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Assessment of Sugarcane Crop Distribution and Sugar Industries in Solapur District: A Geographical Perspective

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Abstract

Agriculture is the backbone of the Indian economy, which not only provides a lifeline to millions of farmers but also plays a vital role in shaping the economic landscape of the country. Large portion of the population dependents on the agriculture. It is one of the most important sectors in India, contributing significantly to its GDP. The sector is home to a wide variety of crops, which can be broadly classified into food crops and cash crops. Food crops such as Rice, Maize (Corn), Jowar, Bajra and Wheat are the main crops of India. It nourishes millions of people, forming the foundation of daily life across the country. On the other hand, cash crops such as Sugarcane, Cotton, Tea and Coffee not only boost the agricultural economy but also contributes to the global market, enhancing India's position as a major exporter. These crops are not only important to India's economy but also supports the livelihoods of millions of farmers, making agriculture an indispensable part of the fabric of the country. Among Cash crops, Sugarcane is important crop in Maharashtra, where, Solapur district is known for its significant contribution to the sugarcane. The fertile soil and favorable climate of this region makes it an ideal location for sugarcane cultivation. These factors plays a vital role in the district's agricultural economy. The district witnessed a large scale sugarcane cultivation, with a total of 150,586 hectares of agricultural area dedicated to the crop in 2023-24. Solapur district is home to a thriving sugar industry, with 38 operating sugar factories spread across various tehsils, hence, Solapur District is selected as a research area. This research paper is an attempt to analyze the geographical study of Sugarcane crop Distribution and Sugar industries in Solapur district.

Keywords: *Agriculture, Sugarcane, Sugar Industry, Economic Landscape*

Introduction

Solapur district in Maharashtra stands as a major hub for sugarcane cultivation and the sugar industry, its fertile soil and favourable climate making it an ideal district for the cultivation of this important crop. In 2023-24 the district had 150,586 hectares of land under sugarcane cultivation. In sugarcane cultivation, Karmala tahsil leads with the highest area (19.44%), followed by Pandharpur tahsil (18.96%) and Malshiras tahsil (12.67%), which together form the backbone of the district's sugarcane production. Apart from cultivation, Solapur district is also home to a thriving sugar industry, with 38 active sugar factories in its tehsil's. Karmala tahsil, Malshiras tahsil and Pandharpur tahsil each have five sugar factories, accounting for 13.16% of the total production capacity of the district. These industries not only provide a stable market for local farmers but also play a vital role in generating employment and boosting economic development in the region. This dynamic interaction between cultivation and industrialization has not only led to the economic development of the district, but has also contributed significantly to the overall sugar production of the state.

Objectives

The main objectives of this research paper are as under:

1. To study the geographical distribution of sugarcane crop in study region.
2. To study the regional distribution of sugar industries in study region.
3. To assess the sugarcane crop distribution and sugar industries in study region.

Database and Methodology

Data plays a crucial role in the discussion and evaluation of the research problem in any research. For this study, secondary data collected from various reliable sources serves as the primary source. These includes agricultural books, government and non-government agricultural reports, socio-economic district abstracts, district census reports and other relevant publications. These data sources plays a significant role in guiding the investigation and shaping the research. A theoretical approach has been used to analyze and interpret the collected data. All the relevant data has been collected at the district level, which provides a comprehensive view of the subject. Arc GIS 10.5 software applied for preparing the map and to show the geographical study of sugarcane crop distribution and sugar industries in Solapur District.

The tahsils of Solapur District are grouped into three categories i.e. high, moderate and low rainfall area on the basis of simple statistical method. To analyze spatial pattern of Sugarcane land use area, the same technique is applied for calculation. The Spearman's Rank Order method is used for analyzes the correlation between geographical study of sugarcane crop distribution and sugar industries area.

