
14. It is suggested that Bio-composting is most suitable for distilleries attached with sugar factory. Strict follow-up and certification of availability of filler material and final product produced is essential.
15. It is suggested that providing subsidy and soft loan bio-composting machinery to the distilleries attached to sample sugar factories from the State and Central Government.
16. For better utilization Pulp and lignosulphonate project of Warana sugar factory well planned for utilized its capacity. Otherwise this plant lease to other industry.
17. At present Datta Co-generation project working only crushing season of sugar factory. But the co-generation plant was designed to operate 330 days per year. It is suggested that co-generation project working above 130 days during the crushing season and 90 days on saved bagasse in the off-season period. The rest of the time it will run on purchased bagase or coal.
18. For better bagasse sales and stability in sales sample sugar factories adopt professional approach for marketing of bagasse, study the market research and also competitors study.
19. Saving bagasse quantity increased by 4 to 5 percent in the factory and all these bagasse used in cogeneration to produce steam as well as electricity for the factory. Also factory current period the modernized technology may be used for factories which will be useful and beneficial. Due to this modernization the use of steam is decreased up to 37.36 percent
20. For better price of molasses the Central and State Government remove the further difficulties such as procedural hurdles such as non-issues of export permits and ban on inter State transport of molasses and minimise rules by sales and regulations and decreased excise tax and inter State tax.
21. For better price of molasses and stability in sales sample sugar factories adopt professional approach for marketing of molasses, study the market research and also competitors study.
22. The ethanol supply will be stabilised or assured uninterrupted supply can be ensured for blending with petrol.

23. The state owned Indian Oil Marketing companies propose to purchase ethanol at a minimum purchase price (MMP) based on the actual cost of production and import price of the ethanol. In the case of ethanol the MMP should be linked to the prevailing retail diesel price.
24. Given the projection for higher sugarcane production these situation of lower sugarcane prices these condition diversion of sugarcane juice for ethanol production may boost up the situation. The government policies might be changed towards the support of ethanol production.
25. Research and Development for mixing of ethanol in petrol will be carried out and mixing increased up to 10 to 15 percent.
26. Current situation the increase the rate of alcohol (Rectified sprit rate per litre-Rs32 to Rs33) and molasses (molasses price PMT-5000) the production expenditure of ethanol becomes in about Rs.36 to 37 per litre. So that the is difference in between production rate or contracted price and sale rate and hence as per current rate of ethanol the supply of it is impossible to its producers. Therefore the ethanol producers Current year i.e. also Datta and Warana ethanol plant less quantity is produced. Hence Dr.Saumitra Chaudhari Committee recommended that the Central Government should connect the prices of ethanol to petrol. The Government increased the ethanol price up to Rs.36 to Rs.37.
27. The sample sugar factories may expand new lines or contract the old marketer for sale of distillery by- products and after the existing product or develop new uses for the existing products.
28. It is researcher suggested that pulp and lingnoslfonate department increased production in the plant by way of increased capacity utilization and reduced cost of production. It is also the study the market condition of pulp and lignoslfonate product.
29. It is suggested that the finished product is entirely free any repulsive odour. The composting department is prepared dry bag able product that is easy to handle and transport.
30. It is suggested to sample co-operative sugar factories and its by-product department that the use of various methods of recruitment is essential for overall development of the factory and its by-products department. Technical and managerial staff should be recruited through scientific

method and non technical and seasonal workers recruited through traditional methods.

