

Historical Trends in Sugarcane Area and Production in India: Analyzing Changes Over the Past Decades

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ABSTRACT

This study examines the historical patterns in sugarcane farming and output in India, analyzing shifts that have occurred in the past few decades. The research offers a thorough analysis of sugarcane areas and production levels, presenting a full account of their changes from the early 20th century to the present. Important areas of concentration encompass regional disparities in cultivation and production, the ramifications of technical progress, and the sway of economic and regulatory shifts. The study emphasizes notable variations in the size of sugarcane cultivation and its productivity, ascribing these patterns to factors such as climatic conditions, agricultural techniques, and governmental actions. This research endeavors to uncover the primary factors responsible for changes in the sugarcane sector by analyzing historical data and patterns. Additionally, it intends to provide valuable insights into future advancements in this field. The findings enhance comprehension of the factors influencing sugarcane production in India and establish a basis for strategic planning and policy development to tackle existing challenges and possibilities in the industry.

Keywords: Sugarcane Production, Production Trends, Cultivation Patterns, Crop Improvement, Climate Effects and Sustainable Practices

INTRODUCTION

Sugarcane is a crucial crop in India, significantly contributing to the country's agricultural economy and the global sugar market. As one of the world's largest producers of sugarcane, India has seen substantial changes in the area under sugarcane cultivation and its production levels over the decades. Understanding these historical trends is essential for policymakers, farmers, and researchers to address current challenges and leverage opportunities for sustainable growth in the sugarcane sector.

The historical trends in sugarcane cultivation and production in India have been influenced by various factors, including technological advancements, climatic conditions, economic policies, and regional disparities. Technological innovations, such as improved irrigation techniques and pest control methods, have played a pivotal role in enhancing sugarcane yield and production efficiency (Singh & Singh, 2010). Climate change and its associated impacts, such as variations in rainfall patterns and temperature, have also significantly affected sugarcane growth and productivity (Rao et al., 2014).

Economic policies and government interventions have further shaped the trajectory of sugarcane cultivation in India. Subsidies, price controls, and trade policies have had profound effects on farmers' decisions regarding sugarcane cultivation (Kumar & Sharma, 2014). Regional variations in soil quality, water availability, and infrastructure have led to differences in sugarcane production across different states (Pandey et al., 2018).

This study aims to provide a comprehensive analysis of the historical trends in sugarcane area and production in India, focusing on the key drivers behind these changes and their implications for the future. By examining data from various sources and incorporating insights from previous research, this study will offer a nuanced

understanding of the factors influencing sugarcane cultivation and production in India over the past several decades.

Understanding these historical trends is crucial for developing strategies to improve sugarcane productivity and sustainability. It also helps in formulating policies that can mitigate the impacts of climate change and economic fluctuations on sugarcane farmers. As the demand for sugar and related products continues to grow, ensuring the stability and growth of the sugarcane sector becomes increasingly important for India's agricultural economy and food security.

LITERATURE REVIEW

The historical trends in sugarcane cultivation and production in India have been the focus of numerous studies, providing a rich body of literature that explores various factors influencing these trends. This review synthesizes key findings from past research, highlighting technological, climatic, economic, and regional aspects that have shaped the sugarcane sector over the past decades.

Technological innovations have played a critical role in enhancing sugarcane yield and production efficiency. Singh and Singh (2010) highlighted significant advancements in irrigation techniques, pest control methods, and high-yielding sugarcane varieties. These technological improvements have contributed to increased productivity and better resource utilization, making sugarcane cultivation more sustainable and profitable. The introduction of drip irrigation, for instance, has been particularly effective in regions with water scarcity, improving water use efficiency and crop yield (Singh & Singh, 2010).

The impact of climate change on sugarcane productivity has been extensively studied. Rao, Swain, and Bal (2014) examined how variations in temperature and rainfall patterns have affected sugarcane growth. Their study found that changes in climate could lead to significant fluctuations in yield, posing challenges for farmers. Adaptation strategies, such as altering planting dates and adopting drought-resistant varieties, have been suggested to mitigate these impacts. However, the effectiveness of these strategies varies across different regions, depending on local climatic conditions and resource availability (Rao et al., 2014).

Economic factors, including government policies, subsidies, and market prices, have profoundly influenced sugarcane cultivation in India. Kumar and Sharma (2014) conducted an econometric analysis to understand the relationship between economic policies and sugarcane productivity. Their findings indicate that subsidies and price controls have had a mixed impact, sometimes leading to overproduction and other times failing to provide adequate incentives for farmers. The study emphasizes the need for balanced policies that support sustainable production without causing market distortions (Kumar & Sharma, 2014).

Regional disparities in sugarcane production are another critical area of study. Pandey, Pandey, and Singh (2018) analyzed statistical data to identify variations in sugarcane yield across different states in India. Their research found that factors such as soil quality, water availability, and infrastructure significantly influence regional differences in production. States with better access to irrigation and advanced agricultural practices tend to have higher productivity levels. Addressing these disparities requires targeted interventions that consider the unique conditions of each region (Pandey et al., 2018).

