

TREND AND FUNCTIONAL ANALYSIS OF SUGARCANE AND SUGAR IN KARNATAKA

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ABSTRACT:

The present study has been made an attempt to analyze the growth and trend pattern of area, production and productivity of sugarcane in Karnataka. Karnataka state being the third largest sugarcane and sugar producing state has potency generate lot of sugarcane by-products in the sugar industry every year. As in the case of the rest of the country, sugar industry in Karnataka also is facing with unpredictability due to a number of reasons including uncertainties in sugarcane production on account of weather and rainfall conditions. Karnataka has been witnessing fluctuating trends in area, production and productivity of sugarcane. It is observed that the economic returns on capital invested on sugar mills would be stable, when the co-products i.e. bagasse, molasses and press mud are efficiently used for production of bio-ethanol, power and bio-fertilizer. Hence, there is enormous opportunity and attractive proposition for sugarcane crop as molecular farming for considering high biomass and its huge potential. Sugarcane had already been engineered to produce high value molecules such as therapeutics, industrial enzymes, vitamins, vaccines, bio-plastics etc.

INTRODUCTION:

Karnataka is one of the fastest growing states in the country. Among the major largest scale industries which are in existence in the state of Karnataka, the sugar industry occupies an important place next only to cotton textile and IT industry. Sugar industry in Karnataka is one of the leading states in India, claiming the third place in the country in respect of the area, production of sugarcane and second place in respect of yield of cane per hector. Further the Karnataka state holds third place both in respect of total number of sugar mills, production of sugar and second place interns of sugar recovery in the country.

Karnataka Sugar Industry has contributed a great deal to India's total level of sugar production and thus has helped the country to meet its demand for sugar. The Sugar Industry in Karnataka contributes around 36 crore per year to the state exchequer in central excise duty. It also contributes more than 900 crore in the form of turnover tax and sales tax to the state exchequer. Karnataka accounted for about 65 billion Indian rupees from sugar crops in the Indian economy in fiscal year 2019. The state made up almost seven percent of the economic value from sugar crops in the agricultural sector in India.

In the above context, brief study on the production and utilisation of sugarcane and sugarcane by-products in Karnataka is presented below.

AREA, PRODUCTION AND YIELD OF SUGARCANE IN KARNATAKA:

In respect of sugarcane production, Karnataka state occupied seventh place in 1950-51, when compared to all other states of India. From 20th century, with respect to area and production of sugarcane, Karnataka started maintaining third or fourth position frequently and with respect to yield of sugarcane it had occupied second place since then. The detail of area,

production and yield of sugarcane in Karnataka for the study period 2009-10 to 20019-20 is given in the **table 1.1**.

It was found that sugarcane was grown in the average area of 441 thousand hectares with S D of 51.54 Lakh hectares producing 384.36 Lakh tonnes of sugarcane with S D of 63.07 lakh tonnes. In comparison with the top cane producing states Karnataka stand 3rd in the area and production of sugarcane where as it stands second in terms of sugarcane yield of 87.15 with S D of 10.11 which is more than national average of 71 tonnes per hectares.

From the **table 1.1**, it was clear that sugarcane production in Karnataka state showed fluctuation in the study period with C V of 16.41 percent. Highest production of about 459 lakh tonnes and highest area of 502 hectare was observed in the year 2018-19 with yield of 91.0 tonnes per hectare. The highest yield of 94.5 tonnes per hectare was observed in the year 2017-18. However, the area, production and yield of sugarcane in Karnataka had shown upward growth with CAGR of 2.48, 2.72 and 0.21 percent respectively which was more than national CAGR.

Table 3.19 Area, Production and Yield of Sugarcane in Karnataka.

Year	Area (‘000 hectare)	Production (Lakh tonnes)	Yield (tonnes/ha)
2009-10	337	304	90.3
2010-11	423	396	93.7
2011-12	432	390	90.2
2012-13	427	371	87
2013-14	476	419	88
2014-15	499	467	94
2015-16	510	397	78
2016-17	410	246	60
2017-18	415	392	94.5
2018-19	502	459	91
2019-20	420	387	92
Total	4,851.00	4,228.00	958.70
Mean	441.00	384.36	87.15
S D	51.54	63.07	10.11
C V (%)	11.69	16.41	11.61
CAGR (%)	2.48	2.72	0.21

Source: Indian Sugar Mill association (ISMA) report 2021

In India, Karnataka stands third in area and cane production next to Uttar Pradesh and Maharashtra States and second with respect to sugar recovery after Maharashtra. Karnataka is bestowed with favorable agro-climatic conditions duly supplemented with suitable soils for sugarcane cultivation.