31. It is suggested to sample cooperative sugar factories and it by-products department that they should consider Trainings and Development is basic need of the by-products in the dynamic conditions because vast technological changes are coming in the production process. So it is necessary to update the knowledge of employees through Training and Development programmes.
32. Various types of Training and Development programmes should be organized for different technical, supervisory and workers etc. The use and impact of Training and Development programmes should have to be studied carefully for its better result.
33. The purpose of organising Training and Development programmes should be for increasing productivity and to create awareness in the mind of employees about objective and importance of work.
34. All sugar factories should matins 2:1 current ratio for making prompt payment against current liabilities and sugar factories should try to minimize the current liabilities. All sample sugar factories more attention to current assets and double it to its current liabilities if possible.
35. For better working and efficiency debt equity ratio is 1:1, is required. All the sample sugar factories should minimize debt equity ratio and all sugar factories should increases their own capital.
36. **Gadinghalaj:** This factory is net worth mines in whole study period because this factory not matins Current ratio also last two years in study period very low current ratio hence this factory did not meet day to day transitions. Also Debt equity ratio is also is mines shows in whole period it is found this unit financial problem. In the process of decontrol non performing this units or small units not survive, they have closed or such units need to be given on lease or merged with bigger units.

Examining the objective:

Objectives	**Reference table number.**	**Outcume**
1.To know the growth and development of sugarcane By-products industries and their ancillaries.	1.5, 1.7, 1.9, 1.11, 1.13, 2.1, 2.3, 2.4, 2.7, 2.8, 2.9, 2.10, 2.11, 2.13, 2.14, 2.15, 2.16, 2.17, 2.23, 2.24, 2.25, 2.26, 2.27, 2.28	It indicate growth and development of sugarcane by-product industries.
2.To examine the financial position of the co-operative sugar factories and its departments of By-products.	5.36, 2.37, 5.38, 5.39, 5.40, 5.41, 5.42, 5.43, 5.44, 5.45, 5.46	It indicate financial position of sample sugar factories.
3.To study the economics of by-products in sample sugar factories.	5.60, 5.61, 5.62, 5.63, 5.64, 5.65, 5.66	It shows cost of by-product of sample sugar factories
4.To study the functional areas like production, marketing, finance and Human Resource of by-products production in the sample units.	4.1, 4.2, 4.3, 4.4, 4.5, 4.13, 4.15, 4.17, 4.18, 4.20, 4.21, 4.22, 4.29, 4.30, 4.31, 5.1, 5.2, 5.3, 5.4, 5.5, 5.7, 5.8, 5.9, 5.10, 5.11, 5.13, 5.14, 5.15, 5.16, 5.17, 5.18, 5.19, 5.20, 5.21, 5.22, 5.23, 5.24, 5.25, 5.26, 5.27, 5.28, 5.29, 5.30, 5.36, 2.37, 5.38, 5.39, 5.40, 5.41, 5.42, 5.43, 5.44, 5.45, 5.46, 5.32 to 5.35	It shows the functional areas. 1. It shows production performance of sample sugar factories and its by-products department. 2. It indicate marketing position of sample sugar factories by-products. 3. It indicate the financial position of sample sugar factories. 4. It shows manpower utilization of by-product deparment sample sugar factories.
5.To know the financial liability of the by-products in sample sugar factories	5.36, 2.37, 5.38, 5.39, 5.40, 5.41, 5.42, 5.43, 5.44, 5.45, 5.46	To stduy the financial liability of the sugar factory and by-products department.
6.To suggest product mix model to sample sugar factories	Chapter no.VI	It shows product mix model for future study.
7. To draw conclusion and appropriate suggestion, if necessary	Chapter no.VII	conclusion and appropriate suggestion

Testing of hypothesis :

Hypothesis	**Reference Table Noumber**	**Hopothesis tested Outcome**
1.Co-operative sugar factories are suffering from the losses due to high cost of production and low productivity in relation to by-product units.	5.60, 5.61, 5.62, 5.63, 5.64, 5.65, 5.66, 4.20, 4.21, 4.22, 4.26	High cost of production– ***Null hypothesis is accepted*** Low productivity- ***reject this hypothesis***
2.Low level of efficiency is found at various By-product departments	4.13, 4.14, 4.18, 4.20, 4.21, 4.22, 4.24	***Null hypothesis is accepted***
3. The functional areas of management like production, marketing, finance and HR are weak in the by-products sample units	4.20, 4.21, 4.22, 4.26. 5.1-5.5, 5.7-5.11, 5.13-5.30. 5.46, 5.47 5.32, 5.33,5.34, 5.35	***Functional areas:*** ***a)Production: reject this hypothesis*** ***b)Marketing:Null hypothesis is accepted*** ***c)Finance: Null hypothesis is accepted*** ***d) Manapower Utilization: reject this hypothesis***
4. By-Products production mix is not up to the mark in sample units.	6.1	***hypothesis is reject.***