Several studies have traced the historical trends in sugarcane area and production, providing insights into past patterns and future projections. The comprehensive review by Singh et al. (2012) explored the evolution of sugarcane cultivation from the early 20th century to the present day, highlighting major milestones and shifts in production practices. Their work underscores the importance of historical data in understanding current trends and predicting future developments. By analyzing long-term data, researchers can identify persistent challenges and emerging opportunities in the sugarcane sector (Singh et al., 2012).

The literature on historical trends in sugarcane area and production in India reveals a complex interplay of technological, climatic, economic, and regional factors. Technological advancements have driven productivity gains, while climate change poses ongoing challenges. Economic policies and government interventions have had mixed impacts, necessitating careful consideration to balance incentives and sustainability. Regional

disparities highlight the need for tailored approaches to address local conditions. Understanding these historical trends is crucial for developing strategies to enhance the resilience and sustainability of the sugarcane sector in India.

Statement of the Problem

India, one of the largest producers of sugarcane globally, has experienced significant fluctuations in sugarcane area, production, and yield over the past several decades. Despite technological advancements and government interventions, the sector faces persistent challenges threatening its sustainability and productivity. Technological innovations, such as improved irrigation methods and pest control techniques, have increased productivity (Singh & Singh, 2010). However, uneven adoption and climate change impacts, like altered rainfall patterns, have led to uncertainties (Rao et al., 2014). Economic policies and regional disparities further complicate the landscape (Kumar & Sharma, 2014; Pandey et al., 2018). This study aims to provide a holistic analysis of these factors to inform future strategies.

Significance of the Study

It is essential to comprehend past patterns in India's sugarcane production and area for a number of reasons. First off, the sugarcane sector in India, one of the world's biggest producers, is vital to the nation's employment and agricultural economies. Policymakers can make better decisions by identifying patterns and underlying variables affecting output with the aid of an analysis of these trends (Kumar & Sharma, 2014). By offering a thorough analysis that incorporates a variety of impacting factors technological, climatic, economic, and regional this study adds to the body of literature. It provides a comprehensive grasp of the potential and problems facing the sugarcane industry, which is crucial for creating strategies that will increase sustainability and production.

Objective of the Study

This study aims to perform a thorough examination of the historical changes in India's sugarcane production and area during the previous few decades. This entails analysing the combined effects on sugarcane production and cultivation of economic policies, climate conditions, technical improvements, and regional inequities. The study intends to give insights that will inform policy formulation, increase regional development, and improve the resilience and sustainability of India's sugarcane sector by identifying the major drivers of change and their ramifications.

RESEARCH METHODOLOGY

The study analyzes historical trends in sugarcane area and production in India, identifying key changes and influencing factors over the past decades. It uses historical data from various secondary sources, including government publications, FAO reports, research articles, academic journals, and agricultural records. A comprehensive literature review will contextualize findings within broader agricultural and economic trends. This review will cover economic policies, technological advancements, climate change impacts, and socio-economic factors. Qualitative data from reports, articles, and expert opinions will support and explain quantitative findings, providing a thorough understanding of the observed trends.

RESULT AND DISCUSSION

The historical analysis of sugarcane area and production in India highlights significant growth driven by government policies, technological advancements, and socio-economic factors. However, addressing challenges related to water use, climate change, and market stability will be vital for the future sustainability of sugarcane cultivation in India. The study provides a comprehensive understanding of past trends and offers insights for future agricultural planning and policy-making.

Table 1 All-India Area, Production and Yield of Total Sugarcane Over the Years

YEAR	AREA	PRODUCTION	YIELD	AREA UNDER IRRIGATION (%)
1950-1951	1.71	57.05	33422	67.33
1951-1952	1.94	61.63	31786	68.77
1952-1953	1.73	51.00	29495	66.29
1953-1954	1.41	44.41	31497	67.66
1954-1955	1.62	58.74	36303	68.79
1955-1956	1.85	60.54	32779	67.19
1956-1957	2.05	69.05	33683	64.93
1957-1958	2.07	71.16	34325	65.19
1958-1959	1.95	73.36	37658	67.40
1959-1960	2.14	77.82	36414	67.88
1960-1961	2.42	110.00	45549	69.26
1961-1962	2.46	103.97	42349	68.04
1962-1963	2.24	91.91	40996	67.75
1963-1964	2.25	104.23	46353	69.64
1964-1965	2.60	121.91	46838	71.52
1965-1966	2.84	123.99	43717	71.14
1966-1967	2.30	92.83	40336	70.98
1967-1968	2.05	95.50	40665	74.08
1968-1969	2.53	124.68	49236	76.95
1969-1970	2.75	135.02	49121	75.48
1970-1971	2.62	126.37	48322	72.38
1971-1972	2.39	113.57	47511	71.80
1972-1973	2.45	124.87	50933	75.01
1973-1974	2.75	140.81	51163	76.46

