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GROWTH PATTERNS IN SUGARCANE PRODUCTION IN INDIA

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ABSTRACT

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This study analyzes growth trends in sugarcane cultivation across Indian states, focusing on area, production and productivity of sugarcane through Compound Growth Rate (CGR), Compound Annual Growth Rate (CAGR) from 2006 to 2022 and trend analysis for export and import of sugarcane. The paper examines inter-state variations using secondary data from various sources such as Cooperative Sugar, Sugar Statistics and Indiastat. Findings reveal that states like Bihar and Punjab exhibit consistent positive growth especially in productivity, while Tamil Nadu, Odisha and Andhra Pradesh show declines across all parameters. Trend analyses suggest that productivity remains relatively stable, while area and production reflect greater fluctuations.

KEY WORDS: ***Sugarcane, Area, Production, Productivity, Import, Export, CGR***

I. INTRODUCTION

Sugar is one of the most essential agricultural commodities in India and forms the backbone of the country's agro-based industries. India ranks among the top producers and consumers of sugar globally, highlighting the commodity's domestic importance and international relevance. The sugar industry plays a vital role in the Indian economy, particularly in the rural sector, where it supports more than 50 million sugarcane farmers and around half a million workers employed directly in sugar mills.

In recent decades, the Indian sugar industry has undergone significant changes due to liberalization policies, government support schemes and advancements in agricultural practices. With the growing emphasis on sustainability and value addition, the sector has also diversified into ethanol production and cogeneration of power, enhancing its role in the renewable energy landscape.

From a trade perspective, sugar is a vital component of India's export-import basket. India often ranks among the top global exporters, especially when domestic production exceeds demand. However, trade performance is affected by fluctuations in global prices, policies, and domestic supply. Imports rise during low-output periods, making sugar trade a closely monitored policy area. Overall, the sugar industry plays a strategic role in India's agriculture, rural economy, energy sector, and trade policy.

II. OBJECTIVES OF THE STUDY

1. To examine the trends in Area, Production and Productivity of Sugarcane in India.
2. To study export and import performance of Sugar in India.

III. METHODOLOGY

The data has been collected from various secondary sources such as Cooperative Sugar, Sugar Statistics, Indiastat, etc. In this study, the data were collected from the period 2006 to 2021. Various analytical tools such as the estimation of CGR, CAGR and Trend analysis were employed to examine the trends in sugarcane production, consumption, export and imports.

IV. REVIEW OF LITERATURE

Arun et al. (2022) conducted a comprehensive study on sugarcane production in India between 2001–02 and 2017–18, reporting positive growth in area, production, and productivity. The study revealed that nearly 65% of sugarcane production was concentrated in Uttar Pradesh and Maharashtra, with tropical states exhibiting higher yields. To improve productivity, the authors recommended sustainable agro-techniques, climate-resilient crop varieties, cost-effective methods, and better coordination between farmers and sugar mills. They emphasized the importance of long-term strategies to enhance productivity and meet global demand. **Nida Bee (2020)** analyzed sugarcane cultivation trends over a 30-year period from 1985 to 2015 and found a 5.63% increase in area

and a 7.40% increase in production. The study attributed growth to favorable monsoon conditions, pricing policies, and government incentives. However, it also highlighted issues such as water scarcity and inconsistent pricing, which caused fluctuations in growth. Despite large cultivation areas, the continued use of traditional methods and limited access to machinery posed constraints. The study suggested that custom hiring centers could help small farmers benefit from modern equipment.

V. RESULTS AND DISCUSSION

Table 1 Area, Production and Productivity of Sugarcane in India

Year	Area ('000 ha)	Production ('000 tons)	Productivity (tons /ha)
2008-09	4415	285029	64.6
2009-10	4175	292302	70
2010-11	4886	342382	70.1
2011-12	5038	361037	71.7
2012-13	4998	341198	68.3
2013-14	4993	352142	70.5
2014-15	5067	362333	71.5
2015-16	4927	348448	70.7
2016-17	4436	306070	69
2017-18	4732	376905	79.66
2018-19	5114	405427	78.25
2019-20	4603	370500	80.5
2020-21	4857	399263	82.2
2021-22	5175	439432	84.91
2022-23*	5883	494228	84.48
CGR	**0.98**	**2.77**	**1.77**
CAGR	**0.02**	**0.04**	**0.02**