Annexure I
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A. Books:

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Annexure – II

Researchers List of Publication

1. Research article published in the "Vivekanand Research Journal" in January-2013 "साखर उद्योगापुढील समस्या व उपाय" ISSN: 2249-295X , VOL-II, NO.2
2. Research article Published in Bharti Vidyapeeth and Yashwantrao Mohite College, Pune in association with Maratha Chamber of Commerce, Industries and Agarculture, Pune Conclave Proceeding held on 13th Feb. 2013 ISBN 978-81-923438-3-9. Title of the article "Vocationalisation of School Education.
3. Research Article published in Bharatiya Sugar, SOUVENIR , 1st Annual Convension-2013 on Sugarcane Agriculture And Sugar Technology. Title of the article "Sugar Decontrol Policies Challenges."
4. Research Article published in "Bharatiya Sugar" Journal September 2013, ISSN 0970-6240. Title of the article "Sugar Decontrol Policies Challenges."
5. Research Article published in "Bharatiya Sugar" Journal January- 2014, ISSN 0970-6240. Title of the article "Indian Sugar Industry Problems and Opportunities."
6. Research Article published in Bharatiya Sugar, SOUVENIR , 2nd Annual Convension-13th and 14th October 2014, on Sugarcane Agriculture And Sugar Technology. Title of the article "Study of Performance of Distilleries affiliated to co-operative sugar industry in Maharashtra.

Annexure III

Questionnaire

Research Topic :- "An Analytical Study of By-products of Sugar Factories with Reference to Kolhapur District."

Researcher :- _____

(The Questionnaire is prepared to collect information related to sugar industries for the purpose of Ph.D. research work. Your personal details and feedback will not be used for any other purpose and will be kept confidential. This is only for academic research work.)

Questionnaire : Sugar Industries

Note :-

1. Please tick mark (√) on appropriate alternative.
2. Rate the questions according to your satisfaction level by using 4/5/6 point likert type scale.

A. Organization Profile :-

Q. 1. Name of the sugar factory : _____

Q. 2. Address for correspondence : _____

Q. 3. Location of the factory from Kolhapur city : East / West / South / North / Center.

Q. 4. Types of organization : Private /Co-operative / Public sector.

Q. 5. Date of establishment :- _____ & Registration Number : - _____

Q. 6. Taluka / District :- _____

Q. 7. Website :- _____

Q. 8. E-mail :- _____

Q. 9. Phone / Mobile No :- _____

Q. 10. No. of working days in a year :-

a) Below 100 b) 100-125 c) 126-150 d) 151-175 e) 175 & above

Q. 11. Total project cost Rs.

.....

Q. 11. By-product Unit :-

Name of the By-Product unit	Yes/No	Date of Establishment	Project cost in Rs.
Distillery unit	Yes/No		
Ethanol unit	Yes/No		
Co-generation unit	Yes/No		
Paper mill	Yes/No		
Other	Yes/No		

B. General Information :-

Q. 12. Factory capacity :-

Particular	Approved	Actual
Sugar -TCD		
Distillery - Liters		
Co-generation -M.W.		
Ethanol-Liters		
Paper Mill-M.T.		
De-Compost -M.T.		
Other-		

Q. 13. Type of manufacturing :-

Sugar	S-30/1	S-30/2	M-30	L-30	Raw Sugar
Distillery					
Co-generation					
Paper mill					
De-Compost					
Other					

