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Sugarcane Crop Area, Production, and Productivity Growth Rates in India

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Abstract
In India, sugarcane is a significant commercial crop. It is essential to the agricultural community's overall socio-economic growth. After Brazil, India is the second-largest producer of sugarcane. In India, sugarcane crops occupy roughly 4.73 million hectares of land. Based on the significance of the sugarcane crop, the current study was carried out to determine the growth rates of sugarcane area, production, and yield in India as well as the productivity of the crop in the country's key sugarcane producing states.The study's data came from a secondary source. In this investigation, basic statistical techniques including the compound annual growth rate and percentage approaches were employed. The study finds that the area, output, and yield have good signs for their compound annual growth rates. Between 1985 and 2015, the area under sugarcane cultivation expanded by 5.63%, while during the same time, the yield of the crop climbed by 7.40%. Due to a variety of factors, including monsoon conditions, government price regulations, and others, sugarcane farming is demonstrating a shifting pattern in both area and production.

Keywords— Compound annual growth rate, Production, Sugarcane, Trends.

INTRODUCTION

The primary source of sweeteners on a worldwide scale is sugarcane, which also maintains a key role as a cash crop. India is the second-largest producer of sugarcane after Brazil. The cultivation of sugarcane has spread throughout India as a result of the country's favourable climate for the crop. In India, sugarcane is grown in two distinct agroclimatic regions: tropical and subtropical. The states of Madhya Pradesh, Goa, Kerala, Tamil Nadu, Andhra Pradesh, Gujrat, and Maharashtra are located in tropical areas.Due to the extended solar hours, chilly nights with clear skies, and the area's favourable latitudinal position for sugar buildup, the tropical region has substantial sugar recovery. There are four states in the subtropical area: Uttar Pradesh, Bihar, Haryana, and Punjab. Seasonal and perhaps even intraseasonal variations in climatic conditions are common. The sugarcane crop experiences all of the yearly seasons. The greatest area planted with sugarcane is in Uttar Pradesh. Maharashtra, however, has the greatest sugar recovery rates.

For the sugar business as well as other related groups of industries, it is a significant supplier of raw materials. Numerous individuals may find work thanks to sugarcane and its by-products, which are also to blame for the farming community's socioeconomic shift. The sugar business has aided and sped up the pace of rural industrialization by playing a key role in resource mobilisation, employment creation, income production, and the development of social infrastructure in rural regions. In India, there is a shifting tendency in the production of sugarcane, which is not consistent.This is a result of the several issues the sugarcane business is now experiencing, including low sugarcane output, government-set prices, payment delays, uncertain monsoon conditions, etc (Gaikwad, C. 2017). The main issue facing sugarcane growers in India is a lack of water, and the unpredictable monsoon season is the main cause of low yield. To analyse the performance of the main sugarcane-producing states in India, the present study will assess the expansion of the area, output, and productivity of sugarcane crops in India.

$$Yt=Y0\ (1+r)\ t \quad (1)$$

Taking log on both side we will get

$$LnYt=LnY0+tLn\ (1+r) \quad (2)$$

$$LnYt= a+bt$$

Where,

$a=LnY0$ $b=Ln\ (1+r)$

Yt= area/ production/ yield Y0= constant

t= time period in years and b= regression coefficient

$$\text{Compound growth rate}= (\text{Anti log } b-1) \times 100 \quad (3)$$

RESULT AND DISCUSSION

Area, Production and Yield of Sugarcane in India

India is the second-largest producer of sugarcane in the world, as was already said, and this has a significant impact on the nation's economy. Therefore, it is crucial to research the country's sugarcane output, yield, and

area. 4147 thousand hectares were planted with sugarcane during the 1995–1996 growing season. In 2017–18, the area grew to 4737 thousand hectares. Production and yield rose from 1995–1996 to 2017–18, as can be seen in the (table1) through the years area.In 2006–07, 5151 thousand hectares, a significant rise in the area under sugarcane was seen. The table makes it evident that there are variations in area, productivity, and yield over the research period. Comparing 2017–18 to 2006–07, sugarcane production increased, although the area harvested in 2006–07 was larger due to different incentives, high-yielding varieties, etc. The analysis makes it abundantly evident that sugarcane farming in India is following an uneven pattern.