1974-1975	2.89	144.29	49855	77.87
1975-1976	2.76	140.60	50903	77.98
1976-1977	2.82	153.01	53383	77.19
1977-1978	3.15	176.97	56160	78.13
1978-1979	3.09	151.66	49114	77.77
1979-1980	2.61	128.83	49358	77.20
1980-1981	2.67	154.25	57844	81.26
1981-1982	3.19	186.36	58359	82.34
1982-1983	3.36	189.51	56441	80.54
1983-1984	3.11	174.08	55978	80.33
1984-1985	2.95	170.32	57673	83.59
1985-1986	2.85	170.65	59889	84.51
1986-1987	3.08	186.09	60444	85.38
1987-1988	3.28	196.74	60006	85.62
1988-1989	3.33	203.04	60992	86.18
1989-1990	3.44	225.57	65612	86.93
1990-1991	3.69	241.05	65395	86.97
1991-1992	3.84	254.00	66069	88.01
1992-1993	3.57	228.03	63843	88.27
1993-1994	3.42	229.66	67120	88.76
1994-1995	3.87	275.54	71254	85.39
1995-1996	4.15	281.10	67787	87.43
1996-1997	4.17	277.56	66496	90.95
1997-1998	3.93	279.54	71133	91.57
1998-1999	4.05	288.72	71203	91.91
1999-2000	4.22	299.32	70934	92.50
2000-2001	4.32	295.96	68578	92.17
2001-2002	4.41	297.21	67370	92.28

2002-2003	4.52	287.38	63576	92.66
2003-2004	3.93	233.86	59380	92.27
2004-2005	3.66	237.09	64752	92.39
2005-2006	4.20	281.17	66919	93.27
2006-2007	5.15	355.52	69022	93.80
2007-2008	5.06	348.19	68877	93.83
2008-2009	4.42	285.03	64553	93.52
2009-2010	4.17	292.30	70020	93.80
2010-2011	4.88	342.38	70091	92.83
2011-2012	5.04	361.04	71668	93.75
2012-2013	5.00	341.20	68254	94.11
2013-2014	4.99	352.14	70522	94.28
2014-2015	5.07	362.33	71511	95.53
2015-2016	4.93	348.45	70720	95.53
2016-2017	4.44	306.07	69001	95.39
2017-2018	4.74	379.90	80198	96.14
2018-2019	5.06	405.42	80105	96.62
2019-2020	4.60	370.50	80497	96.46
2020-2021	4.85	405.40	83566	-
2021-2022*	5.15	431.81	83887	-

Source: E&S Division, DA &FW *4th Advance Estimates

NOTE: Area – Million Hectares, Production – Million Tonnes, Yield – Kg/ Hectares

Table 1 show that the area under sugarcane cultivation in India has shown a general upward trend from 1950 to 2022. Starting at 1.71 million hectares in 1950-1951, it peaked at 5.15 million hectares in 2006-2007 and again in 2021-2022. Significant growth periods include the early 1960s and the late 1970s to early 1980s, reflecting increased agricultural activities and policy interventions. Sugarcane production has seen remarkable growth, rising from 57.05 million tonnes in 1950-1951 to a peak of 431.81 million tonnes in 2021-2022. Notable production increases occurred in the early 1960s and the late 1980s, likely due to improvements in farming practices and technology. Yield per hectare has generally increased, indicating improved agricultural practices and technology. From an initial yield of 33,422 kg/ha in 1950-1951, yields have progressively improved, reaching over 83,000 kg/ha in recent years. The highest yields are observed in the 2010s, correlating with advancements in irrigation and crop management. The percentage of the area under irrigation has steadily increased, from 67.33% in 1950-1951 to over 96% in recent years. This increase has likely contributed to the

substantial growth in both production and yield, as better water management practices lead to more efficient and productive farming.

1950-1980: Steady increase in area and production with moderate yield improvements.

1980-2000: Fluctuations in area but significant gains in production due to better yield.

2000-Present: Consistent growth in area, production, and yield, driven by technological advancements and high irrigation coverage.

The data reveals the critical role of irrigation, government policies, and technological advancements in enhancing sugarcane production and yield. Periods of significant growth align with the introduction of high-yield varieties and improved farming practices. Future strategies should focus on sustainable water management and continued technological innovation to maintain and further improve sugarcane production in India.

Table 2 CAGR (IN %) of All-India Area, Production and Yield of Total Sugarcane Over the Years

YEAR	AREA	PRODUCTION	YIELD	AREA UNDER IRRIGATION (%)
1950-1951	-	-	-	-
1951-1952	13.45	8.03	-4.89	2.14
1952-1953	-10.82	-17.25	-7.21	-3.61
1953-1954	-18.50	-12.92	6.79	2.07
1954-1955	14.89	32.27	15.26	1.67
1955-1956	14.20	3.06	-9.71	-2.33
1956-1957	10.81	14.06	2.76	-3.36
1957-1958	0.98	3.06	1.91	0.40
1958-1959	-5.80	3.09	9.71	3.39
1959-1960	9.74	6.08	-3.30	0.71
1960-1961	13.08	41.35	25.09	2.03
1961-1962	1.65	-5.48	-7.03	-1.76
1962-1963	-8.94	-11.60	-3.19	-0.43
1963-1964	0.45	13.40	13.07	2.79
1964-1965	15.56	16.96	1.05	2.70
1965-1966	9.23	1.71	-6.66	-0.53
1966-1967	-19.01	-23.13	-7.73	-0.22
1967-1968	-10.87	2.88	0.82	4.37

