

# A Comparative Analysis of Area, Production and Productivity of Sugarcane Crop between Tropical and Sub- Tropical Region of India"

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## Abstract

India is the second largest producer of sugar in the world after Brazil, and is also the largest producer of sugarcane and the largest consumer of sugar in the World. Sugarcane as an important commercial crop is being grown under wide range conditions including tropical and sub-tropical region in India. Sugarcane is grown in an area of 4.73 million hectare, which is around 18.01 percent of the net area sown in the world. It was estimated by using simple descriptive statistics, percentage change, and compound annual growth rates. The secondary data has been collected for the period of 30 years from 1991-92 to 2020-21. It was found that the production of sugarcane increased by 1.63 percent over thirty years (1991 to 2021), whereas area and yield increased by 0.81 percent. It is clear from the trend analysis that sugarcane cultivation in India is increasing. The compound growth rate for the whole period of area and production of sugarcane in tropical region is high compared to subtropical region in India.

**Keywords:** *Sugarcane, Tropical region, Sub-tropical region.*

## Introduction

Agriculture plays an important role in every economy. In India agriculture is considered as the backbone of the country and despite concerted industrialization in the last six decades, agriculture still occupies a place of pride. The significance of agriculture in the national economy can be best explained by considering the role of agriculture under different heads. Agriculture sector contributes 18.8 percent to the GVA of the country in 2021-22. In the fiscal year 1950-51, agriculture accounted for 55.4 percent of the GDP. The share of the agriculture has been falling in the country's gross income while industrial and services sectors shares have been on a rise constantly. But from the livelihood point of view still 48.7 percent of the people of India depend on the agriculture sector. It shows that agriculture sector is still important than the industry and the services sectors in providing employment opportunities. Agriculture still contributes significantly to India's GDP despite of its declining trend. (Economic survey 2021-22)

Farmers grow wide variety of crops. These include food crops, commercial crops, oil seeds etc., Sugarcane is one of the most important commercial crops grown in India. Sugarcane plays an important role in national economy and in socio-economic development of the country. Sugarcane is grown primarily in the tropical and sub-tropical zones of the southern hemisphere. Sugarcane is the raw material for the production of white sugar, jiggery (gur) and khandsari. It is also used for chewing and extraction of juice for beverage purpose (Nandhini Duregesh and Padmavathy. 2017).

### **Objectives of the Study**

1. To analyse the growth performance in major Sugarcane producing countries in the world
2. To compare the area, production and productivity of sugarcane cultivation in tropical and sub-tropical region of India

### **Hypotheses**

1. There is increasing trend in the growth of Sugarcane production in India
2. The area and production of Sugarcane in tropical region is significantly high as compared to the sub tropical region

### **Methodology**

The study is based on secondary data collected from Ministry of Agriculture and Farmers Welfare, Directorate of Economics and Statistics, Economic Survey 2020-21, Union Budget. Government of India

The data is analyzed by using the compound annual growth rate, percentage change was calculated. Compound annual growth rates (CAGR) is worked out to study the changes in the area, production, and yield of sugarcane from 1991-92 to 2020-21

