



Research Article

PERFORMANCE OF SUGAR INDUSTRY IN MAJOR SUGAR PRODUCING STATES OF INDIA

PATIL GANESHGOUDA I.^{1*}, MAHAJANASHETTI S. B.² AND PATIL SOMANAGOUDA I.³

¹Department of Agricultural Economics, College of Horticulture, Bidar, 585 403, University of Horticultural Sciences, Bagalkot, Karnataka 587104, India

^{2,3}Department of AgriBusiness Management, University of Agricultural Sciences, Dharwad, Karnataka 580005, India

*Corresponding Author: Email-ganeshpatil.phd@gmail.com

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Abstract- The paper aims to analysis the performance of sugar industry in major sugar producing states of India relating to various parameters such as area under sugarcane, sugarcane production, productivity of sugarcane, sugar production, cane utilization for sugar production, number of factories in operation, installed capacity, capacity utilization, sugar recovery percent and duration of cane crushing. The growth rate technique was employed to assess the performance of sugar factories for the period 1985-86 to 2012-13. The results of the study revealed that majority of the states showed positive significant growth in the area under sugarcane, sugarcane yield, sugarcane production, number of sugar factories in operation, utilization of sugarcane for sugar production, installed capacities and sugar production. This positive growth rates was due to increase in demand for sugar consumption, diversion of cane increase sugar consumption, diversion of cane from khnadasari and gur manufacturing units to sugar factories and increased demand for by-products of sugarcane (bagasse and molasses) for further production of alcohol and co-generation and blending of ethanol with petrol. On the other side, the capacity utilization and duration of crushing season were showed negative growth rate. This could be due to cyclical of sugarcane production which is usually happens once in two or three years i.e. surplus or shortage production of cane, frequent floods, droughts, pest and disease attack on crops.

Keywords- Sugar Production, Sugarcane Production, Installed Capacity, Sugar Recovery

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Introduction

India is the fourth major sugar producing country in the world, after Russia, Brazil and Cuba. Sugar industry occupies an important place among organized industries in India and is one of the largest agro-based industry in the rural India. Around Fifty million sugarcane farmers, their dependents and a large mass of agricultural labourers were involved in sugarcane cultivation, harvesting and ancillary activities, which constitute 7.5 per cent of the rural population of the country. Besides, about half million skilled and semiskilled workers, mostly from the rural areas are engaged in the sugar industry [1]. Sugar industry in India has played an important role in the development of socio economic conditions of the rural population. It has helped in mobilizing rural resources, generating employment, higher income, and development of transport and communication facilities. It is also pertinent to note that some of the sugar factories have diversified their activities using the by-product generated from sugar factories. The activities so generated include setting up of distilleries, organic chemical plants, paper mills, Board factories and cogeneration plants. The industry generates its own replenishable biomass and uses it as a fuel without depending on the fossil fuel. Hence, contribution of sugar industry to the Indian economy is enormous. In all, there were 700 installed sugar factories located across the 18 states in the country. Out of which, 314 were under cooperative sector, 324 were under private sector and 62 were under government sector with a total capacity of around 310 lakh MT of sugar production. The crushing capacity is roughly distributed equally between private sector units and co-operative sector units. The capacity of sugar mills is, by and large, in the range of 2500-5000 Tonnes Crushed per Day (TCD) but increasingly expanding and going even beyond 10,000 TCD. On an average,

the annual output of sugar industry in India Rs. 80,000 crores. The Central and State government receive annually Rs. 2500 crore as excise duty, purchase tax, and cess. India is one of the largest producer and consumer of sugar in the world [1]. With this background, the present study was undertaken with an objective to analysis the performance of sugar factories in major sugar producing states of India with respect to various parameters as mentioned in the methodology section of the study.

Methodology

For analysis of the performance of sugar industries in major sugar producing states of India, 10 major states were selected on the basis of highest area under sugarcane cultivation, sugarcane production and yield per ha. The states of Uttar Pradesh, Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh, Gujarat, Bihar, Haryana, Punjab and Madhya Pradesh were selected to analysis the various parameters of performance of sugar industry such as area under sugarcane, sugarcane production, productivity of sugarcane, sugar production, cane utilization for sugar production, number of factories in operation, installed capacity, capacity utilization, sugar recovery percent and duration of cane crushing by factories. The secondary data pertaining to the above mentioned parameters were gathered from 1985-86 to 2013-14 by referring the sources from www.indiastat.com and co-operative sugar publications. Further, the data had been analysed by employing the below mentioned analytical tools.