Source: Sugar Statistics

Figure 1: Area, Production and Productivity of Sugarcane in India

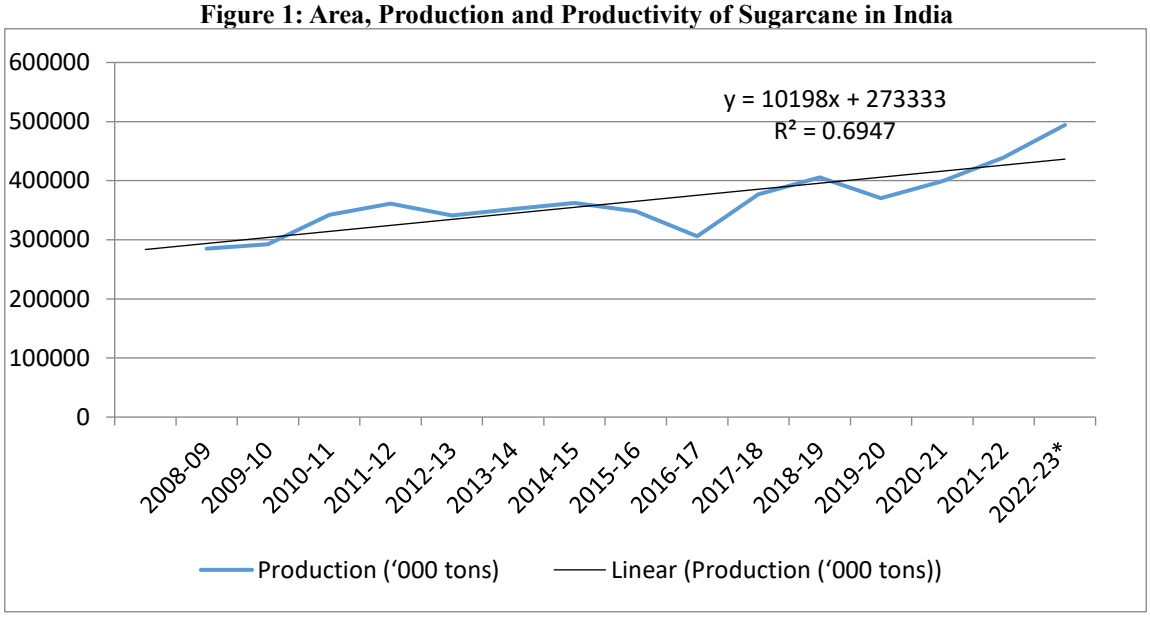


Table 1 and Figure 2 shows the trends in sugarcane cultivation in India from 2008-09 to 2022-23 focusing on Area, Production and Productivity. Over the years, the area under sugarcane cultivation has fluctuated with a Compound Growth Rate (CGR) of 0.98 percent, while production has grown significantly at 2.77 percent indicating improved the production. Productivity has generally increased reaching a peak of 84.91 tonnes per hectare in 2021-22. The highest production (494.23 million tonnes) and area (5.88 million hectare) were recorded in 2022-23. Despite fluctuations the Compound Annual Growth Rate (CAGR) remains low suggesting a steady long-term trend. The data highlights India's consistent improvements in sugarcane farming efficiency and production over time.

Table 2: Sugarcane Area in Important States of India

STATE	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21*	CGR
Andhra Pradesh	264	247	196	158	192	204	196	153	139	122	103	99	102	86	55	-8.77
Gujarat	214	211	221	154	190	202	176	174	208	157	169	182	167	161	183	-1.47
Karnataka	326	306	281	337	423	430	425	420	480	450	397	350	506	429	428	2.55
Madhya Pradesh	64	75	71	62	65	69	59	73	111	103	92	98	118	125	106	4.92
Maharastra	1049	1093	768	756	965	1022	933	937	1030	987	633	902	1163	822	1142	0.15
Orissa	20	20	11	8	13	15	15	14	10	9	5	4	6	9	7	-7.63
Tamilnadu	391	354	309	293	316	346	347	313	263	252	218	180	165	131	139	-7
Bihar	130	109	112	116	248	218	250	258	254	244	240	236	226	224	219	5.3
Haryana	140	140	90	74	85	95	101	102	97	93	102	114	94	96	93	-0.97
Punjab	99	110	81	60	70	80	83	89	94	90	88	96	95	91	95	0.82
Uttar Pradesh	2247	2179	2084	1977	2125	2162	2212	2228	2141	2169	2160	2234	2224	2208	2180	0.25