### **Results and Discussion**

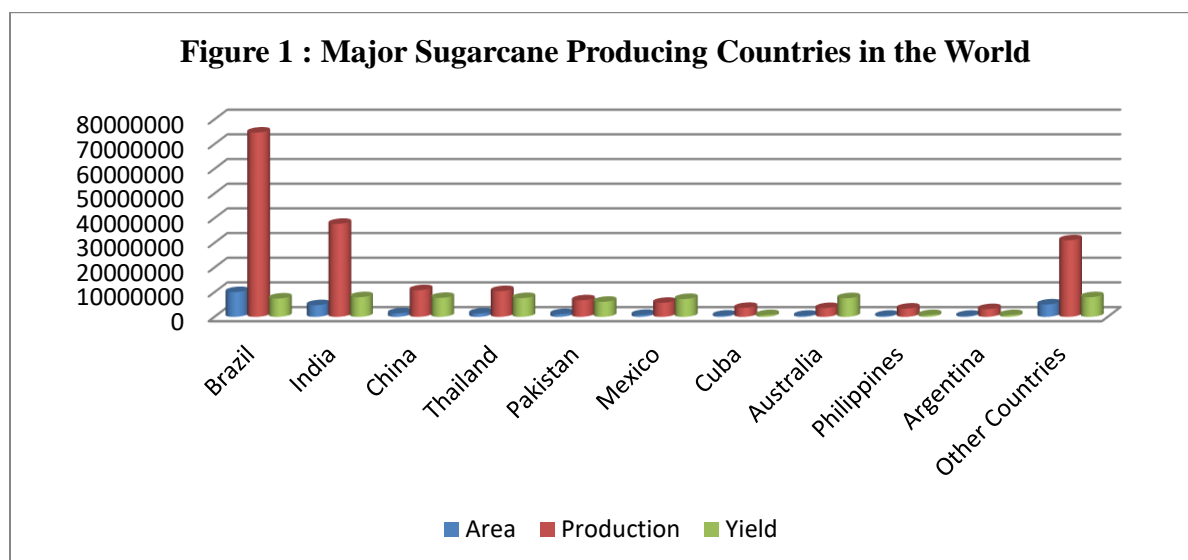
#### ***The Growth Performance in Major Sugarcane Producing Countries in the World***

Table 1 shows the major sugarcane producing countries of the world. At present 115 countries of the world cultivate sugarcane. The top ten sugarcane producing countries are, Brazil, India, China, Thailand, Pakistan, Mexico, Cuba, Australia, Philippines and Argentina. In the world during 2018, sugarcane was cultivated in an area of 26.26 million hectares land with production of 1907.02 million tonnes and an average yield was 72.59 tonnes per hectare. In case of share of area under sugarcane cultivation, Brazil is the largest country sharing about 38.23 percent of total world's area under sugarcane cultivation followed by India with a share of 18.01 percent and Thailand has a share of 5.22 percent. Brazil contributes 39.16 percent to total world's sugarcane production followed by India contributing 19.76 percent and China contributes about 5.67 percent. In case of yield per hectare of sugarcane, Peru holds first place in the World (121.83 tonnes) and Brazil holds the fifth place and India holds the eighth place in the world. Among the top ten countries, except Pakistan average yield per hectare is above the world average of 72.59 tonnes per hectare.

**Table 1: Major Sugarcane Producing Countries in the World**

Rank	Top Ten Countries	Area	% to all World	Production	% to all World	Yield
1	Brazil	10.04	38.23	746.82	39.16	74.36
2	India	4.73	18.01	376.9	19.76	79.68
3	China	1.40	5.35	108.09	5.67	76.89
4	Thailand	1.37	5.22	104.36	5.47	76.05
5	Pakistan	1.10	4.19	671.73	3.52	60.95
6	Mexico	0.78	2.99	568.41	2.98	72.32
7	Cuba	0.49	1.88	362.76	1.90	73.13
8	Australia	0.44	1.69	355.68	1.87	75.64
9	Philippines	0.43	1.67	335.06	1.76	73.32
10	Argentina	0.42	1.62	313.35	1.64	73.41
	Other Countries	5.03	19.15	310.13	16.26	79.68
	<b>World</b>	<b>2.6E+07</b>	<b>100</b>	<b>1907.02</b>	<b>100</b>	<b>72.59</b>

Source : Food and Agriculture Organization, FAO



Source : Food and Agriculture Organization, FAO

### Area, Production and Yield of Sugarcane in Tropical and Sub-tropical Region in India

Sugarcane is one of the most important cash crops, cultivate commercially in all the states of India, except Jammu and Kashmir. It is cultivated from latitude 5 degree to 32 degree N under varied soil and climate conditions. The production has grown significantly over the past several years. This enabled India to become the second-largest producer of sugarcane and sugar after Brazil.

Sugarcane is grown in 4,867 thousand hectares of land and annual sugarcane production stands at nearly 3,77,766 thousand tones in India (2019-20). Uttar Pradesh is the largest sugarcane producing state in India. Other important sugarcane producing states are Punjab, Bihar, Gujarat and Maharashtra. While the average production of sugarcane is concentrated in Northern India, the highest production of raw sugar per hectare is found in Southern India The distinct regions have thus to be recognized as,

- 1) Tropical region and
- 2) Sub-tropical region

The tropical region i e, South of the Vindhyas, which is best suited for sugarcane cultivation and the tropical sugarcane belt which comprises Maharashtra, Gujarat, Andhra Pradesh, Tamil Nadu, Karnataka and Kerala.

