

Sugarcane Production in the Satara District of Maharashtra, India: A Socioeconomic Analysis and a Profitability Analysis

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Abstract : Both economic and social aspects are included in this analysis of sugarcane cultivation in India's Satara region of Maharashtra. The study looks at sugarcane growers' demographics, landholding patterns, input use, irrigation methods, and labour dynamics. In order to emphasise the important factors that impact economic feasibility, it delves deeper into the expenses, returns, and net profit margins linked to sugarcane farming. Secondary sources, such as government reports and agricultural databases, augment primary data obtained from a statistically valid sample of farmers. While growing sugarcane is a lucrative endeavour for farmers, the study found that input prices, irrigation availability, market price variations, and the use of contemporary farming techniques all have an impact on farmers' profitability. Our goal is to help the region's farmers achieve sustainable development in their operations by offering policy suggestions that boost efficiency, lower production costs, and increase farm profitability.

Keywords: Sugarcane production, Satara district, Maharashtra, socioeconomic analysis, profitability farm income, agricultural economics, sustainable agriculture

INTRODUCTION

Sugarcane Scenario at world level

A grass that may reach a height of fifteen feet, sugarcane is what we eat. Tropical regions with warm temperatures are ideal for this perennial shrub. Its morphology consists of a hollow stalk that contains sugar-rich sap and upper-level leaves. After 10 to 15 months, it is ready to be harvested. The Indian sugarcane harvest begins in October and lasts until around the middle of March or April. Several thousand years ago, sugarcane was first grown in India and China. The first mention of it is in 510 B.C. Upon observing cane growing along the banks of the Indus River, the Persian army under the command of Emperor Darius -1 gave it the name "reeds, which produce honey without bees." After quickly making its way into Persia, sugarcane was eventually allowed into Egypt by the Arabs. 'Sugar' is an Arabic term in and of itself. Sugar was brought to the Mediterranean nations by Alexander the Great (356-232 B.C.), and from there it spread along the east coast of Africa.

The process of gathering sugarcane, pressing its delicious juice, and then boiling it to create crystals of raw sugar gained popularity around 600 A.D. Many successful sugar mills were visible to Marco Polo during his visit to China about 600 years later. Cane plantations were established in Madeira, the Canary Islands, Island, & St. Thomas about the middle of the fourteenth century. Until sugar production expanded to tropical America in the sixteenth century, these were Europe's sugar supply. Sugar cane from the West Indies was a major export commodity in the 1700s. According to historical accounts, Dublin & Belfast were the centres for raw cane sugar refining in the mid-seventeenth century. Sugar is special because it may be made from two different, distinct sources. Sugarcane and sugar beets are these. Both can be easily cultivated in temperate zones, although tropical regions are best suited for the second. It was evident that sugar could be made from cane or beetroot in the majority of places.

Although sugar beets have a reputation as a "sweet vegetable," it wasn't until the latter part of the 18th century that they were utilised as a commercial source of sugar. While employed in Berlin, Margraf came up with a method for sugar cane extraction. Achard, one of his pupils, refined this method even more. Nonetheless, two significant historical personalities, Nelson and Napoleon, played a significant role in the development of this process. Europe was cut off from cane sugar after Nelson's triumph at Trafalgar in 1805. After learning about a novel method for obtaining sugar from sugar beets, Napoleon made the decision in 1811 that sugar beets would supply Europe with sugar. It has long been known that the sugarcane originated in the Pacific islands and then expanded to other parts of the globe. Sugar or a sugary product made from it initially developed on the Asian mainland, where it expanded to countries like India, southern China, and neighbouring nations. India is the birthplace of sugarcane, which has been farmed since ancient times. With the exception of the chilly Himalayan region, sugarcane cultivation has nearly reached every corner of the nation. It is grown in over 75 countries across the globe. In terms of both acreage and production, India is the undisputed leader among sugarcane-growing nations. But yields per hectare are lower than in a few of major nations. While nations like the United States and Australia cultivate sugarcane on massive plantation scales, millions of Indian farmers tend to very small plots of land and subject them to a wide range of favourable and unfavourable growing circumstances.

Consequently, our sugarcane production issues necessitate distinct production technologies that can be tailored to our agricultural contexts, as they differ significantly from those of other nations. As a cash crop, sugarcane is unrivalled, and it is the primary crop used to produce sugar around the world, including in India. It covers almost five million acres per year, and the

sugar output is close to 1,37,000,000 metric tonnes. Brazil is the world's second-largest sugarcane producer, behind India. India has more sugar mills than any other country, making it the world leader in sugar production. Sixty percent of the sugarcane grown is transformed into refined sugar, which amounts to more than 11 million metric tonnes. In the fiscal year 2000–2001, India sent out around 81,1027.5 million metric tonnes of sugarcane. Indian exports total at 16,250,000,000 metric tonnes, with 94,587,000 metric tonnes going to Sri Lanka, 367,53,000,000 metric tonnes to Pakistan, 9,12,000,000 metric tonnes to Afghanistan, and 18,20,000,000 metric tonnes to China. This proves that India has a huge sugarcane export potential & world's leading sugarcane grower. This explains why, as compared to other countries, she ranks well in sugarcane output.

