

Cost-Profit Analysis of Sugar Production in Maddur Taluk, Karnataka: A Case Study of Sri Chamundeswari Sugars Limited (SCSL)

Asha D M¹, Parvathamma G L²

¹Department of Economics, Government First Grade College, Patrakarthnagar, Hubballi (Karnataka), India

²Department of Economics, Bangalore University, Jnanabharathi Campus, Bangalore (Karnataka), India

Abstract: *The sugar industry plays a vital role in India's agro-industrial economy by generating employment, supporting rural livelihoods, and producing value-added products from sugarcane. However, increasing production costs and fluctuating sugar prices have posed significant challenges to the profitability of sugar manufacturing. The present study analyses the cost and profitability of sugar production at Sri Chamundeswari Sugars Limited (SCSL), Maddur Taluk, Karnataka, using secondary data collected for the period 2009–10 to 2018–19. Descriptive statistical tools, including averages, standard deviation, coefficient of variation, and compound annual growth rate, were employed to evaluate production costs, profitability, sugar recovery, and process losses. The results indicate that the average production cost of sugar was Rs. 25,976.24 per tonne, while the average ex-mill selling price was Rs. 29,244.90 per tonne, generating a mean profit of Rs. 3,268.66 per tonne with an average profit margin of 10.86%. Sugarcane procurement cost constituted the major share of production cost, whereas conversion cost remained relatively stable. The study further revealed that higher sugar recovery and lower process losses significantly improved profitability by increasing recoverable sugar and reducing unit production cost. Conversely, years with lower recovery, higher production costs, and declining sugar prices resulted in financial losses. The findings emphasize that improving milling efficiency, minimizing process losses, ensuring timely cane crushing, and promoting value addition through ethanol, cogeneration, and bio-fertilizer production are essential for enhancing the long-term profitability and sustainability of the sugar industry. The study provides valuable insights for factory managers, policymakers, and researchers working towards improving the economic performance of integrated sugar industries.*

Keywords: Sugar Production. Cost-Benefit Analysis, Economic Performance, Profitability Analysis, Sugar Industry, Karnataka

1. Introduction

The sugar industry occupies a pivotal position in the Indian agro-based economy, contributing significantly to agricultural development, rural employment, industrial growth, and renewable energy production. India is the world's second-largest producer of sugar after Brazil, with sugarcane cultivated across more than five million hectares, supporting the livelihoods of nearly 50 million farmers and agricultural workers. Besides producing sugar, the industry generates valuable by-products such as molasses, bagasse, and press mud, which serve as raw materials for ethanol production, cogeneration of electricity, bio-fertilizers, paper, and several other value-added products. Consequently, the economic sustainability of sugar mills has become increasingly important for ensuring the viability of sugarcane cultivation and the overall development of rural economies.

The profitability of sugar manufacturing depends on several interrelated technical and economic factors. Sugarcane procurement cost constitutes the largest component of the total production cost, accounting for nearly 70–80 percent of the manufacturing expenditure in most Indian sugar mills. Therefore, fluctuations in Fair and Remunerative Price (FRP), State Advised Price (SAP), labour charges, transportation costs, and operational expenses substantially influence the cost of sugar production. In addition, factory efficiency, sugar recovery percentage, process losses, and capacity utilization determine the quantity of sugar produced from a given quantity of sugarcane. Even marginal

improvements in sugar recovery or reductions in process losses can significantly enhance profitability because of the large volume of cane processed by sugar factories.

In recent years, the Indian sugar industry has experienced increasing economic challenges arising from rising sugarcane prices, volatile sugar markets, fluctuating domestic and international demand, climate variability, and changing government policies relating to sugar pricing and ethanol blending. These factors have created financial stress for many sugar factories, making cost optimization and efficient utilization of sugarcane by-products essential for improving profitability. Consequently, comprehensive cost-profit analyses at the factory level have become increasingly relevant for identifying production constraints, improving operational efficiency, and supporting evidence-based policy decisions.