Growth Rate Analysis:

The performance of sugar industry in Karnataka vis-à-vis other major sugar

producing states and India as a whole was analyzed with the aid of compound growth rate analysis. An exponential function of the following type was fitted to estimate the growth rates. The details of equation and its parameters are depicted as under.

$$Y = ab^t$$

The above equation was converted into the following log linear form for applying ordinary least square (OLS)

$$\ln(Y) = \ln(a) + t \ln(b)$$

Denoting $\ln(a)$ as 'A' and $\ln(b)$ as 'B', the above equation can be further expressed as

$$\ln(Y) = A + Bt$$

The compound growth rate in Y (sugarcane area, sugarcane production and yield etc.) is calculated as

$$[\text{antilog}(B) - 1] \times 100$$

Results and Discussion

Growth in Area under Sugarcane in the Country

The growth in state wise area under sugarcane in India over a period from 1985-

86 to 2013-14 were analyzed using compound annual growth and the results have been depicted in [Table-1]. The state wise growth rate analysis for the above said period revealed that, the highest growth rate was recorded in Maharashtra state (4.34 %) followed by Gujarat (3.15 %), Karnataka (1.94 %), Madhya Pradesh (1.90 %), Tamil Nadu (1.6 %), Bihar (1.34 %) Andhra Pradesh (1.24 %) and Uttar Pradesh (0.96 %). Higher area under sugarcane in these states could be attributed to shift in cropping pattern from other competing crops like Paddy, Ragi, Jowar, Cotton, Cardamom, Groundnut, Sesamum, Small Millets, Tobacco and Tur crops [8]. Further, increase in area can also be attributed to increase in sugarcane prices coupled with growing number of sugar factories, and rising demand for consumption (Indian Sugar Industry Sector Roadmap, 2007). In a few states, expansion of major and medium irrigation project also induced sugarcane cultivation. On the other hand, the states like, Haryana (-0.85 %) and Punjab (-0.73 %) showed negative growth rate. This was due to shift in area under sugarcane to the competing crops like paddy, wheat, potato, cotton, food grains [8] on account of higher market prices, government support price and suitability of crops.

Table-1 State Wise Growth Rate of Sugar Industries performance indicators in India (1985-86 to 2013-14)

Sl. No.	Performance Indicator/ Year	AP	Bihar	Gujarat	Haryana	KA	MP	MH	Punjab	TN	UP	India
1.	Sugarcane Area (Lakh ha.)	1.24**	1.34*	3.15**	-0.85	1.94**	1.90**	4.34**	-0.73	1.60**	0.96**	1.65**
2.	Sugarcane Yield (kg/ha)	0.54**	0.63*	-0.54**	1.51**	0.12	0.95**	-0.49*	-0.02	-0.13	0.47**	0.34**
3.	Sugarcane Production (LT)	1.73**	1.90**	2.44**	0.61	2.10**	2.92**	3.85**	-0.62	1.81**	1.38**	2.01**
4.	Number of Sugar Factories in Operation (No.)	0.58**	-4.87**	1.65**	2.35**	3.53**	0.97*	2.62**	0.97	1.67**	1.05**	1.49**
5.	Installed Capacity (LT)	2.79**	1.22**	3.41**	4.74**	5.29**	5.67**	4.95**	4.64**	4.03**	5.97**	4.81**
6.	Utilization of Sugarcane for Sugar Production (%)	0.77*	-0.92	0.15	1.51**	4.12**	-0.17	0.01	2.39**	1.39**	2.75**	1.88**
7.	Duration of Crushing Season (No. of days)	-0.57	-0.37	-0.49	-1.52*	-0.02	-0.86	-0.92	-2.11**	-0.62	-0.62	-0.69
8.	Capacity Utilization (%)	-0.04	-1.16	-0.59	-2.67**	1.13	-2.82**	-1.03	-3.68**	-0.98	-1.23*	-0.87
9.	Sugar Production (LT)	2.78**	0.51	2.82**	1.94*	6.55**	2.83**	4.07**	1.55	3.14**	4.37**	4.06**
10.	Sugar Recovery (%)	0.09	0.04	-0.18*	-0.04	0.16**	0.12	0.24**	-0.15	0.05	0.10	0.12*

Source: www.indiastats.com

Note: AP = Andhra Pradesh, KA= Karnataka, MP= Madhya Pradesh, MH= Maharashtra, TN = Tamil Nadu and UP = Uttar Pradesh

** and * - Significant at 1 per cent and 5 per cent respectively.

State wise Growth in Sugarcane Yield in the Country

Sugarcane crop is mainly grown for its vegetative growth to extract juice. The crop grows well in tropical and sub-tropical climates between the latitudes 35°N to 35°S. Warm and humid climate is very much favorable for its growth and the temperature ranging from 30°C to 40°C with annual rainfall ranging between 70 cm to 150 cm is the best for its successful cultivation. Very low temperature stops the production of sucrose due to low photosynthesis. Warm long days produce plants with more tillers, juice and high sucrose contents [3].