Formula:

Rank Order Spearman's Method
$$r = 1 - \sigma \Sigma d^2 / n^2 - N$$

Study Area

Solapur district is located in the southern part of Maharashtra which has been selected for the geographical study of sugarcane crop distribution and sugar industries. It is located between 17°10' to 18°32' North latitude and 74°42' to 76°15' East longitude which covers an area of about 14,895 square kilometers. It situated is at an average elevation of 500 meters (1,805 feet) above sea level. The district has about 1,150 inhabited villages and 3 main urban centers. According to 2011 census, Solapur district has total population of 4,317,756, with population density of 290 people. Solapur district has sex ratio of 938 female per 1,000 male. Solapur district has a monsoon climate, with an average annual rainfall of 570 mm. Summers can be very hot, with temperatures reaching 46°C, while winters are mild, with temperatures dropping upto about 9°C and two major seasonal rivers of the Solapur district, Bhima and the Sina rivers, provides essential water for agricultural, industrial and domestic use. Notably, Solapur district has an effective 38 sugar factories, making it one of the largest sugar industries in Maharashtra.

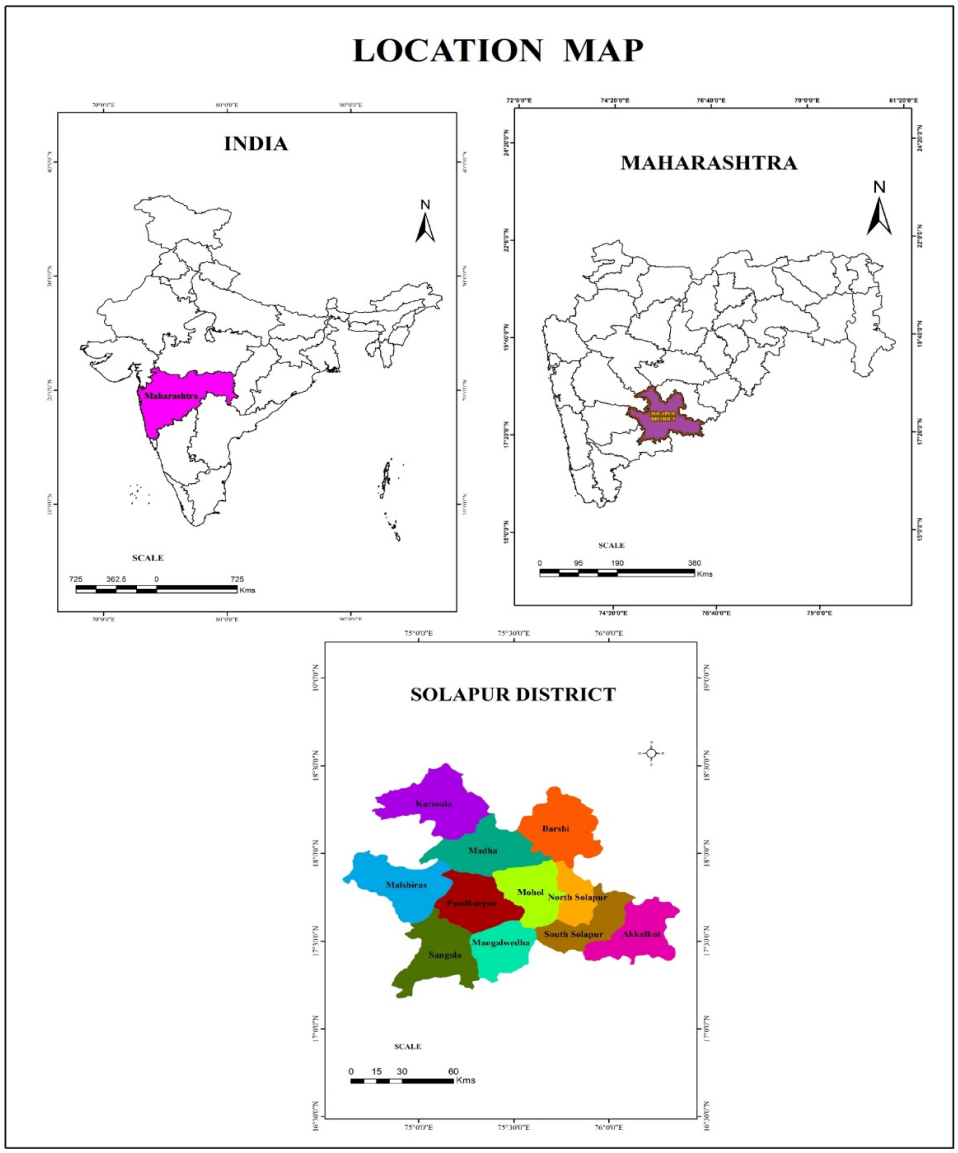

Fig. No. 1

Distribution of Sugarcane Crop

Solapur district is renowned for its rich agricultural heritage, where, distribution of sugarcane farmland across various tahsils in the district for the year 2023-24. Karmala tahsil and Pandharpur tahsil are leading in sugarcane cultivation in the district, as well as Malshiras and South Solapur tehsils are also contributed as a sugarcane cultivated area. It is shown by balanced agricultural graph. It reflects a dynamic pattern influenced by soil fertility, water availability, and infrastructural support is provides valuable insight into the scope of sugarcane cultivation and highlights the factors shaping its distribution in the district.