The subtropical region i e, North of the Vindhyas, where sugarcane is being grown from time immemorial and where climate conditions are rather rigid for cane culture. More than 65 per cent of the sugarcane area is in subtropical belt while the average yield of cane in the subtropical belt is about 40 tonnes/hectare, it is nearly double in the tropical states and the sub-tropical sugarcane belt comprises Uttar Pradesh, Punjab, Hariyan, Bihar, Orissa, Assam and West Bengal.

### Area under Sugarcane Cultivation in India

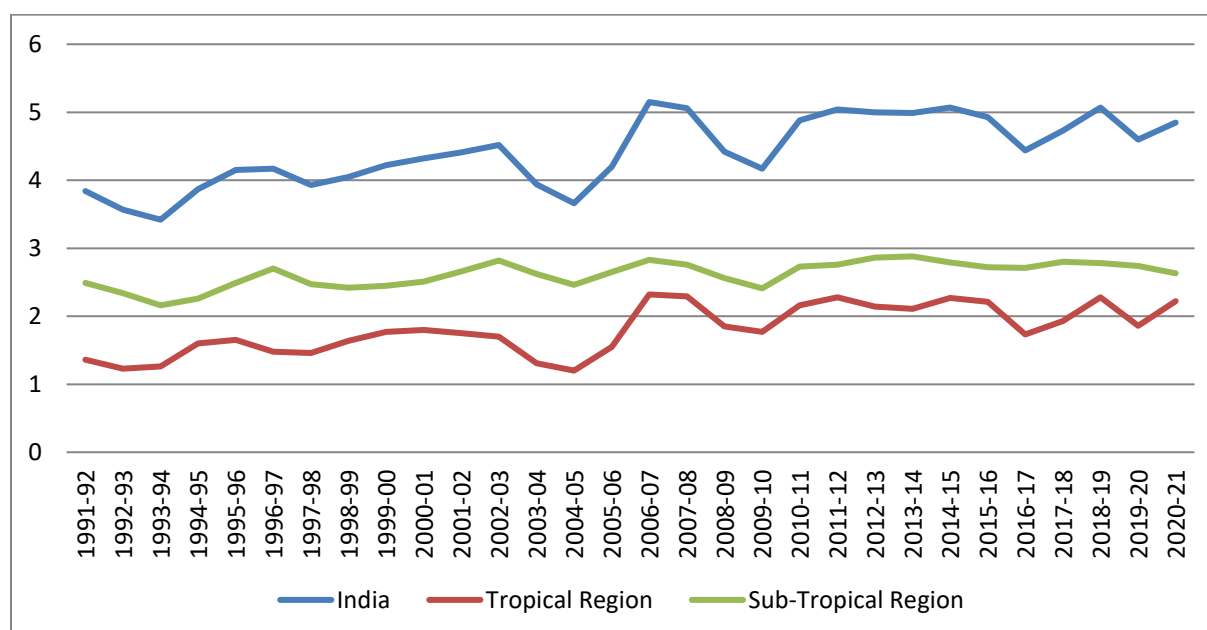
Table 2 depicts area under sugarcane cultivation in India for the year 1991-92 to 2020-21. The area under sugarcane cultivation in the country has increased from 3.84 million hectares in 1991-92 to 4.85 million hectares in 2020-21. But the area under sugarcane cultivation declined in the years of 1997-98, 2003-04, 2004-05, 2008-09, 2009-10, 2015-16, 2016-17 and 2019-20. The decline in the area under sugarcane cultivation was mainly due to the fact that the government did not give expected support to the sugarcane farmers. Therefore, some of the farmers took decision to shift from that sugarcane cultivation to other crops. It is also seen from the table that area under sugarcane cultivation is more in sub-tropical region than in tropical regions of India for the whole period. But the rate of increase in area under sugarcane cultivation is higher in tropical regions because CAGR for the whole period is 2.26 percent and for sub-tropical regions CAGR for the whole period is 0.51percent.