The growth rate analysis revealed that Haryana state recorded the highest positive growth rate of 1.51 percent followed by Madhya Pradesh (0.95%), Bihar (0.63%), Andhra Pradesh (0.54%) and Uttar Pradesh (0.47%). The states of Gujarat (-0.54%), Maharashtra (-0.49%), Tamil Nadu (-0.13%) and Punjab (-0.02%) showed a negative growth with respect to sugarcane yield due to frequent occurrence of droughts during 1992-93, 1997-98, 2003-04, 2008-09 and 2009-10 and lower than normal rainfall during 2012-13, which led to decline in the yield. Apart from these, other major reasons for lower yields were short growing season, moisture stress, pest and disease problem, floods and water logging, delayed planting after wheat and very poor rations [6]. However, in the case of Karnataka, the growth of sugarcane yield was below (0.12%) the growth rate at all India level (0.34%).

State wise Sugarcane Production in the Country

Growth rate analysis of sugarcane production revealed that Maharashtra state registered the highest positive and significant growth rate of 3.85 percent followed

by Madhya Pradesh (2.92%), Gujarat (2.44%), Karnataka (2.10%), Bihar (1.90%), Tamil Nadu (1.81%), Andhra Pradesh (1.73%) and Uttar Pradesh (1.38%). The highest sugarcane production in these states due efficiency in the cost of production and also favorable climatic and soil conditions [7]. Further, the state like Uttar Pradesh, there was also a support from state government through announcement of State Advised Price (SAP) apart from central government fixed Fair and Remunerative Price (FRP) for further promotion farmers to grow more area under sugarcane. Further, other factors like water availability, soil condition and availability of number of sugar factories and their services encouraged the sugarcane growers to reach higher growth rate in sugarcane production in the above said states. The Punjab state is the only state, which had negative growth rate of -0.62 percent due to shift in cropping pattern towards paddy and wheat crop, which were more remunerative than sugarcane crop.

State wise Sugar Factories in Operation

With regard to growth rates of number of sugar factories in operation in the study period, it was revealed that Karnataka state registered the highest growth rate (3.5%) followed by Maharashtra (2.62%), Haryana (2.35%), Tamil Nadu (1.67%), Gujarat (1.65%), Uttar Pradesh (1.05%), Madhya Pradesh (0.97%) and Andhra Pradesh (0.58%). On contrary, Bihar was the only state, which recorded negative growth rate of -4.87 percent. However, a significant growth in the number of sugar factories at all India level (1.49%) was noticed. The reason could be attributed to increased area and production of sugarcane owing to favorable weather, water and soil conditions and also due to diversion of sugarcane from its

production of traditional sweeteners to sugar production (Gur and Khandsari). On the other hand, de-licensing of sugar policies (1997-98) has led to increase in the number of sugar factories across the states from the period 1997-98 to 2012-13 in comparison with previous periods [9].

State wise Installed Capacity of Sugar Factories

The growth rate analysis of installed capacity of sugar factories across the states and India as a whole indicated that the highest growth was recorded in the states of Uttar Pradesh (5.97%) followed by Madhya Pradesh (5.67%), Karnataka (5.29%), Maharashtra (4.95%), Haryana (4.74%), Punjab (4.64%), Tamil Nadu (4.03%), Gujarat (3.41%), Andhra Pradesh (2.79%) and Bihar (1.22%). This higher growth rate in the installed capacity of the factories over the study period was due to increase in the number of sugar factories in India (342 to 526) during the same period. Also, the sugar factories which were established during last decade came up with higher installed capacity and the old sugar factories which were already existing also got modified and reinstalled higher cane crushing capacity. Further, increased demand for sugar and its by-products for further production of alcohol, ethanol and co-generation and liberalized licensing policy facilitated easy accessibility to financial assistance for facilitating up-gradation and modernization of mills.