Table 1

Descriptive Statistics of Sugarcane Crop in India (1995-96 To 2017-18)

Year	Area (‘000Hectare)	Production (‘000Tonne)	Yield (InKgs. /Hect.)
1995-96	4147	281100	67777
1996-97	4174	277560	66496
1997-98	3930	279540	71133
1998-99	4055	288720	71203
1999-00	4220	299320	70934
2000-01	4316	295960	68578
2001-02	4412	297208	67370
2002-03	4520	287383	63576
2003-04	3938	233862	59380
2004-05	3662	237088	64752
2005-06	4202	281172	66919
2006-07	5151	355520	69022
2007-08	5055	348188	68877
2008-09	4415	285029	64553
2009-10	4175	292302	70020
2010-11	4885	342382	70091
2011-12	5038	361037	71668
2012-13	4999	341200	68254
2013-14	4993	352142	70522
2014-15	5067	362333	71511
2015-16	4927	348448	70720
2016-17	4436	306069	69001
2017-18	4737	376905	79650
Source: Ministry of Agriculture & Farmers Welfare, Govt. of India			

Annual Growth Rate of Area, Production and Productivity of Sugarcane

Table 2

Percentage Change in Area, Production and Yield of Sugarcane in India (1995-96 To 2017-18

Year	%Changeinthe area (‘000 hectares)	% Change in production(‘000t)	%Changeinyield (Kgs/ hect.)
1995-96	0.65	-	-
1996-97	0.65	-1.26	-1.89
1997-98	-5.85	0.71	6.97
1998-99	3.18	3.28	0.10
1999-00	4.07	3.67	-0.38
2000-01	2.27	-1.12	-3.32
2001-02	2.22	0.42	-1.76
2002-03	2.24	-3.31	-5.63
2003-04	-12.8	-18.62	-6.60
2004-05	-7.01	1.38	9.05
2005-06	14.75	18.59	3.35
2006-07	22.58	26.44	3.14
2007-08	-1.86	-2.06	-0.21
2008-09	-12.6	-18.14	-6.28
2009-10	-5.44	2.55	8.47
2010-11	17.01	17.13	0.10
2011-12	3.13	5.45	2.25
2012-13	-0.77	-5.49	-4.76

2013-14	-0.12	3.21	3.32
2014-15	1.48	2.89	1.40
2015-16	-2.67	-3.83	-1.11
2016-17	-9.97	-12.16	-2.43
2017-18	6.79	24.12	16.23
Source: Ministry of Agriculture & Farmers Welfare, Govt. of India			

To determine the growth rate through time, the acreage, output, and yield of sugarcane in India were computed using the compound annual growth rate. The table makes it evident that there is an uneven yearly growth rate in the area, output, and yield. Between 2005–2006 and 2006–2007, the region's growth accelerated. The period from 2006 to 2007 saw the biggest yearly growth in terms of area, or 22.58 percent.The year 2003–2004 has the greatest yearly negative growth rate in the region. The output has risen at the times when the region has expanded. The largest production compound annual increase occurred in 2006–2007. The fact that yield is growing more favourably in 2017–18 suggests that farmers can better manage this crop.

Table 3

Compound Annual Growth Rates of Area, Production and Yield of Sugarcane (1985-2015)

Year	Area (inPercent)	Production(inPercent)	Yield(inPercent)
1985-1995	3.83	5.12	1.24
1995-2005	0.13	0.00	0.00
2005-2015	1.60	2.17	0.55
1985-2015	5.63	7.40	1.68

Source: Computed

The table clearly shows that between 1985 and 1995, the CAGR for area, output, and yield increased. However, there is no improvement in output or yield between 1995 and 2005. Area, output, and yield all began to rise after 2005, but the rate of growth was extremely modest. The area planted with sugarcane in India has grown at a compound annual growth rate of 5.63% during the past 30 years (1985-2015). Production will expand by 7.40% year over the next 30 years, while yield will only grow by 1.68%.