District wise Area, Production and Yield of Sugarcane in Karnataka

The **table 1.2 to 1.4** contains the data collected from District Level Database (DLD) for Indian agriculture and allied sectors provided by International Crops Research Institute for the Semi-Arid Tropics (ICRISAT).

Table 1.2: District wise Area of sugarcane cultivation (000 ha) in Karnataka

Districts	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	District Average	Percent Share
Belagavi	198.92	18.24	342.41	168.13	159.44	180.57	175.78	163.51	208.73	182.01	197.77	40.91
Bagalakote	88.5	79.93	178.72	91.36	86.94	93.68	94.09	88.27	83.34	94.43	98.31	20.34
Vijayapura	44.11	41.38	88.42	37.38	44.91	49.05	43.85	35.23	20.78	49.44	45.01	9.31
Mandya	47.94	31.11	61.93	28.75	19.46	21.59	27.78	17.63	20.94	21.76	30.79	6.37
Bidar	29.03	31.33	51.01	31.52	26.49	28.87	19.42	17.71	15.52	29.10	27.87	5.77
Kalburgi	18.94	10.89	30.15	14.8	27.6	45.5	28.6	28.43		45.86	22.88	4.73
Mysore	13.39	12.3		6.55	8	4.1	6.26	3.34	4.15	4.13	9.01	1.86
Haveri	2.37	1.49	6.79	5.68	7.34	10.38	9.82	7.63	13.35	10.46	7.21	1.49
Chamaraja Nagara	11.91	6.42	17.03	7.55	3.05	3.57	2.9	1.88	6.79	3.60	6.79	1.40
Dharwad	5.41	4.53	6.93	4.53	3.71	8.65	8.45	7.33	8.35	8.72	6.43	1.33
Davanagere	8.56	3.7	10.56	4.36	6.9	9.52	4.44	3.84	3.8	9.60	6.19	1.28
Bellary	3.92	1.36	7.61	5.66	6	3.41	7.84	6.99	4.41	3.44	5.24	1.08
Shimoga	7.81	5.9	8.39	3.94	4.92	3.94	3.98	2.45	1.27	3.97	4.73	0.98
Uttara Kannada	1.26	1.3	5.49	3.08	5.32	6.21	6.54	5.94	0	6.26	3.90	0.81
Hassan	6.78	3.64	4.36	2.43	1.46	1.57	0.69	0.84	2.18	1.58	2.66	0.55
Gadag	0.96	0.85	8.61	1.57	0.96	1.87	4.72	2.86	0.81	1.89	2.58	0.53
Tumkur	2.94	1.65	4.13	1.75	1.56	1.67	0.21	0.74	0.92	1.68	1.73	0.36
Koppal	0.94	0.19	2.45	2.1	2.59	2.38	1.79	0.31	1.29	2.40	1.56	0.32
Chickmagalur	1.44	0.82	1.79	1.53	1.55	1.39	1.11	1.04	0.94	1.40	1.29	0.27
Yadagiri	0	0.14	0.56	1.17	1.21	0.86	0.79	0.95	1.22	0.87	0.86	0.18
Others	1.62	1.42	1.54	1.56	0.62	1.44	0.52	0.21	0.23	1.45	0.68	0.14

Source: The District Level Database, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), <http://data.icrisat.org/dld/index.html>

Table 1.3:

District wise Production of sugarcane (000 tonnes) in Karnataka

Districts	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Average	Percent Share
Belagavi	14	168	325	138	143	162	145	107	206	164	1711.8	41.37
Bagalakot	65	766.	161	798.	900.	102	902.	637.	672.	103	900.17	21.76
Mandya	26	413.	817.	346.	249.	254.	306.	219.	234.	256.	336.74	8.14
Vijayapur	18	349.	646.	277	345.	391.	220.	240.	183.	394.	323.97	7.83
Bidar	18	220.	348.	218.	193.	189.	84.8	95.9	115.	190.	183.77	4.44
Kalburgi	76.	63.1	123.	73.1	167.	302.	119.	108.	6.86	305.	134.56	3.25
Mysore	89.	137.	238.	54.7	68.3	37.4	61.8	33.3	50.8	37.7	81.01	1.96
Davanage	45.	49.2	140.	48.0	79.3	122.	56.9	41.2	41.1	123.	74.70	1.81
Haveri	7.2	16.6	56.1	37.2	87.1	109.	96.0	70.3	115.	110.	70.60	1.71
Chamaraj	71.	67.7	213.	55.9	28.9	29.8	25.6	13	74.8	30.1	61.15	1.48
Bellary	23.	13.6	63.6	48.3	48.4	34.9	80.3	51.1	37.2	35.2	43.70	1.06
Shimoga	45.	61.6	88.5	44.9	47.1	39.3	35.9	21.1	11.2	39.6	43.49	1.05
Dharwad	6.1	24.9	41.4	29.7	25.3	64.1	57	50.8	65.8	64.6	43.01	1.04
Uttara	10.	13.9	30.2	32.7	41.9	48.3	47.8	37.2	0	48.7	31.16	0.75
Hassan	23.	37.3	42.6	18.2	12.2	17.1	9.82	5.87	27.6	17.2	21.18	0.51
Gadag	1.0	8.01	78.5	13.1	8.98	19.7	38.1	16	5.56	19.8	20.90	0.51
Tumkur	18.	16.1	35.7	14.7	12.2	17.4	2.24	6.63	8.62	17.5	15.03	0.36
Koppal	3.2	1.77	22.3	17.5	23.1	21.7	14.4	2.15	12.1	21.9	14.04	0.34
Chickmag	4.8	6.44	13.7	8.59	8.81	13.2	6.98	7.21	6.94	13.3	9.02	0.22
Yadagiri	0	1.27	5.07	9.79	10.7	7.86	6.41	6.55	11.4	7.92	6.71	0.18
others	10.	14.5	21.3	13.5	5.19	10.4	4.77	1.79	1.86	10.5	9.42	0.18

Source: The District Level Database, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), <http://data.icrisat.org/dld/index.html>

Table 1.4: District wise Yield of Sugarcane (tonnes/ha) in Karnataka

Districts	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Average
Mandya	55.9	133.	132.	120.	128.	117.	110.	124.	112.	90.8	112.5
Davanagere	52.9	133.	133	110.	114.	128.	128.	107.	108.	89.0	110.5
Mysore	67.0	112.	103.	83.5	85.4	91.2	98.8	99.7	122.	75.8	94.00
Hassan	34.7	102.	97.8	74.9	83.7	109.	142.	70.3	127.	100.	94.35
Shimoge	58.2	104.	105.	114.	95.8	99.7	90.2	86.4	88.3	77.8	92.08
Chamaraja	60.4	105.	125.	74.0	95.0	83.6	88.3	69.3	110.	53.5	86.55

Bagalkote	74.0	95.9	90.2	87.4	103.	109.	95.9	72.2	80.7	128.	93.78
Tumkur	64.1	97.8	86.4	84.4	78.6	104.	104.	90.2	94.0	78.5	88.34
Haveri	30.5	112.	82.6	65.5	118.	105.	97.8	92.1	86.4	116.	90.81
Bellary	60.9	100	83.6	85.4	80.8	102.	102.	73.1	84.5	73.8	84.75
Belagavi	75.2	92.1	95	82.6	90.2	90.2	82.6	65.5	98.8	58.2	83.08
Koppal	34.0	93.1	91.2	83.6	89.4	91.3	80.7	69.3	94.0	143.	87.05
Yadagiri	0	90.7	91.2	83.6	89.0	91.4	80.7	69.3	94.0	85.1	77.54
Gadag	10.7	94.2	91.2	83.6	93.5	105.	80.7	56.0	68.4	66.0	75.01
Uttara	83.3	107.	55.1	106.	78.9	77.8	73.1	62.7	0	98.8	74.35
Vijayapura	42.9	84.5	73.1	74.1	76.9	79.8	50.3	68.4	88.3	105.	74.42
Chickmagalu	33.9	78.5	76.9	56.1	56.8	95.1	62.7	69.3	74.1	70.6	67.44
Bidar	62.2	70.3	68.4	69.3	73.1	65.5	43.7	54.1	74.1	68.8	64.97
Dharwad	11.3	55.1	59.8	65.6	68.3	74.1	67.4	69.3	78.8	84.0	63.41
Kalburgi	40.3	57.9	40.8	49.4	60.8	66.5	41.8	38	68.4	104.	56.88
Others	34.6	54.3	54.0	66.5	31.7	42.8	41.5	38.1	35.9	52.8	45.27

Source: The District Level Database, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), <http://data.icrisat.org/dld/index.html>

From the data in the **table 1.2 -1.4**, it was found that Sugarcane is grown in almost 24 districts of the state except few districts. Belagavi, Bagalakote, Vijayapura, Mandya, Bidar, Kalburgi, Mysore, Davanagere, Haveri and Chamaraja Nagar are the major sugarcane producing districts.