Q. 14. Area of Operation :-

a) One Tehsil b) Two & More than tehsil c) Districts d) State e) Multi State

Q. 15. Frequency of boards meeting :-

a) Monthly b) Quarterly c) Half Yearly d) Annual e) Not fixed

Q. 16. Performance Regarding the Sugar Factory in seven Years.

Year	Total days	s.cane crushing M.T.	Per Ave. day crushing M.T.	Capacity utilization $\frac{day\ Crushing}{rated\ capacity}$ x 100	Sugar Production In Quintals	Sugar Recovery $\frac{C}{F}$	Rate of s.cane In Rs.
A	B	C	D	E	F	G	H
2006							
2007							
2008							
2009							
2010							
2011							
2012							

Q. 17. Financial Scenario of the factory : (Figures are in Rs. Corer/ Lack)

Particulars	2006	2007	2008	2009	2010	2011	2012
Share Capital							
Share holders Rs.							
Deposits (All)							
Total Assets							
Total liabilities							
Current Assets							

Current liabilities							
Net worth							
Inventory							
Fixed Assets							
Lons & Advances							
Profit / Loss							

Q. 18. Fixed capital :- (Figures are in Rs. Corer/ Lack)

Year	Factory	Distillery	Co-generation	Ethanol	Payer mill	De-compost	other
2006							
2007							
2008							
2009							
2010							
2011							
2012							

Q. 19. Working Capital :- (Figures are in Rs. Corer/ Lack)

Year	Factory	Distillery	Co-generation	Ethanol	Payer mill	De-comp	other
2006							
2007							
2008							
2009							
2010							
2011							
2012							

Q. 20. Production cost :- (Figures are in Rs. Corer/ Lack)

Year	Factory	Distillery	Co-generation	Ethanol	Payer mill	De-compost	other
2006							
2007							
2008							
2009							
2010							
2011							
2012							

C. Production :-

Q. 21. How many years your factory have been functioning ?
a) 1 - 5 Year. b) 6 - 10 Year. c) 11 - 15 Year
d) 16- 20 Year. e) more than 21 years.

Q. 22. What are there by-products?
a) Bagasse b) Molasses c) Filer mud d) Any other -------

Q. 23. By-Products :-

Years	Production (M.T.)					
	Bagasse	Percentage to cane par Tone	Molasses	Percentage to cane par Tone	Filter mud	Percentage to cane par Tone
2006						
2007						
2008						
2009						
2010						
2011						
2012						

Q. 24. Distillery Performance :-

Particulars	2006	2007	2008	2009	2010	2011	2012
Capacity Utilization :- A. Capacity per day lit.							
B. Product days only							
C. Capacity utilization point.							
Used Moalsses (Tones)							
Production of Rectified spirit (liters)							
Average Recovery Per tones Molasses							
Used Rectified Sprit Liters For the production of A. Simple denatured sprit B. Special denatured sprit							
Production A. Simple denatured sprit. B. Special denatured sprit.							
ENA (Extra Neutered Alcohol)							

Q. 25. Ethanol (Production)

Particulars	2006	2007	2008	2009	2010	2011	2012
Capacity per day liters.							
Product days only							
Capacity utilization %							
Used Rectified Spirit liters. For the production of Ethanol							
Produced Ethanol liters							

Q. 26. **Other by - product :- (Production)**

Particulars	2006	2007	2008	2009	2010	2011	2012
De-compost fertilizes (M.T.)							
Papers Manufacture A. Pulp (M.T.) B. Ligno salfonate- Powder - Lacquer-							
Co-generation M.W.							
Other							

Q.27. What is the cost of by-product, production ? (2011)

Particular	Sugar	Distillery	Co-generation	Ethanol	Paper mill	De-compost	Other
A. Direct Material							
B. Direct Labour							
C. Direct Overhead							
I. Prim cost							
D. Factory Overhead							
II. Cost of production.							
E. Office and Administrative							
III. Cost of good sold							
F. Sales and distribution							
IV. Cost of sales							
G. Profit							
VI. Selling price							

Q. 28. Is there enough availability of raw material ?
a) Available b) Partly Available c) Not Available

Q. 29. Availability of skilled labor ?
a) Available b) Partly Available c) Not Available

Q. 30. Power and water availability ?
a) Available b) Partly Available c) Not Available

Q. 31. How many shift you have been operating production of by-products ?
a) One b) Two c) Three d) Flexible e) No Specific.