**Table 2: Area under Sugarcane Cultivation in India (1991-92 to 2020-21)**

Year	India (In million hectares)	Tropical Region (In million hectares)	Sub-Tropical Region (In million hectares)
1991-92	3.84	1.36	2.49
1992-93	3.57	1.23	2.34
1993-94	3.42	1.26	2.16
1994-95	3.87	1.6	2.26
1995-96	4.15	1.65	2.49
1996-97	4.17	1.48	2.7
1997-98	3.93	1.46	2.47
1998-99	4.05	1.64	2.42
1999-00	4.22	1.77	2.45
2000-01	4.32	1.8	2.51
CAGR	1.32%	3.16%	0.09%
2001-02	4.41	1.75	2.66
2002-03	4.52	1.7	2.82
2003-04	3.94	1.31	2.62
2004-05	3.66	1.2	2.46
2005-06	4.2	1.55	2.65
2006-07	5.15	2.32	2.83
2007-08	5.06	2.29	2.76

2008-09	4.42	1.85	2.56
2009-10	4.17	1.77	2.41
2010-11	4.88	2.16	2.73
CAGR	1.13%	2.37%	0.29%
2011-12	5.04	2.28	2.76
2012-13	5.00	2.14	2.86
2013-14	4.99	2.11	2.88
2014-15	5.07	2.27	2.79
2015-16	4.93	2.21	2.72
2016-17	4.44	1.73	2.71
2017-18	4.73	1.93	2.8
2018-19	5.07	2.28	2.78
2019-20	4.6	1.86	2.74
2020-21	4.85	2.22	2.63
CAGR	-0.43%	-0.30%	-0.53%
CGR for the whole period	0.81%	1.70%	0.19%

Source: Ministry of Agriculture and Farmers Welfare, Government of India



**Figure 2: Area under Sugarcane Cultivation in India (1991-92 to 2020-21)**

Source: Ministry of Agriculture and Farmers Welfare, Government of India

### Production of Sugarcane in India

Table 3 represents the production of sugarcane cultivation in India from 1991-92 to 2020-21. The production of sugarcane in the country has increased from 253.99 million tonnes to 405.39 million tonnes from 1991-92 to 2020-21. However, the sugarcane production declined in the years of 1992-

93, 1996-97, 2000-01, 2002-03, 2003-04, 2007-08, 2008-09, 2012-13, 2015-16, 2016-17, 2017-18 and 2019-20. The decline in sugarcane production was mainly due to the occurrence of drought, shortage of water supplied through the irrigation system, decrease in the sugarcane harvested area and impact of covid-19 pandemic etc. It is also seen from the table that production of sugarcane is more in tropical region than in sub-tropical regions of India. In the tropical regions of India sugarcane production got increased from 113.05 million tonnes in 1991-92 to 190.15 million tonnes in 2020-21 with CAGR for whole period of 1.81 per cent. In the sub-tropical regions of India sugarcane production increased from 140.94 million tonnes in 1991-92 to 215.24 million tonnes in 2020-21 with CAGR of 1.47 percent.

**Table 3: Production under Sugarcane Cultivation in India (1991-92 to 2020-21)**

Year	India (In million hectares)	Tropical Region (In million hectares)	Sub-Tropical Region (In million hectares)
1991-92	253.99	113.05	140.94
1992-93	228.03	101.45	126.57
1993-94	229.65	105.96	123.7
1994-95	275.54	142.81	132.72
1995-96	281.09	132.94	148.15
1996-97	277.55	120.07	157.48
1997-98	279.54	124.91	154.62
1998-99	288.72	148.07	140.64
1999-00	299.32	160.44	138.87
2000-01	295.96	158.3	137.66
CAGR	1.71%	3.81%	-0.26%
2001-02	297.21	143.48	153.73
2002-03	287.37	130.88	156.49
2003-04	233.86	89.45	144.41
2004-05	237.08	91.07	146.01
2005-06	281.17	128.02	153.15
2006-07	355.52	189.15	166.37
2007-08	348.18	191.92	156.27
2008-09	285.03	151.13	133.89
2009-10	292.3	151.58	140.72
2010-11	342.38	187.79	154.59
CAGR	1.58%	3.04%	0.06%
2011-12	360.98	196.83	164.15
2012-13	341.15	170.71	170.43
2013-14	352.08	178.94	173.14
2014-15	362.33	189.31	172.97
2015-16	348.44	169.19	182.25
2016-17	443.56	263.3	180.26
2017-18	379.9	159.98	219.92
2018-19	405.42	177.50	227.92
2019-20	370.50	150.20	220.30
2020-21	405.39	190.15	215.24
CAGR	1.30%	-0.38%	3.06%