From the table 1.2 In terms of area of sugarcane cultivation Belagavi stands first with average area of 197.77 thousand ha (40.91 percent, followed by Bagalakote with 98.31 thousand ha (20.34 percent), Vijayapura with 45.01 ha, (9.31 percent) Mandya with 30.79 thousand ha, (6.37 percent), Bidar with 27.87 thousand hectares, (5.77 percent) and Kalburgi 22.88 thousand ha, (4.73 percent) covering almost 87.43 percent of sugarcane cultivation area of Karnataka state. These six districts have highest impact on the sugarcane production in the Karnataka.

From the table 1.3 in terms of production of sugarcane, Belagavi stands first with 1711.87 Lakh tonnes (41.37 percent) followed by Bagalakote with 900.17 Lakh tonnes (21.76), Mandya with 336.74 Lakh tonnes (8.14 percent) and Vijayapura with 323.97 lakh tonnes (7.83 percent), Bidar with 183.77 Lakh tonnes (4.44 percent) and Kalburgi with 134.56 Lakh tonnes (3.25 percent). About 86.79 percent of the total sugarcane production in Karnataka resulted from six districts.

From the table 1.4, it was found that Mandya stand first in terms of yield followed by Davanagere, Mysore, Hassan, Shivamoga and Chamaraja Nagar. It was interesting note that Mandya district being placed at fourth position in area and third position in production of sugarcane, Mandya district stands first position interterm of yield with 112.54 tonnes per hectare which very much higher than the state average yield 87.15 tonnes per hectare. The higher yield was generally observed in southern districts of Karnataka where as northern district of Karnataka showed less sugarcane yield. The reason for this variation may the fertility of soil as well as availability water is more in southern district in comparison to northern districts.

However, the sharp fluctuations in the sugarcane production are mainly due to the following reasons: 1. Variations in rainfall. 2. Non availability of labour for timely operation of cultivation.

3. Fluctuations in agricultural prices. 4. Nonavailability of good quality sugarcane variety. 5. Lifting of sugarcane stalks by the factories from the farmers etc

SUGAR PRODUCTION IN KARNATAKA:

Karnataka Sugar Industry ranks third in terms of its contribution of sugar in the total sugar production in the country. The Sugar Industry in Karnataka is able to manufacture sugar in such huge quantities due to the fact that sugarcane is abundantly available in the state. Karnataka Sugar Industry has contributed a great deal to India's total level of sugar production and thus has helped the country to meet its demand for sugar. The Karnataka state government must make more efforts in order to boost the sugar industry in Karnataka.

The Sugar Industry in Karnataka contributes around 36 crore per year to the state exchequer in central excise duty. It also contributes more than 900crore in the form of turnover tax and sales tax to the state exchequer. The state government in an attempt to boost Karnataka Sugar Industry has set up the Karnataka Sugar Institute (KSI) which has emerged as a center for education and training for sugar technology. The Karnataka Sugar Institute also provides important support to the Sugar Industry in Karnataka by doing R&D in the various aspects of sugarcane processing and production.

Table 1.5 Year wise Status of Sugar Production in Karnataka

Year	No. of Factories in operation	Quantity of Sugarcane Crushed (Lakh tonnes)	Sugar Production (Lakh tonnes)	Recovery Rate of sugar (% to cane)
2009-10	54	239.74	25.58	10.67
2010-11	59	337.58	36.83	10.91
2011-12	58	347.58	38.72	11.14
2012-13	60	333.37	34.67	10.4
2013-14	62	381.46	41.77	10.95
2014-15	65	446.20	49.35	11.06
2015-16	64	377.00	40.49	10.74
2016-17	64	212.46	21.65	10.19
2017-18	65	354.15	37.54	10.6
2018-19	67	412.86	44.3	10.73
2019-20	65	351.51	34.94	9.94
Total	683.00	3,793.91	405.84	117.33
Mean	62.09	344.90	36.89	10.67
S D	3.91	67.95	7.87	0.37
C V (%)	6.30	19.70	21.34	3.46
CAGR (%)	2.08	4.34	3.53	-0.78

Source: Indian Sugar Mill association (ISMA) report 2021

From the table 1.5, it was observed that Karnataka had produced average of 36.89 lakh tonnes of sugar with S D of 7.87 by crushing 345.90 lakh tonnes of sugarcane with S D 67.95 of during the 2009-10 to 2019-20. The lowest sugarcane production of 21.65 thousand tonne was observed during the 2016-17. The lowest production sugarcane in the year 2016-17 was due the severe drought faced in Karnataka especially in the sugarcane producing district such as with Belagavi,

Bagalakote, Vijayapura and Mandya. The highest sugar production of 49.35 lakh tonnes is noticed in the year 2014-15 may be due to the fixed sugarcane price offered by governments based on the recovery rate.