Q. 32. Production plan (at time of season)
a) Weekly b) Half Monthly c) Monthly
d) Quarterly e) Half Yarely f) yarely

Q. 33. Causes of failures --------
a) Raw material shortage. b) Labour Problem.
c) Overstocking of finished products d) Marketing Problem.
e) Lack of No business mind f) Machinery Failure.
g) Financial Problem. h) Any other

Q. 34. Rejection percentage of by - products.
a) 1 - 5 % b) 6 - 10 % c) 11 - 15% d) 16 - 20 %

Q. 35. Your By-product unit quality certificate from out side agency ?
a) Yes b) No. c) Not Necessary

Q. 36. Existence of Research and development section.
a) Yes b) No c) Can't say.

Q. 37. If yes, major trust area of R and D department.
a) New Product Development b) Process innovation c) Both

Q. 38. What are the problem facing by-product units?

_____

_____

B. Finance

Q. 39. **Total Investment :-** (Figures are in Rs. Corer/ Lack)

Particulars	Factory	Distillery unit	Paper mill	Co-generation	Compost Fertilizer	Other
Land						
Land & Building						
Plant & Machinery						
Raw material						
Finished Goods						

Q. 40. Statement Showing Total Loan :-

Particular	2006	2007	2008	2009	2010	2011	2012
Distillery Unit -							
A. Short Term Loan							
B. Medium Term Loan							
C. Long Term Loan							

Paper Mill -							
A. Short Term Loan							
B. Medium Term Loan							
C. Long Term Loan							
Co-Generation -							
A. Short Term Loan							
B. Medium Term Loan							
C. Long Term Loan							
Ethanol -							
A. Short Term Loan							
B. Medium Term Loan							
C. Long Term Loan							
Compost Fertilizer -							
A. Short Term Loan							
B. Medium Term Loan							
C. Long Term Loan							
Other -							
A. Short Term Loan							
B. Medium Term Loan							
C. Long Term Loan							

Q. 41. Are you getting credit facility from your supplier ?
a) Yes b) No c) Can't say

Q. 42. Have you create reserve fund for future period ?
a) Yes b) No c) Partly created e) Created as per law f) Can't say

C. Marketing :-

Q. 43. Own marketing department
a) Yes b) No

Q. 44. Regular Advertising
a) Yes b) No c) Not necessary.
If yes, what is the mode of advertisement ?
a) News paper and periodicals. b) Bill board and hording
c) sugar year books d) Dealers contest.
e) Distillery association yearly reports f) Audio visual media
g) Any other --------

Q. 45. Where do you sell your by-product.
a) Whole seller b) Brokers / Merchant. c) Any other factory
d) State Govt. e) Total India f) Export g) Any other -----

Q. 46. System of by-product marketing ?
a) Whole seller b) Brokers / Merchant. c) State Govt.
d) Central Govt. e) Export.