Source: Sugar Statistics

Table 2 presents the area of sugarcane in India across important states of India from 2006-07 to 2020-21. **Uttar Pradesh consistently held the largest area under sugarcane**, maintaining figures above 2,000 thousand hectares throughout the study period. **Maharashtra and Karnataka followed**, showing significant fluctuations but generally high levels of cultivation. Maharashtra showed a notable dip in 2016-17 but rebounded strongly by 2020-21. States like **Andhra Pradesh and Tamil Nadu** exhibited a **declining trend**, especially Andhra Pradesh, which dropped from 264 to 55 thousand hectares. Smaller contributors like **Orissa, Punjab, and Haryana** maintained relatively stable but minimal area shares. The data reflects regional disparities and shifting dynamics in sugarcane cultivation, influenced by factors such as climate, water availability, and state-level policy support.

Table 3: Sugarcane Production in Important States of India

(In 000' tonnes)

State	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21*	CGR
Andhra Pradesh	21692	20254	15380	11708	14964	16686	15567	12009	9987	9353	7830	7948	8091	6724	4295	-8.95
Gujarat	15630	15190	15510	12400	13760	12750	12690	12550	14330	11120	11950	12052	12036	11570	13621	-1.61
Karnataka	28670	26240	23328	30443	39657	38808	35732	37905	43776	37834	27378	28263	42006	38181	41088	2.33
Madhya Pradesh	2806	3180	2975	2535	2667	2677	2642	3173	4567	5281	4730	5430	6956	7434	5666	7.76
Maharastra	78568	88437	60648	64159	81896	86733	69648	76901	84699	73680	52262	83134	92443	69312	97070	0.6
Orissa	1274	1096	646	490	903	885	952	937	723	577	344	240	381	505	389	-7.71
Tamilnadu	41124	38071	32804	29746	34252	38576	33919	32454	28093	25494	18988	16536	16208	14119	13944	-7.62
Bihar	5956	3855	4960	5033	12764	11289	12741	12882	14034	12649	13036	13982	11661	13579	15005	8.47
Haryana	9580	8860	5130	5335	6042	6959	7437	7499	7169	6692	8223	9633	7571	7730	7567	0.95
Punjab	6020	6690	4670	3700	4170	5653	5919	6675	7039	6607	7152	8024	7774	7302	7855	3.69
Uttar Pradesh	133949	124665	109048	117140	120545	128819	132427	134689	133061	145385	140169	177056	179715	179539	177262	3.27

Source: Sugar Statistics

Table 3 displays sugarcane production across major Indian states from 2006-07 to 2020-21. Uttar Pradesh leads by a large margin, consistently producing over 100,000 thousand tonnes and peaking in 2018-19. Maharashtra follows with significant production, showing fluctuations but reaching its highest in 2020-21. Karnataka also shows a strong performance especially after 2010-11, with production crossing 40,000 in recent years.
Tamil Nadu once a top producer shows a steady decline over time.