From the **table 1.5** it was noticed that Karnataka state had recorded average yield of 10.67 which quite higher than national average of 10. The lowest yield observed was about 9.94 in the year 2019-20, whereas the highest yield of 11.14 was observed in the year 2011-12. From the higher yield of sugar it can be concluded that There was high fluctuation in the sugar production during the study period.

Over all, Karnataka has registered upward growth in terms of sugarcane crushed, sugar produced with 4.34 and 3.53 CAGR. However, the yield of sugar had shown downward growth with -0.78 CAGR.

From the **table 1.6** the district wise data on the production of sugar indicate that, top five sugar producing district of Karnataka were Belagavi with 13.36 lakh tonnes of sugar followed by Bagalakote (8.48 lakh tonnes), Vijayapura (34.14 Lakh tonnes), Mandya (28.26 lakh tonnes) and Mysore 14.43 lakh tones.

Among the top five sugar producing district, Belagvi has highest recovery of 10.97 followed by Bagalakote with 10.17 percent, Vijayapura with 10.14, Mysore with 9.77 and Mandya with 9.44 percent.

In terms of yield of sugar Uttara Kannada stands first with 11.30 percent and Davanagere district producing sugar with least sugar recovery of 6.82 in Karnataka state. The districts which have recovery of sugar more than 10 percent are Belagavi Chamaraja Nagara, Bagalkote and Vijayapura.

Table 1.6 District wise Production of Sugar in Karnataka in 2019-20

District	Quantity of Sugarcane Crushed (Lakh Tonnes)	Quantity of Sugar Produced (Lakh Tonnes)	Recovery of Sugar (%)
Belagavi	126.56	13.36	10.97
Bagalakote	89.58	8.48	10.17
Vijayapura	34.14	3.55	10.14
Mandya	28.26	2.67	9.44
Mysore	14.43	1.41	9.77
Bidar	11.96	1.05	8.8
C. Nagar	8.84	0.9	10.22
Uttara Kannada Kannada	7.74	0.88	11.3
Kalburgi	8.97	0.58	9.84
Gadag	6.13	0.55	9.02
Bellary	4.68	0.45	9.54
Davanagere	6.19	0.43	6.82
Haveri	4.29	0.41	9.65

Yadgiri	2.36	0.18	9.59
Total	354.13	34.94	9.66

Source: Directorate of sugarcane and sugar, Government of Karnataka

Production and Utilization of Sugarcane By-products in Karnataka:

Karnataka state being the third largest sugarcane and sugar producing state has potency generate lot of sugarcane by-products in the sugar industry every year. It is expected that if more quantity of sugarcane crushed for the production of sugar, the more amount of sugarcane by-products is generated every year. The efficient utilisation of sugarcane by-products lies with industry in order to earn additional profit and to make the industry sustainable.

The details of sugarcane crushed and sugarcane by-products generated is presented in the **table 1.7**.

Table 1.7 Production Details of Sugar and Sugarcane By-products in Karnataka:

Year	Production of Sugar (Lakh tonnes)			Production of Sugarcane by-products (Lakh tonnes)				
	Quantity of Sugarcane crushed	Sugar Production	Recovery of sugar (% to cane)	Quantity of Molasses produced	Recovery of Molasses (% to cane)	Quantity of Bagasse produced*	Quantity of Press mud produced*	Quantity of Cane tops and leaves produced*
2009-10	239.74	25.58	10.67	10.74	4.48	74.32	7.19	71.92
2010-11	337.58	36.83	10.91	15.20	4.50	104.65	10.13	101.27
2011-12	347.58	38.72	11.14	15.67	4.51	107.75	10.43	104.27
2012-13	333.37	34.67	10.40	15.01	4.50	103.34	10.00	100.01
2013-14	381.46	41.77	10.95	16.86	4.42	118.25	11.44	114.44
2014-15	446.20	49.35	11.06	20.56	4.61	138.32	13.39	133.86
2015-16	377.00	40.49	10.74	17.79	4.72	116.87	11.31	113.10
2016-17	212.46	21.65	10.19	10.01	4.71	65.86	6.37	63.74
2017-18	354.15	37.54	10.60	16.33	4.61	109.79	10.62	106.25
2018-19	412.86	44.30	10.73	18.94	4.59	127.99	12.39	123.86
2019-20	351.51	34.94	9.94	15.67	4.46	108.97	10.55	105.45