Q. 47. Do you lounch your by Product brand ?
a) Yes b) No c) Going to lounch

Q. 48. At the time of sale are you offering price discount.
a) Yes b) No. c) Not Necessary

Q. 49. Previous year sells/marketing bagasse :- (Figures are in Rs. Corer/ Lack)

Year	Sales In Rs.							
	Internal uses As fuel		Domestic Market		Total		Stock	
	M.T.	Rs.	M.T.	Rs.	M.T.	Rs.	M.T.	Rs.
2006								
2007								
2008								
2009								
2010								
2011								
2012								

Q. 50. Molasses :- (Figures are in Rs. Corer/ Lack)

Year	Sales In Rs.									
	Internal uses As fuel		Domestic Market		Export market		Total		Stock	
	M.T.	Rs.	M.T.	Rs.	M.T.	Rs.	M.T.	Rs.	M.T.	Rs.
2006										
2007										
2008										
2009										
2010										
2011										
2012										

Q. 51. Filter mud :- (Figures are in Rs. Corer/ Lack)

Year	Sales In Rs.							
	Internal uses As fuel		Domestic Market		Total		Stock	
	M.T.	Rs.	M.T.	Rs.	M.T.	Rs.	M.T.	Rs.
2006								
2007								
2008								
2009								
2010								
2011								
2012								

Q. 52. Previous year sales in Distillery Unit :- (Figures are in Rs. Corer/ Lack)

Year	Rectified Spirit		Simple Denatured		Special Denatured Spirit		Any other product
	Litters	Amount	Litters	Amount	Litters	Amount	
2006							
2007							
2008							
2009							
2010							
2011							
2012							

Q. 53. De-compost Fertilizers Sales :- (Figures are in Rs. Corer/ Lack)

Year	De-compost Fertilizers		Stock	
	M.T.	Rs.	M.T.	Rs.
2005				
2006				
2007				
2008				
2009				
2010				
2011				
2012				

Q. 54. Paper Unit Sales :- (Figures are in Rs. Corer/ Lack)

Year	Pulp		Ligno Salfonate				Stock
	M.T.	Rs.	Powder		Lacquer		
			M.T.	Rs.	M.T.	Rs.	
2005							
2006							
2007							
2008							
2009							
2010							
2011							
2012							

Q. 55. Ethanol Sales :- (Figures are in Rs. Corer/ Lack)

Year	Ethanol		Stock	
	Lit.	Rs.	Lit.	Rs.
2006				
2007				
2008				
2009				
2010				
2011				
2012				

Q. 56. Co-generation :- (Figures are in Rs. Corer/ Lack)

Year	Co-generation		Stock	
	Lit.	Rs.	M.W.	Rs.
2006				
2007				
2008				
2009				
2010				
2011				
2012				

Q. 57 Are you providing replacement or cash refund against defective by-products ?
a) Yes b) No c) Not necessary. d) Same time

Q. 58 Percentage of By-product income over main product
a) 0-5% b) 6-10% c) 11-15%
d) 16-20%. e) 21-25% f) More than 26%

Q. 59. What is the revenue by way of sale of by-product? 2011

Particular	**Per tone**	**Per Kg.**	**Profit / Loss**
De-compost Fertilizers			
Paper unit			
Ethanol			
Co-generation			
Distillery			
Other			

F) Human Resource Management / personnel :-

Q. 60. H.R.M. Utilization in the by-product department :-

Particulars	**Year**						
	2006	2007	2008	2009	2010	2011	2012
Permanent Staff							
Unskilled							
Skilled							
Semi-Skilled							
Administrative							
Total =							
Seasonal							
Unskilled							
Skilled							
Semi-Skilled							
Administrative							
Total =							
Grand Total (A+B)							

Q. 61. Which method of selection test was used for selection ?
a) Written Test b) Interview c) Both d) No test

Q. 62. Are you providing training to your employees and workers for effective production of by-products ?
a) Yes b) No c) Some time

Q. 63. If is what are the methods used for employees training ?
a) Lecture b) On the job c) Film show and video d) Any other method----

Q. 64. What is your opinion about by-product to main product ?
a) Beneficial to main project b) Burden on main project. c) Can't say.

Q. 65. What is your opinion about by-product Industries ?

_____

_____

Q. 66 What are the problems facing by your factory in by-product , production and marketing ?

_____

Q. 67 Do SWOT of by-product of sugar ?
S =

W =

O =

T =

Date :- ..... **Signature**