1968-1969	23.41	30.55	21.08	3.87
1969-1970	8.70	8.29	-0.23	-1.91
1970-1971	-4.73	-6.41	-1.63	-4.11
1971-1972	-	-10.13	-1.68	-0.80
1972-1973	-	9.95	7.20	4.47
1973-1974	12.24	12.77	0.45	1.93
1974-1975	5.09	2.47	-2.56	1.84
1975-1976	-4.50	-2.56	2.10	0.14
1976-1977	2.17	8.83	4.87	-1.01
1977-1978	11.70	15.66	5.20	1.22
1978-1979	-1.90	-14.30	-12.55	-0.46
1979-1980	-15.53	-15.05	0.50	-0.73
1980-1981	2.30	19.73	17.19	5.26
1981-1982	19.48	20.82	0.89	1.33
1982-1983	5.33	1.69	-3.29	-2.19
1983-1984	-7.44	-8.14	-0.82	-0.26
1984-1985	-5.14	-2.16	3.03	4.06
1985-1986	-3.39	0.19	3.84	1.10
1986-1987	8.07	9.05	0.93	1.03
1987-1988	6.49	5.72	-0.72	0.28
1988-1989	1.52	3.20	1.64	0.65
1989-1990	3.30	11.10	7.57	0.87
1990-1991	7.27	6.86	-0.33	0.05
1991-1992	4.07	5.37	1.03	1.20
1992-1993	-7.03	-10.22	-3.37	0.30
1993-1994	-4.20	0.71	5.13	0.56
1994-1995	13.16	19.98	6.16	-3.80
1995-1996	7.24	2.02	-4.87	2.39
1996-1997	0.48	-1.26	-1.90	4.03
1997-1998	-5.76	0.71	6.97	0.68

1998-1999	3.05	3.28	0.10	0.37
1999-2000	4.20	3.67	-0.38	0.64
2000-2001	2.37	-1.12	-3.32	-0.36
2001-2002	2.08	0.42	-1.76	0.12
2002-2003	2.49	-3.31	-5.63	0.41
2003-2004	-13.05	-18.62	-6.60	-0.42
2004-2005	-6.87	1.38	9.05	0.13
2005-2006	14.75	18.59	3.35	0.95
2006-2007	22.62	26.44	3.14	0.57
2007-2008	-1.75	-2.06	-0.21	0.03
2008-2009	-12.65	-18.14	-6.28	-0.33
2009-2010	-5.66	2.55	8.47	0.30
2010-2011	17.03	17.13	0.10	-1.03
2011-2012	3.28	5.45	2.25	0.99
2012-2013	-0.79	-5.50	-4.76	0.38
2013-2014	-0.20	3.21	3.32	0.18
2014-2015	1.60	2.89	1.40	1.33
2015-2016	-2.76	-3.83	-1.11	0.00
2016-2017	-9.94	-12.16	-2.43	-0.15
2017-2018	6.76	24.12	16.23	0.79
2018-2019	6.75	6.72	-0.12	0.50
2019-2020	-9.09	-8.61	0.49	-0.17
2020-2021	5.43	9.42	3.81	-
2021-2022*	6.19	6.51	0.38	-
TOTAL	1.54	2.85	1.29	0.51

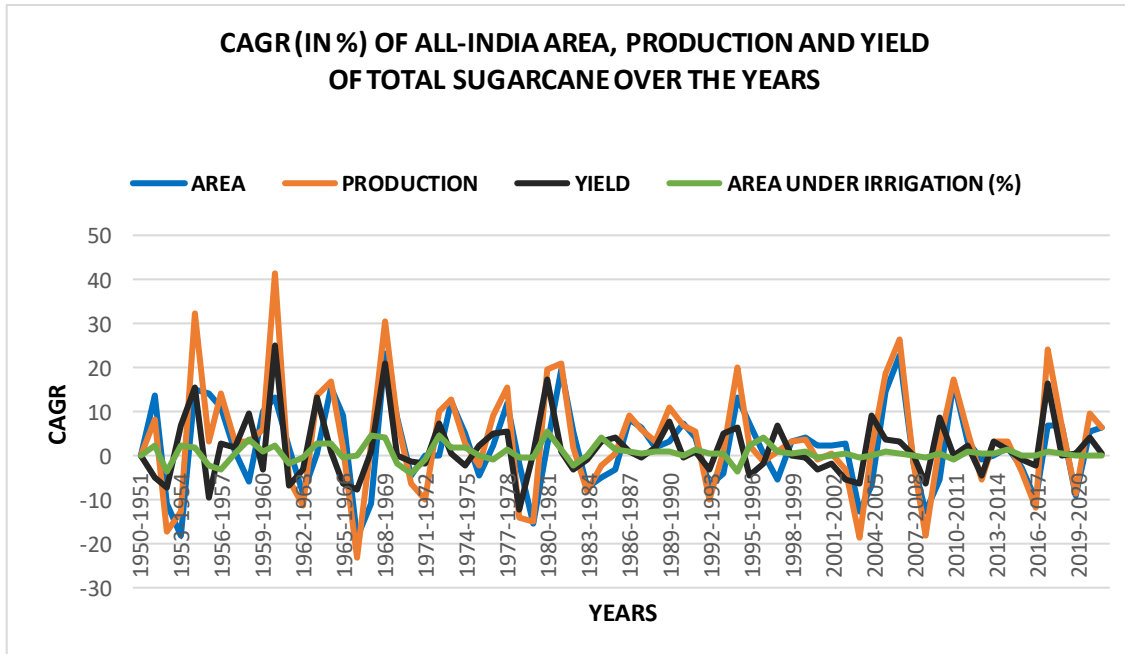
Source: E&S Division, DA &FW *4th Advance Estimates