Table No. 1 Solapur District: Distribution Of Sugarcane Crop (2023-24)

Sr. No.	Name of Tahsil	Farmland (in Hectare)	Farmland (In %)
1	Akkalkot	2861	1.90
2	Barshi	7617	5.06
3	Karmala	29273	19.44
4	Madha	17151	11.39
5	Malshirus	19081	12.67
6	Mangalwedha	8108	5.38
7	Mohol	13130	8.72
8	North Solapur	3013	2.00
9	Pandharpur	28557	18.96
10	Sangola	3615	2.40
11	South Solapur	18180	12.07
Total		**150586**	100.00

Source: Socio-Economic Abstract of Solapur District (2023-24)

Table No. 1 and Fig. No. 2 Shows Tahsilwise distribution of Sugarcane Crop in 2023-24 of the Solapur district. It reveals distinct patterns is categorized into- High, Moderate, and Low concentrations.

High Concentration (Above 15%):

Karmala (19.44%) and Pandharpur (18.96%) are the dominant areas in Solapur district. Fertile soil, favourable climate and reliable irrigation systems like these factors are beneficial for those tehsils, The presence of well-developed infrastructure and proximity to sugar industries further increase sugarcane production in these areas.

Moderate Concentration (10-15%):

Malshiras (12.67%), Madha (11.39%) and South Solapur (12.07%) fall in the medium concentration category in Solapur district. These regions have moderately fertile soil and receive adequate rainfall. However, sometimes water scarcity and limited access to advanced farming techniques limit further expansion.

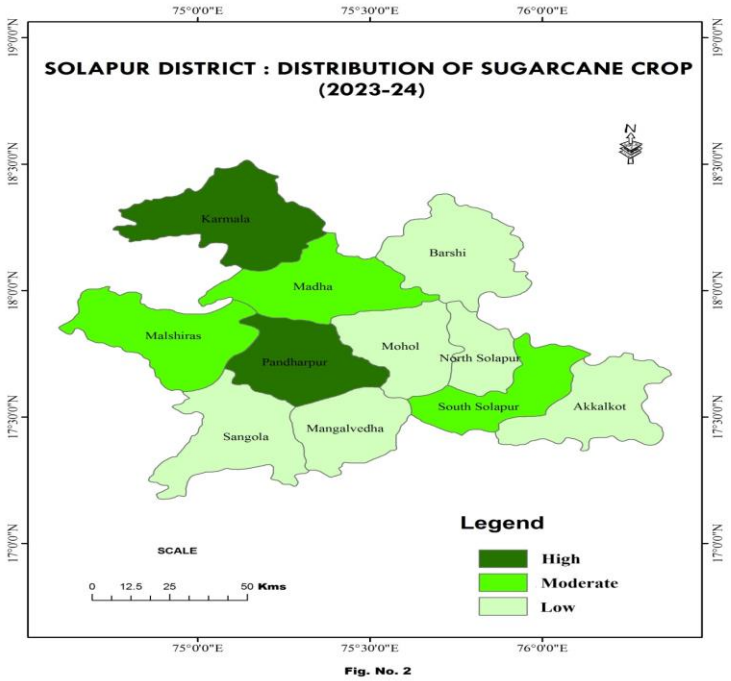

Fig. No. 2

Low Concentration (Below 10%):

In Solapur district, sugarcane cultivation is low in Barshi (5.06%), Mangalwedha (5.38%), Mohol (8.72%), Akkalkot (1.90%), North Solapur (2.00%) and Sangola (2.40%). Low concentration denoted from shown tahsils due to the low fertile land, rain-fed agriculture, lack of the irrigation facilities and semi-arid climate, Focuses on alternative crops like Jowar and pulses in these areas.