Karnataka is one of the leading sugar-producing states in India, where the sugar industry plays an important role in regional economic development. Maddur Taluk of Mandya District is a prominent sugarcane-growing region owing to its fertile soils, favourable climatic conditions, and irrigation facilities. Among the major sugar industries operating in this region, **Sri Chamundeswari Sugars Limited (SCSL)** occupies a significant position. Established in 1970 under the Sakthi Group, SCSL commenced commercial sugar production in 1974 with an installed crushing capacity of 1,250 tonnes of cane per day (TCD), which was subsequently expanded to 2,400 TCD and later to 5,000 TCD. Over the years, the company has diversified its

operations by establishing a 50 KLPD distillery for the production of Rectified Spirit (RS), Extra Neutral Alcohol (ENA), and Denatured Spirit from molasses. It has also invested in a 26 MW cogeneration power plant, methane recovery systems, bio-composting facilities, and other environmentally sustainable technologies that maximize the utilization of sugarcane by-products while minimizing environmental impacts.

Although SCSL has adopted integrated production practices and value-added processing technologies, the profitability of sugar manufacturing continues to depend largely on production costs, sugar recovery efficiency, and market prices. Evaluating these economic relationships is essential for understanding the financial performance of the factory and identifying opportunities for improving operational efficiency. In particular, analysing sugar recovery, process losses, production costs, and revenue provides valuable insights into the economic sustainability of sugar manufacturing.

Against this background, the present study examines the cost and profitability of sugar production at Sri Chamundeswari Sugars Limited during the period 2009–10 to 2018–19. The study analyses production costs, ex-mill sugar prices, profit margins, sugar recovery, and process losses to evaluate their influence on factory profitability. The findings are expected to provide useful information for factory management, policymakers, researchers, and stakeholders in developing strategies to improve production efficiency, optimize by-product utilization, and strengthen the long-term competitiveness and sustainability of the sugar industry in Karnataka.

2. Objectives

- 1) To analyse the production cost structure of sugar manufacturing at Sri Chamundeswari Sugars Limited (SCSL), Maddur Taluk, Karnataka, during the period 2009–10 to 2018–19.
- 2) To evaluate the profitability of sugar production by examining production costs, ex-mill sugar prices, profit margins, and annual financial performance of the factory.
- 3) To assess the influence of sugar recovery and process losses on the profitability of sugar production and suggest appropriate measures to improve production efficiency and economic sustainability.

3. Methodology

The present study adopted a **case study approach** to analyse the cost and profitability of sugar production at **Sri Chamundeswari Sugars Limited (SCSL), K.M. Doddi, Maddur Taluk, Mandya District, Karnataka**. The study was based entirely on **secondary data** collected from the factory's annual reports, production records, financial statements, and technical reports for a period of **ten years (2009–10 to 2018–19)**. Information on sugarcane crushed, sugar production, cane procurement price, production cost, ex-mill sugar price, sugar recovery, process losses, and profitability indicators was compiled for analysis.

Descriptive statistical tools such as **totals, averages (mean), standard deviation, percentages, and annual growth trends** were used to evaluate changes in production costs and profitability over time. Cost of production per tonne of sugar was estimated by combining cane procurement cost and conversion cost. Profitability was assessed by comparing the ex-mill selling price with the production cost to estimate net returns and profit margins. The findings were interpreted to assess the economic performance of sugar production and to identify factors influencing production efficiency and financial sustainability of the sugar factory.

4. Results and Discussion

Cost-profit analysis of sugar production in SCSL factory was estimated by finding the production cost and price per tonne of sugar. The production cost is the total of sugarcane cost and conversion cost incurred for producing one tone of sugar from the basic raw materials ie sugarcane.

The cane cost per tonne of sugar was calculated by the total cane cost to the total quantity of sugar produced. The total cane cost was calculated by multiplying the total cane crushed to the price of sugarcane.

The detail of cost-profit analysis of sugar production in SCSL factory presented below

Production Cost of Sugar:

Following **table 2** shows the trends of production cost per tonne of sugar over last ten years from 2009-10 to 2018-19. The total cane cost spent divided by total quantity of sugar produced gives the cane cost per tonne of sugar.