CAGR for the Whole period	1.63%	1.81%	1.47%
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Source: Ministry of Agriculture and Farmers Welfare, Government of India

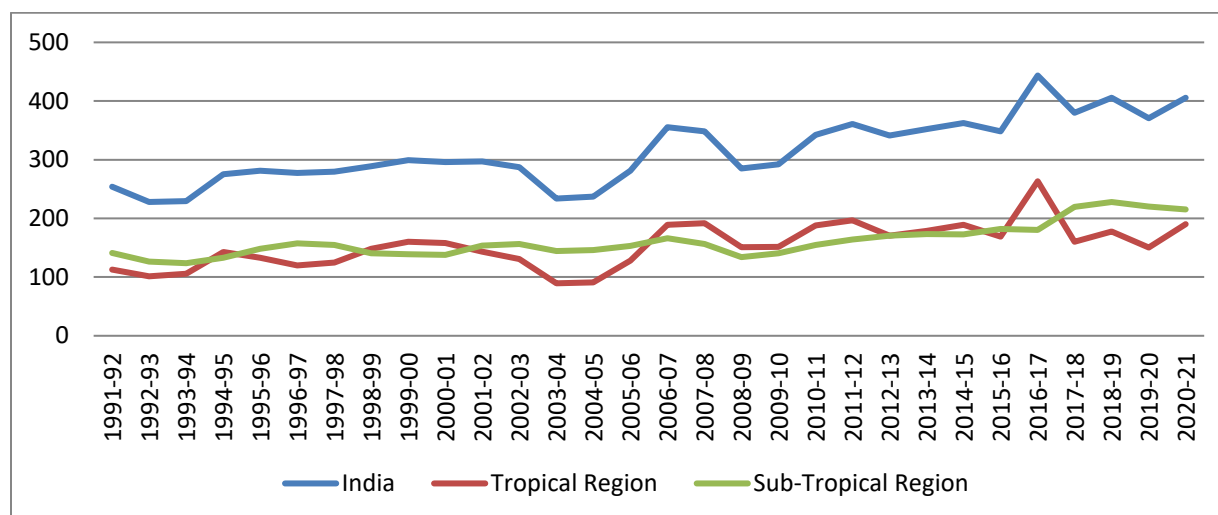


Figure 3: Production of Sugarcane in India (1991-92 to 2020-21)

Source: Ministry of Agriculture and Farmers Welfare, Government of India

### Yield per Hectare of Sugarcane in India

Table 4 shows the yield per hectare of sugarcane including tropical region and sub-tropical regions of from 1991-92 to 2020 21. The yield per hectare of sugarcane in the country has increased from 66.07 tonnes per hectare to 83.56 tonnes per hectare from 1991 to 2018. But the yield of sugarcane declined in the years of 1992-93, 1995-96, 1996-97, 1999-00 to 2003-04, 2008-09, 2012-13, 2015-16 and 2016-17. This decline is due to the shortage of water, indiscriminate use of fertilizers, low sugarcane recovery etc. It is also seen from the table that yield per hectare of sugarcane is more in tropical region than in sub-tropical regions of India. In the tropical regions of India, the yield per hectare has almost remained same in the study period but in the sub-tropical regions, even though the yield per hectare is less than in tropical regions, the CAGR is more which shows that the increase in yield per hectare is lower when compared to that of tropical region.