State-Wise Sugarcane Cultivation in India

Table 4

States	Area (Million hectare)	%toAllIndia	Production (Milliontonnes)	%toAllIndia	Productivity (Kg./hectare)
UttarPradesh	2.23	47.21	177.06	46.98	79255
Maharashtra	0.90	19.06	83.13	22.06	92166
Karnataka	0.35	7.40	28.26	7.50	80751
Tamil Nadu	0.18	3.80	16.54	4.39	92002
Bihar	0.24	4.99	13.98	3.71	59202
Gujrat	0.18	3.85	12.05	3.20	66220
Haryana	0.11	2.41	9.63	2.56	84500
Punjab	0.10	2.03	8.02	2.13	83583
Andhra Pradesh	0.10	2.09	7.95	2.11	80283
Uttarakhand	0.09	1.90	6.30	1.67	70044
Madhya Pradesh	0.10	2.07	5.43	1.44	55408
Telangana	0.04	0.74	2.56	0.68	73086
Others	0.12	2.45	5.98	1.59	- 79650
AllIndia	4.73	100.00	376.90	100.00	79255

Source:MinistryofAgriculture&FarmersWelfare,Govt.ofIndia

Table 4 shows the acreage, output, and productivity of sugarcane in India broken down by state. According to the data, Uttar Pradesh is the state that produces the most sugarcane, followed by Maharashtra and Karnataka. The analysis makes it evident that production is closely correlated with the area planted in sugarcane when analysing the state-level production. In 2017–18, the nation as a whole produced 376.90 million tonnes. As we've already mentioned, Uttar Pradesh, Maharashtra, Karnataka, and Tamil Nadu supplied the most land for sugarcane farming. Therefore, it stands to reason that output would be higher in these states as well.According to the data, Uttar Pradesh produces the most sugarcane in the nation; this state alone produced 177 million tonnes or almost 47% of the nation's total production. Maharashtra is the second-largest producer of sugarcane in the nation, contributing around 22% of the nation's total production, or over 83 million tonnes. Karnataka is also the third-largest producer of sugarcane, contributing around 8% of the nation's total output, or roughly 28 million tonnes.Similar to the previous example, Tamil Nadu produced 16.54 million tonnes of sugarcane and

shares 4.39 percent of the national production, placing this state fourth in terms of production. In addition, Bihar, Gujarat, Haryana, Punjab, and Andhra Pradesh are other important producing states in India; their contributions to the nation's overall output range from 1 to 4%. Madhya Pradesh, Telangana, and many other states produced very little sugarcane.

Any crop's productivity is influenced by a wide range of variables, including market conditions, technical development, and remuneration for high-quality products. In 2017–18, India had an average production of 79650 KG/hectare. According to research, Maharashtra had the greatest yield in the same year, 92166 KG/hectare. In terms of sugarcane productivity, Haryana comes in second; the state's yield was calculated at 84500 KG/hectare. Punjab produced 83583 KG/hectare, which placed it third in terms of production. The largest producer of sugarcane in the nation, Uttar Pradesh, with average productivity that is comparable to the national average. Due to poor soil fertility and a lack of technical innovation, the states of Bihar and Madhya Pradesh have very low levels of productivity.

CONCLUSION

The area planted with sugarcane expanded by 5.63% between 1995 and 2015, according to the discussion above, although output and yield climbed by 7.40% and 1.68%, respectively. The analysis shows that there is no consistent pattern of expansion in sugarcane agriculture in India; instead, the trend is erratic. This is because sugarcane growers deal with a variety of issues, such as water shortages and price issues. The development of the sugarcane crop demands a consistent supply of more water. Rainfall is the key determinant of whether there is enough water available.The output of sugarcane is negatively impacted by variations in the seasonal rainfall in India. Sugarcane is a crop with a long growing season that requires more irrigation. Crop drying and yield loss are caused by a lack of water availability. Sugarcane pricing policies are a significant contributor to sugarcane crop fluctuations. Year-to-year variations in agricultural product prices have a significant impact on both the supply of goods and the production choices of farmers.Government policies about the sector have always been arbitrary due to the high stakes involved in the cane crop and the sweet commodity. Politicians developed rules under pressure from various interests rather than based on sound economic principles, and the resulting policies may benefit various stakeholders. Farmers continue to cultivate sugarcane using conventional techniques and tools, despite the vast area that is covered by the crop. Due to inadequate crop spacing, tiny land holdings, and a lack of funding, mechanisation is not widely used in India. Some equipment is valuable and out of reach for farmers, but the introduction of pricey machines through specialised hiring facilities can enable farmers to profit from technology.

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