Sugarcane Workers

People whose jobs it is to grow & harvest sugarcane, a tall perennial grass prized for its abundant sugar content, are called sugarcane workers. These employees are vital to the manufacturing process of sugar, ethanol, and other goods made from sugarcane. Their duties change from one step of the sugarcane processing line to the next.

1. Cultivation:

- **Planting:** Planting sugarcane crops is a possible task for sugarcane workers. Planting sugarcane stalks or setts and making sure they are spaced correctly are common steps in this process.
- **Cultivation and Maintenance:** One potential job function for sugarcane workers is planting sugarcane crops. Common steps in this procedure include planting sugarcane stalks or setts and ensuring they are spaced correctly.

2. Harvesting:

- **Cutting and Loading:** Harvesting sugarcane, which entails chopping the ripe stalks and putting them on trucks, is a very labour-intensive process. Although mechanical harvesting is sometimes utilised, manual cutting methods have always been the norm.

- **Transportation:** Moving the sugarcane from the fields to the processing facilities is another possible task that workers are involved in. Various forms of conveyance, such as trucks and carts, can be utilised for this purpose.

3. Processing:

Mill Workers: Some people's jobs at sugar mills include processing the sugarcane that has been harvested. One step in this process is crushing the cane to release its juice, which is subsequently refined into sugar or ethanol.

Working Conditions: Workers in the sugarcane industry frequently endure hazardous conditions, including long hours, physical labour, or exposure to severe weather. Issues including fair salaries, worker safety, and labour rights have been sought to resolve in areas where labour practices & conditions are a cause for concern.

Global Context: Numerous tropical & subtropical regions across the globe rely heavily on sugarcane production; nations in Asia, Africa, and Latin America are among the world's leading producers. Agricultural and labour laws in any given area can have a significant impact on the working conditions and practices of sugarcane workers.

Human rights & labour groups have focused on sugarcane workers in an effort to improve their working conditions & treatment, despite the fact that they play a crucial role in the sugar industry.

LITERATURE REVIEW

Márcia Azanha Ferraz Dias Moraes (2015) Through an examination of labour characteristics, wages, and working conditions, this article examines the socio-economic implications of Brazil's sugar cane sector. In addition, it compares the socioeconomic indicators of first- and second-generation sugar cane workers, as well as those of agricultural workers generally, to see how families play a role in these variables. Our data is sourced from the *Relação Anual de Informações Sociais (RAIS)* & *Pesquisa Nacional por Amostra de Domicílios (PNAD*, or National Household Sample Survey). The research shows that in 2012, approximately one million people were employed by the three main parts of the country's sugarcane industry: sugar production, ethanol production, and sugar cane growing. Additionally, the results demonstrate that second-generation workers' family backgrounds influence their work-related decision-making, which in turn affects the sectors' socioeconomic indicators. When looking at

indications for both the sugar cane industry or agriculture as a whole, it was clear that the former was in better shape. Indicators for the second generation reveal that, compared to first-generation workers, they have superior choices & conditions.

Dr. P. Mohanraj (2014) All of a plant's metabolic & manufacturing processes rely on water. Crops are cultivated in environments with vastly different topographies, soil types, climates, seasons, & access to water. Also, different crops have different behaviours & structural differences. As a result, there is a large range in their water needs. The goal of water management is to ensure that crops are adequately watered while minimising water loss. Irrigating crops without adequate monitoring results in significant water loss. The primary goal of irrigating crops, regardless of the method used, is to consistently and maximally store water in the effective root zone while minimising water loss. Civilization itself predates irrigation. Wells, tanks, canals, and rivers were all used for irrigation in ancient times, according to historical records.