Table 1: Details of Production Cost of Sugar in Sri Chamundeswari Sugars Limited (SCSL), K. M. Doddi, during 2009-10 to 2018-19

Year	Quantity of Cane Crushed (Tonnes)	Price per Tonne of Cane (Rs.)	Total Cane Cost (Lakhs)	Quantity of Sugar Produced (Tonne)	Cane Cost Per Tonne of Sugar (Rs) *	Conversion Cost per Tonne of Sugar (Rs)	Production Cost per Tonne of Sugar (Rs) *	Total Production Cost (Lakhs)
	1	2	3=(1x2)/10 ⁵	4	5= (3/4)	6	7=(5+6)	(8=7x4)
2009-10	444562	1950	8669	41712	20783	512	21295	8883
2010-11	7939110	1900	15084	73491	20525	498	21023	15450
2011-12	805332	2000	16107	70200	22944	501	23445	16458
2012-13	895605	2400	21495	79524	27029	580	27609	21956
2013-14	618190	2650	16382	57387	28547	583	29130	16717
2014-15	6527200	2200	14360	60525	23726	589	24315	14716
2015-16	770080	2300	17712	69164	25609	529	26138	18078
2016-17	412703	2520	10400	34781	29902	600	30502	10609
2017-18	388726	2550	9913	34699	28567	630	29197	10131

2018-19	587670	2613	15356	58035	26460	650	27110	15733
Total	6369499	23083	145477	579518	254090	5672	259762	148731
Mean	636950	2308	14548	57952	25409	567	25976	14873
S D	179369	283	3920	16093	3299	54	3340	4000

Source: Compiled from the data collected at the sugar factory during field visit

The results presented in Table 1 indicate substantial year-to-year variation in sugar production cost, primarily driven by fluctuations in sugarcane procurement prices and the quantity of cane crushed. During the study period (2009–10 to 2018–19), the average quantity of cane crushed was **636,950 tonnes**, producing an average of **57,952 tonnes of sugar** annually. The average cane procurement price was **Rs. 2,308 per tonne**, resulting in a mean cane cost of **Rs. 25,409 per tonne of sugar**. After including the average conversion cost of **Rs. 567 per tonne**, the mean total production cost of sugar was **Rs. 25,976 per tonne**, with an average annual production expenditure of **Rs. 14,873 lakhs**.

The lowest production cost per tonne of sugar (**Rs. 21,295**) was recorded during **2009–10**, mainly due to the relatively lower sugarcane procurement price (Rs. 1,950 per tonne) and favourable sugar recovery. Conversely, the highest production cost (**Rs. 30,502 per tonne**) occurred in **2016–17**, despite crushing only **412,703 tonnes** of cane. The sharp increase was primarily attributable to the higher cane procurement price (Rs. 2,520 per tonne) coupled with lower sugar output (34,780.90 tonnes), indicating reduced conversion efficiency and increased fixed cost burden per unit of output.

A clear positive relationship exists between cane price and sugar production cost. The increase in cane procurement price from **Rs. 1,900–2,000 per tonne** during the initial years to **Rs. 2,613 per tonne** in **2018–19** significantly elevated the cane cost per tonne of sugar. Since sugarcane accounts for nearly **95–98%** of the total production cost,

even modest increases in cane price substantially influence overall manufacturing cost. In contrast, the conversion cost remained relatively stable, varying only between **Rs. 498 and Rs. 650 per tonne**, suggesting that factory operational efficiency was maintained throughout the study period.

The relatively high standard deviations observed for cane crushed (179,369.09 tonnes), sugar production (16,092.93 tonnes), and production cost (Rs. 3,339.84 per tonne) further indicate considerable variability in annual factory performance, likely reflecting fluctuations in sugarcane availability, climatic conditions, recovery percentage, and government pricing policies. Overall, the findings demonstrate that sugarcane procurement cost is the dominant determinant of sugar production cost, while improvements in sugar recovery, operational efficiency, and optimal capacity utilization are essential for reducing unit production costs and enhancing the profitability and competitiveness of the sugar industry.

Cost-Profit Analysis of Sugar Production:

A study cost-profit resulting from sugar production in SCSL Sugar factory during the years 2009-10 to 2018-19 presented in the following **table 2**. It was found that for every tonne of sugar SCSL had obtained a mean profit of 3,269 rupees after spending of 25,976 rupees per tonne of sugar. During the field visit, it was observed that SCSL has a modern sugar manufacturing which has produced high quality sugar in more efficient manner with sufficient average profit margin of 10.86 percent.