Table 4: Sugarcane Productivity in Important States of India

(in tonnes per hectare)

State	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21*	CGR
Andhra Pradesh	82.2	82.2	78.5	74.1	77.9	81.8	79.4	78.5	71.8	76.7	76	80.28	79.33	79.19	78.08	-0.18
Gujarat	73	72	70.2	80.5	72.4	63.1	72.1	72.1	68.9	70.8	70.7	66.22	71.97	71.89	74.53	-0.15
Karnataka	87.9	85.8	83	90.3	93.8	90.3	84.1	90.3	91.2	84.1	69	80.75	83	89	96	-0.21
Madhya Pradesh	43.6	42.3	42.2	40.8	41	35.1	0	0	0	0	51.4	55.41	58.95	59.47	53.45	0
Maharastra	74.9	80.9	79	84.9	84.9	84.9	74.6	82.1	82.2	74.7	82.6	92.17	79.5	84.28	85	0.45
Orissa	63.4	55.4	59.8	61.3	69.5	59	63.5	66.9	72.3	64.1	68.8	64.95	63.06	56.42	56.14	0.01
Tamilnadu	105.1	107.5	106.2	101.5	108.4	111.5	97.7	103.7	106.8	101.2	87.1	92.02	98.24	107.6	100	-0.67
Bihar	46	35.5	44.3	43.4	51.5	51.8	51	49.9	55.3	51.8	54.3	59.2	51.7	60.7	68.4	2.99
Haryana	68.4	63.3	57	72.1	71.1	73.3	73.6	73.5	73.9	72	80.6	84.5	80.37	80.27	81.19	1.92
Punjab	60.1	60.8	57.7	61.7	59.6	70.7	71.3	75	74.9	73.4	81.3	83.58	81.83	80.2	82.6	2.86
Uttar Pradesh	59.6	57.2	52.3	59.3	56.7	59.6	59.9	60.5	62.1	67	64.9	79.26	80.81	81.3	81.3	3.01

Source: Sugar Statistics

Table 4 shows the Productivity of Sugarcane across Indian states from 2006-07 to 2020-21. Tamil Nadu consistently recorded the highest productivity, peaking at 111.5 in 2011-12, though it saw a decline in later years. Karnataka also demonstrated strong productivity improving steadily to reach 96 tonnes per hectare in 2020-21. Maharashtra and Andhra Pradesh maintained relatively high and stable productivity levels. In contrast states like Bihar, Madhya Pradesh and Orissa had lower productivity though Bihar showed notable improvement in recent years. Uttar Pradesh, despite being the largest producer had moderate productivity but showed a gradual rise over time. Punjab and Haryana maintained good and consistent productivity figures throughout the peri

Table 5: Export of Sugar in India

Year	Quantity (in Tonnes)	Value (Rs./in Crores)
2007-08	4684554	5412.16
2008-09	3331997	4448.74
2009-10	44045	110.23
2010-11	3249300	10352.27
2011-12	4074900	12973.73
2012-13	2784489	8576.83
2013-14	2473483	7152.17
2014-15	1950931	5296.53
2015-16	3128275	9787.95
2016-17	2538230	8621.61
2017-18	1750724	5180.54
2018-19	3977639	9451.57
2019-20	5787322	13910.31
2020-21	7506555	20577.09
2021-22	10431275	34197.63
2022-23	4035868	14500.78
CGR	**11.23**	**1023.08**
CAGR	**-0.01**	**0.07**

Source: Sugar Statistics

Table 5 highlights India's sugar export trends from 2007-08 to 2022-23, showcasing fluctuations in both quantity and value. Export volumes varied significantly, reaching a peak of 10.43 million tonnes in 2021-22. The value of exports also saw a substantial rise hitting ₹34,197.63 crores in 2021-22 indicating higher global demand and pricing. Despite occasional declines, a strong growth trend is observed in recent years particularly from 2018-19 onward. The Compound Growth Rate (CGR) for export volume stands at 11.23 percent, while the export value has surged with a CGR of 1023.08 percent, signifying an increase in global sugar prices. The data reflects India's strengthening position in the international sugar market.