Sara Herreras Martínez (2013) Value added, imports, & employment are some of the socio-economic metrics used to evaluate the effects of producing bioethanol from sugarcane in Northeastern Brazil (NE). Three scenarios, all set to take place in 2020, are examined using an extended inter-regional Input-Output (IO) model. Scenario A represents the status quo, while scenarios B and C envision the sector expanding into new areas and adopting more efficient agricultural and processing methods. Value added & imports rise relative to the present by 2020 across all scenarios. There is a 2.8 billion USD value addition in the sugarcane-ethanol sector in the Northeastern region under the BaU scenario, over 4 billion USD under scenario A, and 9.4 billion USD under scenario B. Scenarios A and B show increases in regional imports of 38% & 262%, respectively, whereas scenario B predicts a growth of 4%. The study demonstrates that the substantial loss of employment, amounting to 114,000 jobs, caused by the transition from manual to mechanised harvesting may be compensated for by increased productivity and indirect benefits. Scenario A predicts a 10% increase in regional employment by 2020 (or about 12,500 jobs), while scenario B predicts a 126% increase (or about 160,000 jobs). Imports of inputs from the Northeast have a significant indirect impact on the remainder of Brazil's sugarcane production. At the regional level, an extended inter-regional IO model can help to quantify both the direct and indirect socio-economic consequences, as well as provide light on the connections between different regions. How the model is applied to NE Developing or expanding the sugarcane-ethanol sector in the region under the conditions

analysed here has the potential to create major beneficial socio-economic consequences for both the NE region and Brazil's economy as a whole, according to Brazil.

OBJECTIVES

1. To analyse the age, education, family size, employment, and landholding trends of sugarcane farmers in the Satara district.
2. To study how sugarcane growers manage their fields, from choosing seeds to watering techniques, fertiliser and pesticide applications, and labour force allocation.

RESEARCH METHODOLOGY

The material and data used in this research came from secondary sources such as books, journals, and unpublished papers. People find annual reports on the sugar business to be very helpful when trying to piece together the sector's history. The following formula was considered for the purpose of determining the percentage increase.

$$\% \text{ Increase} = \frac{x1}{x2} \times 100$$

Whereas,

X1 is the increased number value

X2 is the original number value

RESULTS

The climate and geography of the Satara District are both particularly conducive to the cultivation of sugarcane. The region is characterized by the presence of four main drainage systems, namely the Krishna, Yerla, Mamganga, and Nira Rivers, and also has an annual rainfall average of 1249 millimetres. As a result of the availability of this water, income crops such as sugarcane have taken the place of more traditional crops in the agricultural landscape. In terms of crops, it is the most common crop in this region.

A number of Sugar Industries in Satara District

Sugar production is the second major agricultural sector in Maharashtra state, and it is also the second largest sector in India. There is a significant contribution that the sugar business makes

to both the national and state economies. This sector is dependent on agriculture. In Maharashtra, the fast expansion of the sugar business has been a significant contributor to the socio-economic development of rural areas. Within the Satara area, there are fifteen sugar plants that are managed by both the commercial sector and the cooperative sector. The private sector is responsible for six of these fifteen factories, while the cooperative sector is responsible for nine of these enterprises.

Between 1996–1997 and 2016–2017, the number of sugar industries in the United States increased from seven to fifteen. It can be seen from the geographical distribution that Karad and Satara tahsil have a greater number of sugar industries than other counties. Although it has been noticed that sugar industries are expanding at a high rate since 2001-2002, this growth may be attributed to the expansion of agriculture and the improvement of modern irrigational infrastructure.

Spatio-Temporal Growth of Sugar industries and its crushing capacity

In order to prevent mechanical stoppages, breakdowns, and production bottlenecks, the crushing capacity is contingent not only on the availability of sugarcane but also on the availability of people in the sector (Mohite, 1947).

Table 1: Satara District: Growth trend of the sugar industry

Sr. No.	Particular	1996-97	2001-02	2006-07	2011-12	2016-17	% increase
1	No. of industries in operation	7	9	10	11	15	-
2	Daily Crushing Capacity (TCD)	20050	26550	33250	35750	51950	259.10
3	Cane Crushed	3554813	3396126	3343461	5664785	7765378	218.44

	Metric tonnes						
4	Sugar Production Metric tonnes	401802.3	395856	402604	686692	911435	226.83

Source: district Socio-economic review & statistical abstract of Satara district (1996-97 to 2016-17)

In the Satara area, there were just seven sugar industries operating during the 1996–1997 fiscal year. Over the course of that time period, these industries had a crushing capacity of 20050 TCD. Ajinkyatara S.S.K. Ltd., located in Shahunagar, Shendre, Sugar Industry, has a capacity of 2500 TCD, whereas Kisanveer S.S.K. Ltd., located in Kisanveer Nagar, Bhujinj, has a capacity of 3000 TCD. Shriram S.S.K. Ltd., Ramnagar, Phaltan, has 2000 TCD Capacity, Yashwantrao Mohite Krishna S.S.K. Ltd., Rethare Bk, Shivngar, has 5000 TCD Capacity, Sahyadri S.S.K. Ltd., Yashwant Nagar., has 5000 TCD Capacity, Loknete Balasaheb Desai S.S.K. Ltd., (Marali) Daultanagar, has 1250 TCD Capacity, New Phaltan Sugar Works Ltd., Sakharwadi. Sugar has a capacity of 1300 TCD.