Table 2: Details of Cost-profit of Sugar Production in Sri Chamundeswari Sugars Limited (SCSL), K. M. Doddi, during 2009-10 to 2018-19

Year	Quantity of Sugar Produced (Tonnes)	Production Cost per Tonne of Sugar *(Rs)	Ex-mill Price per Tonne of Sugar (Rs)	Profit per Tonne of Sugar (Rs)	Total Production Cost of Sugar (Lakhs)	Total Gross Revenue of Sugar (Lakhs)	Total Profit of Sugar (Lakhs)	Profit/Loss Margin (%)
	1	2	3	4=(3-2)	5=(1x2)/10 ⁵	6=(1x3)/10 ⁵	7=(6-5)	8=(7/6)x100
2009-10	41712	21295	28745	7450	8883	11990	3108	25.92
2010-11	73491	21023	25134	4111	15450	18471	3021	16.36
2011-12	70200	23445	26196	2751	16458	18390	1931	10.5
2012-13	79524	27609	30774	3165	21956	24473	2517	10.28
2013-14	57387	29130	27572	-1558	16717	15823	-894	-5.65
2014-15	60525	24315	27714	3399	14716	16774	2057	12.27
2015-16	69164	26138	25610	-528	18078	17713	-365	-2.06
2016-17	34781	30502	34597	4095	10609	12033	1424	11.84
2017-18	34699	29197	35541	6344	10131	12332	2201	17.85
2018-19	58035	27110	30566	3456	15733	17739	2006	11.31
Total	579518	259762	292449	32687	148731	165738	17007	108.61
Mean	57952	25976	29245	3269	14873	16574	1701	10.86
S D	16093	3340	3608	2716	4000	3832	1333	9.12
C V (%)	28	13	12	83	27	23	78	83.99
CAGR (%)	3.74	2.72	0.68	-8.18	6.56	4.45	-4.75	-8.8

Source: Compiled from the data collected at the sugar factory during field visit

Table 2 presents the cost–profit analysis of sugar production over the period **2009–10 to 2018–19**, revealing considerable fluctuations in profitability due to variations in production cost and ex-mill sugar prices. During the study period, the

factory produced an average of **57,952 tonnes of sugar annually**, with a mean production cost of **Rs. 25,976 per tonne** and an average ex-mill selling price of **Rs. 29,245 per tonne**. Consequently, the factory realized an average profit

of **Rs. 3,269 per tonne**, generating an annual gross revenue of **Rs. 16,574 lakhs** and an average net profit of **Rs. 1,701 lakhs**, corresponding to an average profit margin of **10.86 percent**.

The analysis indicates that profitability was highly sensitive to changes in market prices and production costs. The highest profit per tonne (**Rs. 7,450**) and the maximum profit margin (**25.92%**) were recorded during **2009–10**, when the production cost remained relatively low (Rs. 21,294.94 per tonne) while the ex-mill sugar price was comparatively high (Rs. 28,745 per tonne). This favourable price-cost relationship enabled the factory to earn a total profit of **Rs. 3,108 lakhs**, demonstrating the importance of efficient cost management and favourable market conditions.

In contrast, the factory incurred financial losses during **2013–14** and **2015–16**, when production costs exceeded the prevailing ex-mill sugar prices. In **2013–14**, the production cost reached **Rs. 29,130 per tonne**, whereas the selling price declined to **Rs. 27,572 per tonne**, resulting in a loss of **Rs. 1,558 per tonne** and a negative profit margin of **–5.65 percent**. Similarly, during **2015–16**, the factory recorded a loss of **Rs. 528 per tonne**, translating into a total loss of **Rs. 365 lakhs**. These findings emphasize the vulnerability of sugar mills to market price volatility, particularly when statutory sugarcane procurement prices continue to rise despite declining sugar prices.