In short, regions with high sugarcane yields thrive due to fertile land and strong infrastructure. On the other hand Low sugarcane yields face challenges such as water scarcity and soil limitations, which affects on sugarcane cultivation.

Sugar Industries

Solapur district is known as the "Sugar Bowl of Maharashtra" due to its favorable climate for sugarcane cultivation and the high interest of farmers in sugarcane production. In Maharashtra, there are 38 sugar factories in a single district, which is very high at the state level. Out of these, 14 Co-operative and 28 Private sugar factories are working in Solapur District. With expansion of the industry is widespread and significant. 38 sugar factories spread across 11 tehsils of the Solapur district. Karmala, Malshiras and Pandharpur are contributing 13.16% to the total number of industries. The strong presence of these industries not only strengthens the local economy but also supports the agricultural community, making Solapur a major player in the sugar production sector of the state.

Table No. 2 In Solapur District: Distribution Of Sugar Industries (2023-24)

Sr. No.	Name of Tahsil	Sugar Industries	
		In No.	In %
1	Akkalkot	1	2.63
2	Barshi	3	7.89
3	Karmala	5	13.16
4	Madha	4	10.53
5	Malshirus	5	13.16
6	Mangalwedha	4	10.53
7	Mohol	4	10.53
8	North Solapur	4	10.53
9	Pandharpur	5	13.16
10	Sangola	1	2.63
11	South Solapur	2	5.26
Total		**38**	100.00

Source: Complied by the Researcher.

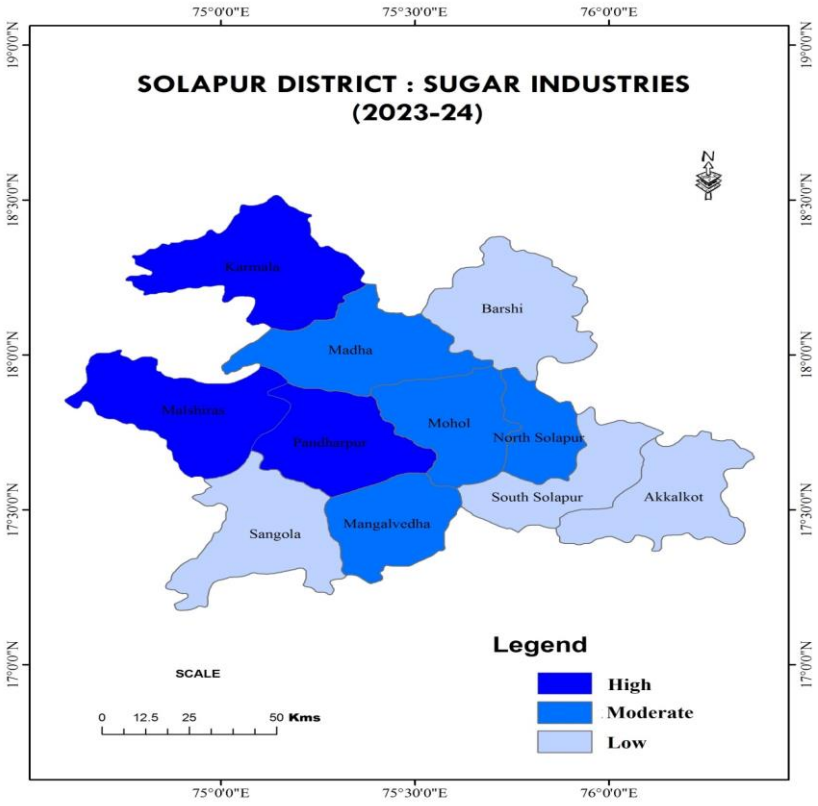

Fig. No. 3

Table No. 2 and Fig. No. 3 Distribution of Tahsilwise Sugar Industries in Solapur District.