Average	345.74	36.89	10.67	15.71	4.54	107.18	10.37	103.72
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* calculated at average recovery rate (percent cane) of 31 percent for bagasse, 3 percent for press mud, 30 percent for cane tops and leaves.

Source: Directorate of sugarcane and sugar, Government of Karnataka

The Sugar Industry in Karnataka state crushes 345.74 lakh tonnes of sugarcane for the production of sugar of quantity 36.89 lakh tonnes with 10.67 recovery rate. Along with sugar it produce average amount of molasses (15.71 Lakh tonnes) with average yield of 4.54 percent. The average quantity of bagasse estimated is about 107.18 lakh tonne and that of press mud is 10.37 lakh tonnes.. In addition, out of the amount of sugarcane crushed, 103.72 lakh tonnes of cane tops and leaves are generated in the farmer's field. From the **table 1.8**, it was very clear that there was large amount of sugarcane by-products (240 lakh tonnes) generated in the sugar industry of Karnataka. The complete utilisation of sugarcane by-products would result lot of revenue to sugar industry.

Table 1.8 District wise Production Capacity of Sugar, Power, Alcohol and Ethanol in Sugar Industry of Karnataka during 2019-20

District	Factories in Operation	Crushing Capacity (TCD)	Capacity of Co- generation (MW)	Capacity of Alcohol Production (KLPD)	Capacity of Ethanol Production (KLPD)
Belagavi	22	1,11,500	488	764	620
Bagalakote	11	87,750	314	560	170
Vijayapura	09	33,000	173	110	50
Mandya	05	22,500	96	146	60
Kalburgi	03	17,500	79	180	0
Bidar	06	16,500	34	0	0
Davangere	02	7,250	46	60	50
Bellary	02	7,000	28	0	0
U. Kannada	01	6,325	31	50	50
Yadagiri	01	5,000	24	50	0
Gadag	01	5,000	32	120	120
C. Nagar	01	3,600	20	0	0
Haveri	01	2,500	0	0	0
Shimoga	01	2,500	41	0	0
Hassan	01	1,250	0	0	0
Total	65	3,29,225	1491	2100	1130

Source: Directorate of sugarcane and sugar, Government of Karnataka

Karnataka State has fairly balanced spread of sugar factories in southern and northern parts where large tracts of land are put under sugarcane cultivation, especially in the irrigation command areas with assured irrigation facilities.

There are 68 sugar factories across the State which can again be classified into (i) State owned (3 units) (ii) Co-operative sector (16 units), & (iii) Private companies (49 units). There is predominance of Private Sugar Companies in the State which take a major share of sugarcane production. In Karnataka there are presently around 65 working sugar factories with annual crushing capacity of 3.29 Lakh tonne/day, cogeneration capacity of 1491 MW/day, alcohol production capacity of 2100 KLPD and ethanol production capacity of 1130 KLPD. More number of sugar factories are present in the northern district of Karnataka compared to southern district of Karnataka. Highest number of factories are situated in Belagavi district (22) followed by Bagalakote (11), Vijayapura (09), Bidar (06), Mandya (05) and Kalburgi (03).

3.8. CONCLUSION:

Karnataka state being the third largest sugarcane and sugar producing state has potency generate lot of sugarcane by-products in the sugar industry every year. As in the case of the rest of the country, sugar industry in Karnataka also is facing with unpredictability due to a number of reasons including uncertainties in sugarcane production on account of weather and rainfall conditions. Karnataka has been witnessing fluctuating trends in area, production and productivity of sugarcane. It is observed that the economic returns on capital invested on sugar mills would be stable, when the co-products i.e. bagasse, molasses and press mud are efficiently used for production of bio-ethanol, power and bio-fertilizer. Hence, there is enormous opportunity and attractive proposition for sugarcane crop as molecular farming for considering high biomass and its huge potential. Sugarcane had already been engineered to produce high value molecules such as therapeutics, industrial enzymes, vitamins, vaccines, bio-plastics etc.,