NOTE: Area – Million Hectares, Production – Million Tonnes, Yield – Kg/ Hectares

Table 2 shows that the compound annual growth rate (CAGR) for the area under sugarcane cultivation has shown significant fluctuations over the years. Notable periods of growth include 1951-1952 (13.45%) and 2006-2007 (22.62%), indicating substantial expansion in these years. However, there were also periods of decline, such as in 1966-1967 (-19.01%) and 2003-2004 (-13.05%), reflecting challenges in agricultural expansion during these times.

Sugarcane production experienced significant growth in various periods, with the highest CAGRs observed in 1960-1961 (41.35%) and 2006-2007 (26.44%). These periods align with technological advancements and favorable agricultural policies. Conversely, declines in production were observed during periods like 2002-2003 (-3.31%) and 2008-2009 (-18.14%), possibly due to adverse climatic conditions or other socio-economic factors.

The yield per hectare also demonstrated variability, with high growth in 1960-1961 (25.09%) and 2017-2018 (16.23%), highlighting the impact of improved farming techniques and high-yield varieties. Conversely, declines were noted in years such as 1966-1967 (-7.73%) and 2002-2003 (-5.63%), indicating potential challenges in maintaining high productivity.



The percentage of the area under irrigation generally increased, contributing positively to the overall productivity. Significant increases occurred in 1980-1981 (5.26%) and 1968-1969 (3.87%), aligning with periods of agricultural investment. Slight declines were observed during certain periods, such as 1961-1962 (-1.76%) and 1994-1995 (-3.80%).

1950-1980: This period saw moderate but consistent growth in area, production, and yield, with significant gains in irrigation coverage.

1980-2000: This era experienced significant growth in production and yield despite fluctuations in the area under cultivation, reflecting advancements in agricultural practices.

2000-Present: Marked by sustained growth in all parameters, supported by high irrigation coverage and technological improvements.

The data suggests that periods of high growth in sugarcane area, production, and yield are closely linked to technological advancements, favorable government policies, and improvements in irrigation infrastructure. Periods of decline often correspond to adverse climatic conditions or economic challenges. Continued focus on sustainable water management, technological innovation, and supportive policies will be crucial for maintaining and enhancing sugarcane productivity in India.

Over the entire period, the total CAGR for the area under cultivation, production, yield, and irrigation coverage are 1.54%, 2.85%, 1.29%, and 0.51%, respectively. These figures highlight the overall positive growth trends and the critical role of irrigation in supporting agricultural expansion and productivity.

Table 3 Area, Production and Yield During 2020-21 and 2021-22 in Major Producing States Coverage Under Irrigation

2021 – 2022 #						2020-2021					Area under Irrigation (%) 2019-20*
State /UTs	Area	% to all India	Production	% to all India	Yield	Area	% to all India	Production	% to all India	Yield	
1	2	3	4	5	6	7	8	9	10	11	12
Uttar Pradesh	2.18	42.29	177.43	41.09	81500	2.18	44.94	178.34	43.99	81807	95.98
Maharashtra	1.23	23.94	110.54	25.60	89700	1.14	23.56	105.14	25.93	91999	100.00
Karnataka	0.64	12.37	61.15	14.16	96000	0.44	9.13	42.53	10.49	96000	99.49
Gujarat	0.22	4.33	17.46	4.04	78307	0.22	4.52	16.95	4.18	77327	98.92
Tamil Nadu	0.15	2.84	15.46	3.58	105860	0.13	2.63	13.28	3.28	104030	99.99
Bihar	0.21	4.10	12.06	2.79	57131	0.22	4.56	12.11	2.99	54766	88.13
Haryana	0.11	2.09	8.75	2.03	81231	0.10	2.04	8.53	2.10	86179	99.98
Punjab	0.09	1.69	7.15	1.66	82051	0.09	1.84	7.49	1.85	83841	96.29
Madhya Pradesh	0.09	1.81	5.38	1.25	57840	0.10	1.96	5.44	1.34	57270	99.95
Andhra Pradesh	0.05	0.91	3.65	0.85	77748	0.06	1.13	4.14	1.02	75248	92.26
Uttarakhand	0.04	0.85	3.52	0.82	80000	0.05	0.95	3.68	0.91	80000	99.21
Others	0.14	2.76	9.27	2.15	65123	0.13	2.74	7.77	1.92	58379	-
All India	5.15	100.00	431.81	100.00	83887	4.85	100.00	405.40	100.00	83566	96.46

Source: E&S Division, DA & FW, # Fourth Advance Estimates, *Provisional

NOTE: Area – Million Hectares, Production – Million Tonnes, Yield – Kg/Hectare

Table 3 presents the data on sugarcane area, production, and yield for the major sugarcane-producing states in India for the years 2020-21 and 2021-22, along with the percentage of area under irrigation as of 2019-20.