From these figure it shows following distribution Sugar Industries. It reveals distinct patterns is categorized into- High, Moderate, and Low concentrations.

High Concentration

Karmala, Malshiras and Pandharpur, with 13.16% each, fall in the high concentration category in Solapur district. These areas are known for their favourable agro-climatic conditions, including fertile soil and irrigation facilities, which support extensive sugarcane cultivation. The presence of developed transport infrastructure and proximity to major markets is further boosting industrial development in this tehsil.

Moderate Concentration

Madha, Mangalwedha, Mohol and North Solapur, with 10.53% each, are classified as medium concentration in Solapur district . These talukas benefit from moderate water availability and relatively good soil quality, although sometimes water scarcity or poorly developed infrastructure limit further expansion.

Low Concentration

Barshi (7.89%), South Solapur (5.26%), Akkalkot and Sangola (2.63% each) fall under the low concentration category in Solapur district. Factors such as limited water resources, low soil fertility and poor transport facilities are reduce industrial presence in these regions. Additionally, these areas can focus more on alternative crops or other types of economic activities.

In short, regions with favorable geographical conditions, high sugarcane area, and infrastructure have a high concentration of sugar industries, while the regions with low sugarcane area have fewer sugar factories due to water scarcity and poor infrastructure.

Correlation between Sugarcane Crop Distribution and Sugar Industries

The Spearman's Rank Order method is used for the calculation of the correlation of Sugarcane crop distribution and Sugar industries in Solapur District. The formula are-

$$r= 1-6(\Sigma d^2)/N(N^2 -1)$$

Table No. 3 The Sugarcane Crop Distribution And Sugar Industries In Solapur District

Sr. No.	Name of Tahsil	Farmland (In Hectare)	Farmland (In %)	Rank	Sugar Industries (No.)	Sugar industries (In %)	Rank	d^2
1	Akkalkot	2861	1.90	11	1	2.63	5	36
2	Barshi	7617	5.06	8	3	7.89	3	25
3	Karmala	29273	19.44	1	5	13.16	1	0
4	Madha	17151	11.39	5	4	10.53	2	9
5	Malshirus	19081	12.67	3	5	13.16	1	4
6	Mangalwedha	8108	5.38	7	4	10.53	2	25
7	Mohol	13130	8.72	6	4	10.53	2	16
8	North Solapur	3013	2.00	10	4	10.53	2	64
9	Pandharpur	28557	18.96	2	5	13.16	1	1
10	Sangola	3615	2.40	9	1	2.63	6	9
11	South Solapur	18180	12.07	4	2	5.26	4	0

Source: Complied by the Researcher

$r = 1-6(\Sigma d^2)/N(N^2 -1)$
Here, r = Correlation, N= Number of Observation, D= deviation
$r = 1-6*189/11 (11^2-1)$
r = 0.14

It is observed that there is moderate positive or direct correlation i.e. p= 0.14 between the Sugarcane crop distribution and Sugar industries in Solapur District. There are the some reasons-especially physiography, slope, plain area, fertile soil, climate and irrigation system for moderate positive or direct correlation in Solapur district.

Conclusion

There are wide disparities in the Sugarcane crop distribution and Sugar industries area of Solapur District. The highest the Sugarcane crop distribution are observed in Karmala tahsil whereas lowest in Akkalkot tahsil of Solapur district. The highest Sugar industries was observed in Karmala tahsil, Malshirus tahsil and Pandharpur tahsil and lowest in Sangola tahsil. But the correlation between the Sugarcane crop distribution and Sugar industries found moderate positive or direct correlation i.e. r =0.14. It means high Sugarcane crop distribution, high Sugar industries. It was observed higher the Sugarcane crop distribution, high Sugar industries i.e. Karmala tahsil. That tahsil has 29273 hect. Sugarcane crop distribution and 5 Sugarcane industries.

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Conflicts of interest
The authors declare that there are no conflicts of interest regarding the publication of this paper.

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