The coefficients of variation further reveal that profit-related indicators exhibited substantially greater variability than production cost and selling price. While production cost and ex-mill price showed relatively stable coefficients of variation of **12.86 percent** and **12.34 percent**, respectively, profit per tonne and profit margin recorded much higher values of **83.08 percent** and **83.99 percent**, indicating significant fluctuations in profitability. Furthermore, the compound annual growth rate (CAGR) shows that production cost increased annually by **2.72 percent**, whereas the ex-mill sugar price grew by only **0.68 percent**. Consequently, profit per tonne and profit margin declined at annual rates of **4.75 percent** and **8.80 percent**, respectively. These trends suggest that rising production costs were not adequately compensated by increases in sugar prices, thereby exerting continuous pressure on the profitability of

the sugar industry. Therefore, improving operational efficiency, enhancing sugar recovery, diversifying revenue through by-products, and adopting cost-effective technologies are essential strategies for sustaining the long-term financial viability of sugar mills.

Sugar Losses in different By-products:

The sugar loss in different by-products is presented in the **table 4.10**. The data presented in **Table 3** reveal that sugar recovery and process losses are critical determinants of the technical efficiency and profitability of sugar production. During the study period (2009–10 to 2018–19), the average **sugar recovery** was **9.10%**, while the mean **total sugar loss** was **2.12%**, resulting in an average sugar content in cane of **11.22%**. Among the different forms of sugar losses, the largest proportion occurred through **molasses (1.29%)**, followed by **press mud (0.54%)**, **undetermined losses (0.22%)**, and **bagasse (0.06%)**. The total sugar loss varied between **2.04% and 2.23%**, indicating relatively small numerical differences; however, even a marginal increase in sugar loss translates into substantial reductions in recoverable sugar because of the large volume of sugarcane processed annually.

The profitability data presented in **Table 2** demonstrate a strong inverse relationship between sugar losses and the economic performance of the sugar factory. Higher sugar recovery increases the quantity of marketable sugar from a given quantity of cane, thereby reducing the production cost per tonne and improving profit margins. In contrast, greater process losses reduce the amount of recoverable sugar, resulting in higher unit production costs and lower profitability. This relationship is evident during **2013–14** and **2015–16**, when the factory recorded financial losses despite maintaining substantial production volumes. During these years, increasing production costs coupled with lower ex-mill sugar prices and reduced recovery adversely affected profitability, leading to negative profit margins of **–5.65%** and **–2.06%**, respectively. Conversely, years characterized by better recovery efficiency and favourable market prices, such as **2009–10** and **2017–18**, generated significantly higher profits, demonstrating the importance of minimizing sugar losses throughout the manufacturing process.

Table 3: Sugar losses in different by-products in Sri Chamundeswari Sugars Limited (SCSL), K. M. Doddi, Maddur Taluk during 2009-10 to 2018-19

Year	Recovery of Sugar (%)	Percent of Sugar losses (%)					Sugar Content in the Cane (%)
		Molasses	Bagasse	Press mud	Un-determined	Total Sugar Loss (%)	
		2	3	4	5	6= (2+3+4+5)	
2009-10	9.38	1.21	0.06	0.58	0.26	2.11	11.49
2010-11	9.26	1.25	0.05	0.59	0.21	2.10	11.35
2011-12	8.72	1.28	0.08	0.51	0.25	2.11	10.83
2012-13	8.88	1.28	0.07	0.58	0.29	2.23	11.11
2013-14	9.28	1.24	0.08	0.52	0.20	2.04	11.32
2014-15	9.27	1.28	0.05	0.53	0.20	2.06	11.33
2015-16	8.98	1.31	0.06	0.56	0.20	2.12	11.10
2016-17	8.43	1.37	0.06	0.54	0.23	2.20	10.63
2017-18	8.93	1.34	0.04	0.50	0.20	2.08	11.01
2018-19	9.88	1.38	0.04	0.52	0.20	2.14	12.02
Mean	9.10	1.29	0.06	0.54	0.22	2.12	11.22

Source: Compiled from the data collected at the sugar factory during field visit

The observed variations in profitability can be attributed to several technical and economic factors. Technically, poor cane quality, delayed harvesting and transportation, deterioration in cane freshness, inefficient milling and juice extraction, inadequate clarification, poor crystallization efficiency, and operational inefficiencies contribute to higher sugar losses. Climatic variability, particularly drought or excessive rainfall, also influences cane maturity and sucrose accumulation, thereby affecting sugar recovery. Economically, rising statutory sugarcane procurement prices, increasing labour and energy costs, fluctuations in ex-mill sugar prices, and volatile domestic and international sugar markets significantly influence the profitability of sugar factories. Since sugarcane constitutes the largest component of production cost, any increase in cane price without a corresponding rise in sugar prices places considerable financial pressure on sugar mills.