Table 4: Yield of sugarcane in India (1991-92 to 2020-21)

Year	India (In million hectares)	Tropical Region (In million hectares)	Sub-Tropical Region (In million hectares)
1991-92	66.07	83.21	56.7
1992-93	63.83	82.5	54.03
1993-94	67.12	84.04	57.25
1994-95	71.26	89.16	58.6
1995-96	67.78	80.41	59.41
1996-97	66.5	81.25	58.41
1997-98	71.14	85.48	62.65
1998-99	71.21	90.55	58.13
1999-00	70.93	90.73	56.65
2000-01	68.58	87.72	54.82

<b>CAGR</b>	<b>0.42%</b>	<b>0.59%</b>	<b>-0.37%</b>
2001-02	67.37	82.08	57.72
2002-03	63.58	77.03	55.48
2003-04	59.38	68.1	55.02
2004-05	64.75	75.97	59.29
2005-06	66.92	82.7	57.72
2006-07	69.02	81.64	58.71
2007-08	68.88	83.74	56.55
2008-09	64.56	81.67	52.21
2009-10	70.02	85.83	58.43
2010-11	70.09	87.08	56.67
<b>CAGR</b>	<b>0.44%</b>	<b>0.66%</b>	<b>-0.20%</b>
2011-12	71.67	86.37	59.52
2012-13	68.25	79.72	59.66
2013-14	70.52	84.63	60.16
2014-15	71.51	83.28	61.94
2015-16	70.72	79.78	61.44
2016-17	69	78.07	66.23
2017-18	80.19	83.25	70.23
2018-19	80.1	83.21	73.7
2019-20	80.49	85.05	71
2020-21	83.56	87.51	71.43
<b>CAGR</b>	<b>1.72%</b>	<b>0.15%</b>	<b>2.05%</b>
<b>CAGR for the whole period</b>	<b>0.81%</b>	<b>0.17%</b>	<b>0.80%</b>

Source: Ministry of Agriculture and Farmers Welfare, Government of India

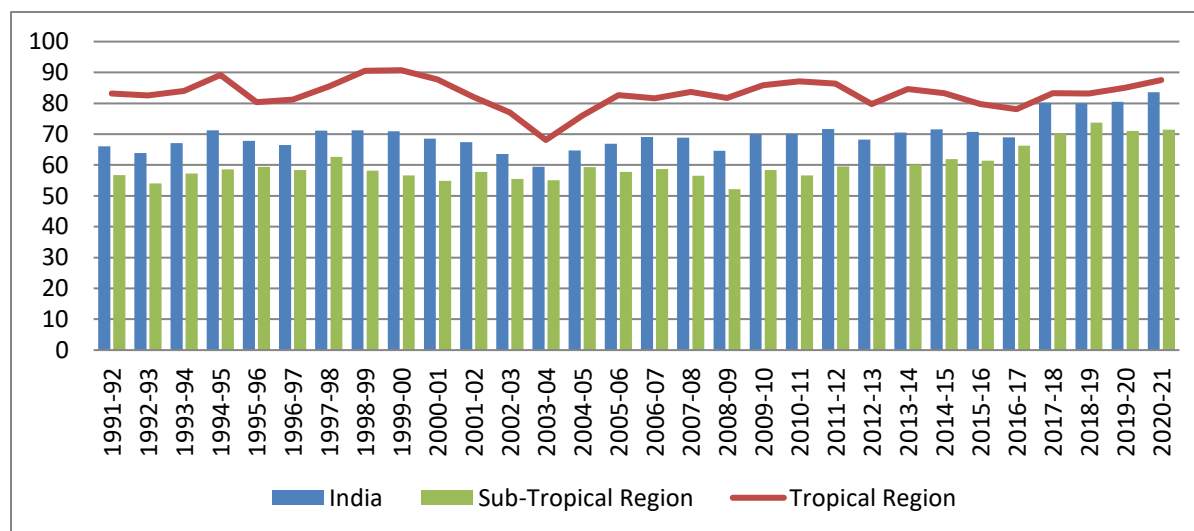


Figure 4: Yield of Sugarcane in India (1991-92 to 2020-21)

Source: Ministry of Agriculture and Farmers Welfare, Government of India

## Conclusion

India is the second largest producer of sugarcane and sugar in the world after Brazil. The sugarcane cultivation in India plays a vital role towards socio-economic development in the rural area by mobilizing rural resources and generating higher income and employment opportunities. It was found that the production of sugarcane was found to be increased by 1.63 percent over thirty years, whereas area and yield increased by 0.81 percent. It is clear from the study that the trend of sugarcane cultivation in India is increasing. The compound growth rate for the whole period of area and production of tropical region is high compared to subtropical region in India.

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