Uttar Pradesh

2021-22: Uttar Pradesh accounted for 42.29% of the total sugarcane area in India, producing 177.43 million tonnes (41.09% of India's production) with a yield of 81,500 kg/ha.

2020-21: The state had 44.94% of the total area, producing 178.34 million tonnes (43.99%) with a yield of 81,807 kg/ha.

Irrigation: 95.98% of the area under sugarcane was irrigated, highlighting the importance of irrigation in maintaining high productivity.

Maharashtra

2021-22: Maharashtra contributed 23.94% to the total area and 25.60% to the total production, with a yield of 89,700 kg/ha.

2020-21: It had 23.56% of the area and produced 105.14 million tonnes (25.93%) with a higher yield of 91,999 kg/ha.

Irrigation: 100% of the area under sugarcane was irrigated, indicating complete dependence on irrigation for cultivation.

Karnataka

2021-22: Karnataka covered 12.37% of the area, producing 61.15 million tonnes (14.16%) with the highest yield of 96,000 kg/ha.

2020-21: The state had 9.13% of the area, producing 42.53 million tonnes (10.49%) with the same yield.

Irrigation: 99.49% of the area was irrigated, underscoring the critical role of irrigation in achieving high yields.

Gujarat

2021-22: Gujarat accounted for 4.33% of the area and 4.04% of the production, with a yield of 78,307 kg/ha.

2020-21: The state had 4.52% of the area and produced 16.95 million tonnes (4.18%) with a slightly lower yield of 77,327 kg/ha.

Irrigation: 98.92% of the area was irrigated, supporting consistent yields.

Tamil Nadu

2021-22: Tamil Nadu had 2.84% of the area and 3.58% of the production, with the highest yield among all states at 105,860 kg/ha.

2020-21: The state covered 2.63% of the area, producing 13.28 million tonnes (3.28%) with a yield of 104,030 kg/ha.

Irrigation: Nearly 100% of the area was irrigated, emphasizing the reliance on irrigation.

Bihar

2021-22: Bihar contributed 4.10% to the area and 2.79% to the production, with a yield of 57,131 kg/ha.

2020-21: The state had 4.56% of the area and produced 12.11 million tonnes (2.99%) with a yield of 54,766 kg/ha.

Irrigation: 88.13% of the area was irrigated, slightly lower compared to other major states.

Haryana

2021-22: Haryana covered 2.09% of the area and produced 8.75 million tonnes (2.03%) with a yield of 81,231 kg/ha.

2020-21: The state had 2.04% of the area, producing 8.53 million tonnes (2.10%) with a yield of 86,179 kg/ha.

Irrigation: Nearly 100% of the area was irrigated.

Punjab

2021-22: Punjab accounted for 1.69% of the area and 1.66% of the production, with a yield of 82,051 kg/ha.

2020-21: The state had 1.84% of the area, producing 7.49 million tonnes (1.85%) with a yield of 83,841 kg/ha.

Irrigation: 96.29% of the area was irrigated.

Madhya Pradesh

2021-22: Madhya Pradesh covered 1.81% of the area and produced 5.38 million tonnes (1.25%) with a yield of 57,840 kg/ha.

2020-21: The state had 1.96% of the area, producing 5.44 million tonnes (1.34%) with a yield of 57,270 kg/ha.

Irrigation: Nearly 100% of the area was irrigated.

Andhra Pradesh

2021-22: Andhra Pradesh had 0.91% of the area and 0.85% of the production, with a yield of 77,748 kg/ha.

2020-21: The state covered 1.13% of the area, producing 4.14 million tonnes (1.02%) with a yield of 75,248 kg/ha.

Irrigation: 92.26% of the area was irrigated.

Uttarakhand

2021-22: Uttarakhand contributed 0.85% to the area and 0.82% to the production, with a yield of 80,000 kg/ha.

2020-21: The state had 0.95% of the area, producing 3.68 million tonnes (0.91%) with the same yield.

Irrigation: 99.21% of the area was irrigated.

Others

2021-22: Other states collectively covered 2.76% of the area, producing 9.27 million tonnes (2.15%) with a yield of 65,123 kg/ha.

2020-21: These states had 2.74% of the area, producing 7.77 million tonnes (1.92%) with a yield of 58,379 kg/ha.

All India

2021-22: The total area under sugarcane cultivation was 5.15 million hectares, with a production of 431.81 million tonnes and an average yield of 83,887 kg/ha.

2020-21: The total area was 4.85 million hectares, producing 405.40 million tonnes with an average yield of 83,566 kg/ha.

Irrigation: 96.46% of the area was irrigated in 2019-20, highlighting the critical role of irrigation in sugarcane cultivation across India.