Table 6: Import of Sugar in India from 2007-08 to 2022-23

Year	Import	
	Quantity (In Tonnes)	Value (Rs./In Crores)
2007-08	8.06496	2.24
2008-09	386099	583.11
2009-10	2424045	5961.24
2010-11	1004100	2723.21
2011-12	119661	374.67
2012-13	1122259	3094.38
2013-14	880519	2279.21
2014-15	1537830	3645.15
2015-16	1600027	4011.03
2016-17	2144429	6849.63
2017-18	2401484	6017.22
2018-19	1487677	3147.5
2019-20	1114828	2441.95
2020-21	1963233	4698.64
2021-22	358431	1227.4
2022-23	1235	16.26
CGR	**39.52**	**25.35**
CAGR	**0.65**	**0.22**

Source: Sugar Statistics

Table 6 presents India's sugar import trends from 2007-08 to 2022-23 illustrating fluctuations in both quantity and value. Imports peaked at 2.4 million tonnes in 2017-18, with significant variations over the years. The highest import value was recorded in 2016-17 at ₹6,849.63 crores. A declining trend is observed in recent years, with imports dropping to just 1,235 tonnes in April-June 2022-23 indicating reduced

dependency on foreign sugar. The Compound Growth Rate (CGR) for import volume is 39.52 percent, while the value has increased at a CGR of 25.35 percent, suggesting price fluctuations. Overall, India's sugar imports have reduced, aligning with increased domestic production.

Figure 2: Export and Import Trends of Sugar in India

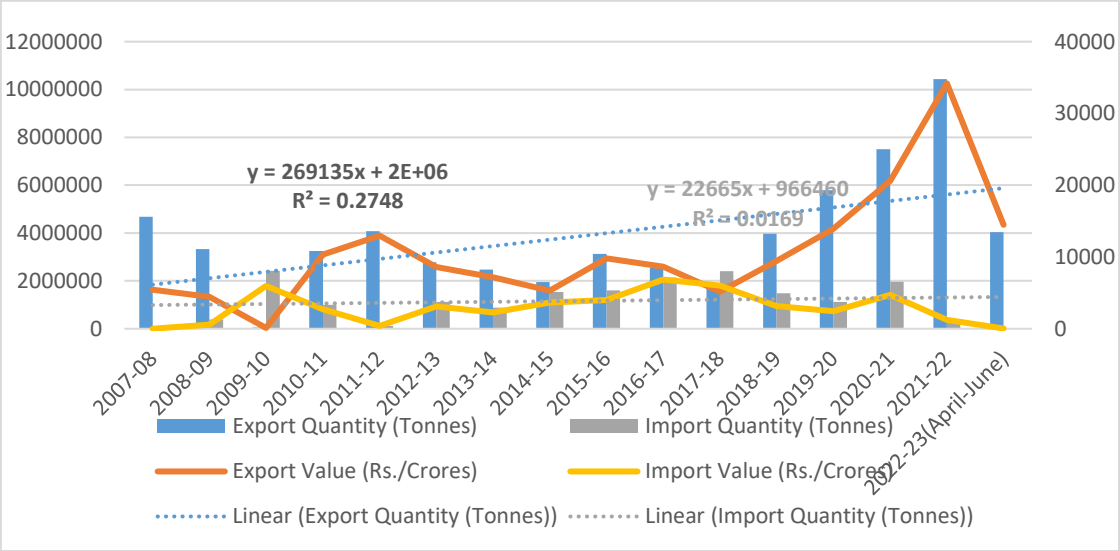


Figure 2 presents the export and import trends of sugar in India from 2007-08 to 2022-23. Sugar exports (blue bars) have shown a significant rising trend, especially after 2017-18 reaching their peak in 2021-22 before slightly declining in 2022-23. Imports (green bars) on the other hand, have remained relatively low and stable over the years, with minor fluctuations. The trend lines indicate a strong upward trajectory for exports ($R^2 = 0.2748$), while imports have a weaker ($R^2 = 0.0169$) suggesting that India has shifted towards becoming a net exporter of sugar. This trend reflects increased domestic production and favourable international demand for Indian sugar.

VI. CONCLUSION

This study provides an analytical overview of the Compound Growth Trends in sugarcane cultivation across Indian states, revealing notable regional disparities. States like Bihar and Punjab demonstrate consistent positive growth in area, production and productivity reflecting effective agricultural practices and policy support. In contrast, states such as Tamil Nadu, Odisha and Andhra Pradesh show declining trends, indicating structural or environmental challenges affecting sugarcane cultivation. So, the g overnment of India should concentrate on production side by giving skill based training and more subsidies for farmers such as fertilizer, irrigation, implements and skill etc.

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