To improve profitability, sugar factories should focus on reducing process losses through modernization of milling and extraction systems, adoption of advanced process control technologies, regular equipment maintenance, and continuous monitoring of sugar losses in molasses, bagasse, and press mud. Timely harvesting and crushing of mature cane, promotion of high-sucrose sugarcane varieties, and strengthening extension services to farmers can further improve sugar recovery. Additionally, diversification into value-added products such as ethanol, cogeneration of electricity, compressed biogas, and bio-fertilizers can provide supplementary income and reduce dependence on sugar sales alone. These integrated measures would enhance process efficiency, improve resource utilization, lower production costs, and ensure the long-term economic sustainability and competitiveness of the sugar industry.

5. Conclusion

The analysis of sugar production economics of Sri Chamundeswari Sugars Limited (SCSL), K. M. Doddi, Maddur Taluk over the period 2009–10 to 2018–19 demonstrates that the profitability of sugar manufacturing is strongly influenced by sugarcane procurement cost, sugar recovery, process efficiency, and prevailing market prices. The results reveal that sugarcane cost constitutes the largest share of total production cost, making the industry highly sensitive to increases in cane prices. Although conversion costs remained relatively stable throughout the study period, fluctuations in sugar recovery and process losses significantly affected the cost of sugar production and overall profitability. Higher sugar recovery and lower processing losses resulted in increased sugar output, reduced unit production costs, and improved profit margins, whereas lower recovery combined with rising production costs and declining ex-mill sugar prices led to financial losses in certain years.

The study further indicates that sugar losses in molasses, press mud, bagasse, and other process streams directly reduce recoverable sugar, thereby adversely affecting factory profitability. Improving operational efficiency through modern milling technology, effective process control, timely cane harvesting and crushing, and the use of high-sucrose sugarcane varieties can substantially reduce

production costs. Furthermore, diversification into value-added products such as ethanol, cogeneration of electricity, and bio-fertilizers can strengthen revenue streams and reduce dependence on sugar alone. Overall, enhancing technical efficiency and optimizing by-product utilization are essential for improving the long-term economic sustainability and competitiveness of the sugar industry.

References

- [1] Directorate of Economics and Statistics. (2023). *Agricultural statistics at a glance 2023*. Ministry of Agriculture and Farmers Welfare, Government of India.
- [2] Food and Agriculture Organization. (2023). *FAOSTAT statistical database*. FAO. <https://www.fao.org/faostat/>
- [3] Government of India. (2022). *National Policy on Biofuels – 2022*. Ministry of Petroleum and Natural Gas, New Delhi.
- [4] Hugot, E. (1986). *Handbook of cane sugar engineering* (3rd ed.). Elsevier Science Publishers.
- [5] Indian Sugar Mills Association (ISMA). (2023). *Indian sugar industry: Annual statistics and performance report*. New Delhi.
- [6] Ministry of Consumer Affairs, Food and Public Distribution. (2023). *Sugar production and pricing policy in India*. Department of Food and Public Distribution, Government of India.
- [7] Solomon, S. (2016). Sugarcane production and development of sugar industry in India. *Sugar Tech*, 18(6), 588–602.
- [8] Solomon, S. (2011). *The Indian sugar industry: An overview*. Indian Institute of Sugarcane Research, Lucknow.
- [9] Vijay Kumar, B., & Singh, S. P. (2018). Economic analysis of sugar production and profitability in cooperative sugar factories of Karnataka. *International Journal of Current Microbiology and Applied Sciences*, 7(5), 2738–2746.
- [10] Yadav, R. L., Solomon, S., & Kumar, V. (2019). Improving sugar recovery and profitability in the Indian sugar industry through efficient sugarcane production and processing. *Sugar Tech*, 21(4), 565–575.