Irrigation Coverage: High irrigation coverage, often close to or at 100%, is a common feature among the major sugarcane-producing states, indicating its importance in achieving high yields.

Yield Variability: Tamil Nadu consistently achieved the highest yield, reflecting the state's effective agricultural practices and favorable growing conditions.

Production Dominance: Uttar Pradesh and Maharashtra are the leading producers, collectively contributing to over 60% of India's total sugarcane production.

Growth Trends:

Most states showed an increase in both area and production from 2020-21 to 2021-22, indicating overall growth in the sugarcane sector. This analysis highlights the critical role of irrigation and effective agricultural practices in maintaining and enhancing sugarcane production across India.

Table 4 CAGR (IN %) of Area, Production and Yield During 2020-21 and 2021-22 in Major Producing States Coverage Under Irrigation

FROM 2020 -21 TILL 2021-22 #					
State /UTs	Area	% to all India	Production	% to all India	Yield
1	2	3	4	5	6
Uttar Pradesh	0.00	-5.90	-0.51	-6.59	-0.38
Maharashtra	7.89	1.61	5.14	-1.27	-2.50
Karnataka	45.45	35.49	43.78	34.99	0.00
Gujarat	0.00	-4.20	3.01	-3.35	1.27
Tamil Nadu	15.38	7.98	16.42	9.15	1.76
Bihar	-4.55	-10.09	-0.41	-6.69	4.32
Haryana	10.00	2.45	2.58	-3.33	-5.74
Punjab	0.00	-8.15	-4.54	-10.27	-2.13
Madhya Pradesh	-10.00	-7.65	-1.10	-6.72	1.00
Andhra Pradesh	-16.67	-19.47	-11.84	-16.67	3.32
Uttarakhand	-20.00	-10.53	-4.35	-9.89	0.00
Others	7.69	0.73	19.31	11.98	11.55
All India	6.19	0.00	6.51	0.00	0.38

Source: E&S Division, DA & FW, # Fourth Advance Estimates, *Provisional

NOTE:Area – Million Hectares, Production – Million Tonnes, Yield – Kg/Hectare

Table 4 provides the Compound Annual Growth Rate (CAGR) for the area, production, and yield of sugarcane in major producing states from 2020-21 to 2021-22, including the percentage of area under irrigation.

Uttar Pradesh: Experienced no growth in area and a decline in production and yield, reflecting a reduction in productivity and output.

Maharashtra: Showed significant growth in area (7.89%) and a modest increase in production (5.14%), despite a decrease in yield (-2.50%).

Karnataka: Demonstrated strong growth across all metrics, with area (45.45%) and production (43.78%) increasing significantly, while yield remained stable.

Gujarat: Maintained its area, with modest growth in production (3.01%) and a slight improvement in yield (1.27%).

Tamil Nadu: Exhibited growth in the area (15.38%), production (16.42%), and yield (1.76%), indicating a positive trend in productivity.

Bihar: Saw a decrease in area (-4.55%) and production (-0.41%), but an increase in yield (4.32%).

Haryana: Had growth in the area (10.00%), but declines in production (-2.58%) and yield (-5.74%).

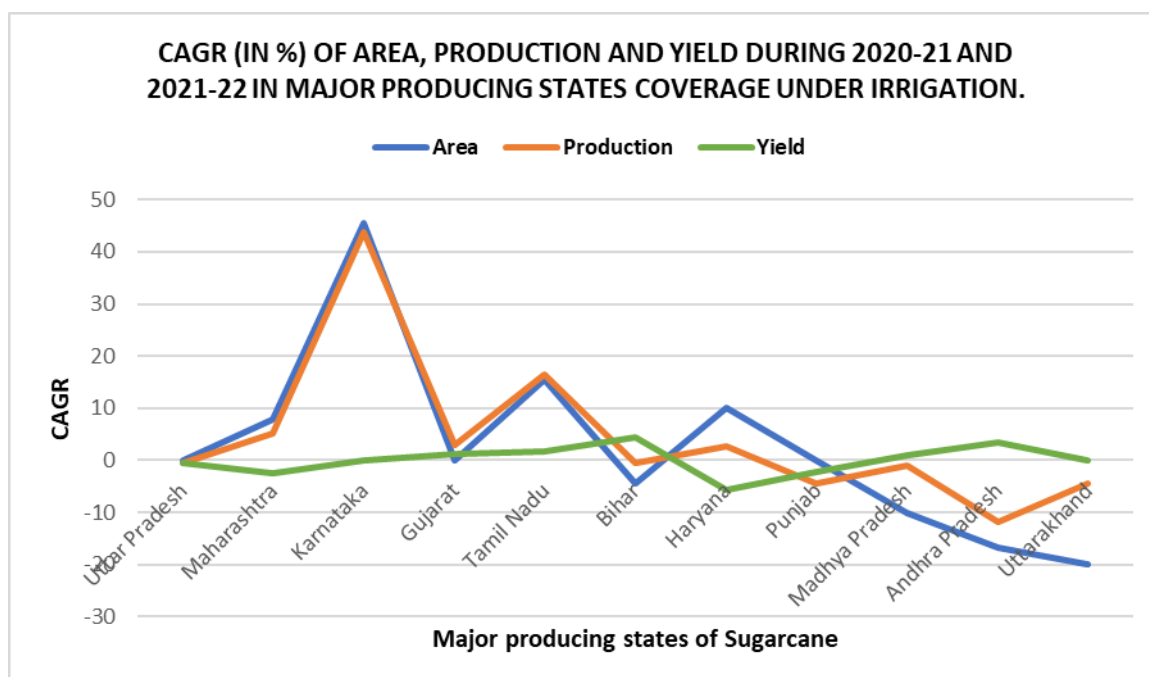
Punjab: No change in the area, but saw reductions in production (-4.54%) and yield (-2.13%).