The sugar factory in question not only has the biggest crushing capacity in the Satara district, but it also has the highest crushing capacity in the state. Over the course of the following years, the crushing capacity of the sugar industries has expanded, and in addition, new sugar factories have established up in the region. The overall crushing capacity was raised to a maximum of 26550 TCD during the 1991–2002 fiscal year. This includes the crushing capacity of Rayat S.S.K. Ltd., Shewalewadi (Mhasoli), which has grown by 2500 TCD, as well as the crushing capacity of Jarandeshwar Sugar Mills Pvt. Ltd., Chicagoan, which has increased up to 2500 TCD respectively. Following that, in another new sugar business was established in the district. It is called Pratapgad S.S.K. Ltd., and it is located in Songaon- Karandoshi. It is leased by Kisanveer Pratapgad S.S.K. Ltd., and it has a crushing capacity of 2500 units per day. The amount of sugarcane that could be crushed in this district grew by 35750 TCD during the 2011-2012 fiscal year. According to the most current figures that are available about the crushing capacity for the year 2016-17, fifteen sugar factories have attained a total capacity of

51950 TCD. Sugarcane crushing capacity is available. This rise in crushing capacity is a consequence of the expansion of sugar factories in the Satara area, and it represents a 259 percent increase in comparison to the capacity in 1996-1997.

Crushed Sugarcane in Satara District

According to Gaikwad S.B. (2003), the availability of sugarcane production in the command region of the individual sugar industry is the primary factor that determines the amount of cane crushing that operates inside the sugar industry. The following zones are used to examine the geographical and temporal sugarcane crushing that occurred during the years 1996-1997 and 2016-2017.

1. High Sugar Cane Crushing Zone: -

There were seven sugar enterprises that crushed a total of 355,4813 metric tonnes of sugarcane in the year 1996-1997. Karad tahsil falls within the jurisdiction of this High Sugar Cane Crushing Zone. Beginning in 1996-1997, the amount of sugarcane that is crushed at a quick rate. The amount of sugarcane that was crushed in 2001-2002 was 2111 thousand metric tonnes, whereas in 2006-2007 it was 1878 thousand metric tonnes, and in 2011-2012 it was 2525 thousand metric tonnes. Sugarcane crushing is becoming more prevalent in the Phaltan and Wai tahsil areas. Sugarcane was crushed to the tune of 5519 thousand metric tonnes in 2016-2017.

2. Moderate Sugarcane Crushing Zone

The amount of crushed sugarcane that was produced in this region during the year 1996-1997 was 994 thousand metric tonnes. This zone is located in the Wai and Satara tahsil. 19850 thousand metric tonnes in the 2001-2002 fiscal year, 1034 thousand metric tonnes in the 2006-2007 fiscal year, and 1209 thousand metric tonnes in the 2011-2012 fiscal year. subsequently to the formation of Khatav tahsil in the territory of modest sugarcane crushing. During the 2016–2017 fiscal year, 1915,000 metric tonnes

3. Low Sugarcane Crushing Zone: -

It was noted that Patan, Koregaon, and Jaoli tahsils had a low sugarcane crushing zone. In the year 1996-1997, the amount of sugarcane that was crushed was 277 thousand metric tonnes. In 2001-2002, there were 395 thousand metric tonnes, in 2006-2007, there were 234 thousand

metric tonnes, and in 2011-2012, there were 946 thousand metric tonnes available. 1036 thousand metric tonnes were produced in 2016–2017.

CONCLUSION

Sugar is becoming more in demand on a global market, and this trend is expected to continue. Over the course of the following years, the crushing capacity of the sugar industries has expanded, and in addition, new sugar factories have established up in the region. despite the fact that sugar is sold at a high price on the market and that farmers who cultivate sugarcane have made a lot of money from this commodity. Within the Satara area, there are fifteen sugar plants that are managed by both the commercial sector and the cooperative sector. The private sector is responsible for six of these fifteen factories, while the cooperative sector is responsible for nine of these enterprises. There is a disparity in the distribution and crushing capacities of sugar factories in a Satara municipal area. The Karad and Phaltan tahsils in this district are in the forefront of the expansion of sugarcane harvests and the number of sugar manufacturing facilities. The tahsils of Wai, Satara, and Khatav are located in the Moderate Sugarcane crushing Zone, whereas the tahsils of Patan, Koregaon, and Jaoli are included in the low sugarcane crushing zone.

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