State wise Utilization of Sugarcane for Sugar Production

In India, many states recorded higher growth rate in utilization of sugarcane for sugar production. The highest was observed in the case of Karnataka state (4.12%), followed by Uttar Pradesh (2.75%), Punjab (2.39%), Haryana (1.51%) and Tamil Nadu (1.39%). Higher cane utilized for sugar production in these states was mainly due to efficient management of increased supply of cane. On the contrary, Bihar (-0.92%) and Madhya Pradesh (-0.17%) states recorded a negative growth in utilization of cane sugar production. This was due to lower crushing capacity of the sugar factories and also many were of old with obsolete equipments/machineries, untimely payment of cane bills, increase in the diversion of cane towards Gur and Khandsari production etc.

State wise Duration of Crushing Season

The growth rate analysis for duration of crushing season showed negative growths in all the States. However, Karnataka state showed a lower magnitude of negative growth in comparison with other major sugar producing states, which was to the tune of -0.12 percent. On contrary, the states of Punjab (-2.11%) and Haryana (-1.52%) had reported a very high negative growth rate in crushing period. Hence, the analysis at all India level was negative growth rate to the tune of -0.69 percent. This could be due to higher fluctuation in sugarcane production and cyclical production of sugarcane, lack of staggered plantation, mix of varieties with different duration and diversion of cane for other purpose etc.

State wise Capacity Utilization

During the study period, all the states showed negative growth rate in capacity utilization of the sugar factories except Karnataka state. The states like Punjab (-3.68%), Madhya Pradesh (-2.82%) and Haryana (-2.67%) were reported higher negative growth rate. This was mainly because of non-availability of cane to the sugar factories especially due to drought and severe pest and disease infestation. Further, it was also due to diversion of cane to the jaggery production during periods of lower prices for sugarcane paid by the sugar factories. However, in the case of Karnataka state, positive growth rate in capacity utilization was noticed during the study period.

State wise Sugar Production

The higher positive significant growth rate in sugar production had been observed in the major sugar producing states of Karnataka (6.55%), Uttar Pradesh (4.37%), Maharashtra (4.07%), Tamil Nadu (3.14%), Gujarat (2.82%) and Andhra Pradesh (2.78%). Higher growth rate was mainly due to increase in sugarcane area and production of cane, increase in installation capacity of the sugar factories, increase in number of factories with greater crushing capacity, increase in diversion of cane from jaggery production to sugar production etc. Only in Bihar

state, the growth in sugar production was low due low milling efficiency and recovery of sugar from sugarcane is very low[2].

State wise Sugar Recovery of Sugar Factories

Sugar recovery was observed to be highest during dry weather condition with low humidity, bright sunshine hours, cooler nights with wide diurnal variations and very little rainfall during ripening period. These conditions were favorable for high sugar accumulation during sugarcane cultivation [4]. During the study period, the growth rate in sugar recovery was found to be the highest in the states of Maharashtra (0.24%) and Karnataka (0.16%) owing to suitability of climatic conditions for accumulation of sucrose contents in the cane i.e. long hours of sunshine, cool nights with clear skies and the latitudinal position of this area are that are highly favorable for sugar accumulation in the cane [5]. All major sugar producing states in the country except Gujarat (-0.18%), Haryana (-0.04%) and Punjab (-0.15%) reported positive growth rate in sugar recovery due to various reasons as mentioned above.

Conclusion

A majority of the states showed positive significant growth rates in the area under sugarcane, sugarcane yield, sugarcane production, number of sugar factories in operation, utilization of sugarcane for sugar production, installation capacities and sugar production. This positive growth rates were due to increased demand for sugar consumption, diversion of cane from khandasari and gur manufacturing unit to sugar factories and increase in demand for by-products of sugarcane (bagasse and molasses) for further production of alcohol and co-generation and blending of ethanol with petrol due to government policies. However, there is need for sugar factories, sugarcane growers and the governments to control the cyclicity of sugarcane production which usually happens once in two to three years for overcoming shortages and surplus production, as it was witnessed by negative growth in duration of crushing season and capacity utilization of factories.

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Author Contributions

1. Dr. Ganeshgouda I. Patil, Ph. D scholar – undertaken research work, data collection, analysis and paper writing
2. Dr. S. B. Mahajanashetti, Chairmen, assisted in analysis and paper writing
3. Mr. Somanagouda I. Patil, Assisted in data collection and analysis of the Data

Abbreviations

TCD -Tonnes Crushed per Day
FRP- Fair and Remunerative price
SAP - State Advisory Price
MT- Metric tonne

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

Conflict of Interest: None declared

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