Madhya Pradesh: Experienced declines in the area (-10.00%) and production (-1.10%), with a modest increase in yield (1.00%).

Andhra Pradesh: Faced significant declines in area (-16.67%) and production (-11.84%), despite an increase in yield (3.32%).

Uttarakhand: Saw a reduction in area (-20.00%) and production (-4.35%), with no change in yield.

Others: Displayed growth in the area (7.69%) and production (19.31%), with a substantial increase in yield (11.55%).



All India: The total area and production saw slight growth (6.19% and 6.51%, respectively), with a minimal increase in yield (0.38%).

The data highlights varied trends across states, with significant growth in Karnataka and Tamil Nadu, while states like Uttar Pradesh, Madhya Pradesh, and Andhra Pradesh experienced declines in key metrics. The overall national growth reflects positive trends in area and production, albeit with modest improvements in yield.

CONCLUSION

India's sugarcane output and area historical analysis show notable shifts and dynamic patterns over the previous few decades. The information illustrates how the climate, agricultural techniques, and technological developments have all had an impact on the changing sugarcane farming environment.

Over the years, sugarcane production and total area have increased significantly. While fluctuations have occurred, the general trend points to a growing area under cultivation and higher production levels, reflecting the expanding demand and improvements in farming practices. The yield per hectare has shown variability, with certain states achieving significant improvements due to better irrigation and cultivation techniques. States like Karnataka and Tamil Nadu have demonstrated substantial growth in yield, while others have experienced stagnation or decline. Different states have shown diverse growth patterns. Uttar Pradesh and Maharashtra remain dominant in terms of area and production, contributing significantly to national output. However, states such as Andhra Pradesh and Madhya Pradesh have faced challenges, including reductions in area and production. Irrigation continues to play a critical role in sugarcane cultivation, with states having higher irrigation coverage generally achieving better productivity. The reliance on irrigation underscores its importance in sustaining and enhancing sugarcane yields across the country.

In the most recent data, while overall growth in area and production is evident, there are concerns about yield improvements. States are experiencing varied trends, with some showing positive growth and others facing declines. This emphasizes the necessity of focused interventions to deal with issues and take advantage of chances to increase productivity. The area and production trends of sugarcane throughout history show a complicated interaction between growth and difficulties. Sustaining development and raising yields in the future will need substantial management of irrigation resources along with ongoing investments in infrastructure, technology, and agricultural techniques.

RECOMMENDATIONS

- **Enhance Irrigation Infrastructure:** Given the critical role of irrigation in sugarcane cultivation, further investment in irrigation infrastructure is essential. Expanding irrigation coverage, improving water management techniques, and adopting advanced irrigation technologies will help maintain and increase yields.
- **Promote Modern Agricultural Practices:** Productivity can be increased by implementing contemporary farming techniques such as integrated pest management, precision agriculture, and soil health monitoring. Farmers should be given resources and training to help them make the switch to these methods.
- **Support for Research and Development:** Invest in R&D to create sugarcane cultivars with high yields and resistance to drought. Innovations that solve regional concerns can be sparked by collaboration between academic institutes and the agricultural sector.
- **Improve Supply Chain and Infrastructure:** For the purpose of processing and shipping sugarcane, strengthen the infrastructure and supply chain. The sugarcane industry will be more profitable and efficient overall if storage facilities are improved and post-harvest losses are decreased.
- **Diversify Water Sources:** Promote the use of alternate water sources to augment conventional irrigation techniques, such as groundwater recharge and rainwater harvesting. The effects of water scarcity on sugarcane production can be lessened by diversifying your water sources.
- **Focus on Regional Strategies:** Develop plans that are tailored to certain possibilities and problems in the region. For example, states that are experiencing yield decreases ought to get focused assistance to deal with regional problems and boost output.

- **Promote Sustainability:** Use environmentally friendly farming methods to lessen your impact on the environment. This entails encouraging the preservation of soil, cutting back on chemical inputs, and using methods that improve ecological balance.
- **Facilitate Access to Financial Resources:** Give farmers financial assistance and subsidies so they can implement cutting-edge techniques and technologies. Farmers who have access to loans and insurance can better manage their risks and make improvements.
- **Encourage Collaboration:** Encourage cooperation between stakeholders in the public, business, and agricultural sectors to solve issues and advance best practices in the production of sugarcane.

India can ensure long-term growth and stability in the sugarcane business by putting these ideas into practice and improving the productivity, sustainability, and resilience of the sector.

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