



Growth Trend in Area, Production and Yield of Sugarcane During Post-WTO Era in Western Region of Uttar Pradesh

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ABSTRACT

Sugarcane is one of the most important cash crops in the world economy, as it is the most prominent and ancient source of sugar used by mankind. Sugarcane is known to be thriving well in Brazil, India, Australia, Cuba, USA, Philippines, and Indonesia. The data obtained from secondary sources are analyzed for post WTO period to obtain estimates the compound growth rate of area, production and yield of sugarcane in western region of Uttar Pradesh. The data obtained for the period of 20 years beginning with 1995-96 to 2014-15. The data is divided into two sub periods i.e. 1995-96 to 2004-05, 2005-06 to 2014-15 beside overall period 1995-96 to 2014-15. The study revealed that the area, production and yield of sugarcane in western region have increased during the entire study period, while area under sugarcane declined during II sub period i.e. 2005-06 to 2014-15 and yield also decreased during, I sub period i.e. 1995-96 to 2004-05. The study suggested that the efforts should be made to improve the productivity of sugarcane in western region of Uttar Pradesh to increase its production at higher rate.

Key words: Sugarcane, Area, Production, Yield, CGR, Post WTO

The major sugarcane growing states in India are Uttar Pradesh, Maharashtra, Tamil Nadu, Andhra Pradesh, Karnataka and Gujarat. These states contribute around 85 per cent sugarcane production of the country. Sugarcane crop is a boon of Uttar Pradesh and Maharashtra. It plays vital role in the economy of the states. Uttar Pradesh ranked first in area (2.14 million ha) and production (133.06 million tons) followed by Maharashtra in area (1.03 million ha) and production (84.70 million tons) in the year 2014-15. Uttar Pradesh alone produced 36.72 per cent of total sugarcane of the country while, Maharashtra produced 23.38 per cent of total sugarcane of the country (Agricultural Statistics at a Glance 2016).

It is observed that some countries registered diminishing trends in sugarcane yield during post liberalization WTO reform period. However, the global sugarcane production has showed that the sugarcane acreage and yield was stable in majority of countries in post reform

period as compare to pre-reform regime (Greeshma 2014). The annual fluctuations in sugarcane production continued as the matter of concern and discussion to solve the problem of raw material supply to the sugar mills. The fluctuations in sugarcane area and production had serious implication of processing raw material supply management chain to sugar mills affecting crushing duration and sugar-energy production. These fluctuations in sugarcane production and yield depends on farm input supply, comparative production cost advantage and relative profitability, government price policies, timely cane price payment to the farmers, infrastructural facilities and climatic conditions.

During pre-reform period area under sugarcane in U.P. has increased from 1.35 to 1.77 million ha during 1970-1990, with the annual CGR of 1.50 per cent per annum. Though the Uttar Pradesh had maximum sugarcane acreage, its share at national level has declined marginally (More *et al.* 2017). Similarly, sugarcane production in U.P. increased substantially with CGR 3.09 per cent which was significant at 1 per cent level during pre-reform period. During post reform period Uttar Pradesh still had maximum acreage under sugarcane; its share at national level has declined from 51.5 to 43 per cent during post reform period (1993 to 2013). Similarly, the CGRs for production and yield in U.P.

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declined substantially as compared to the pre-reform period. Amongst six major sugarcane producing states in the country, three states, U.P., Maharashtra, and Karnataka had showed declining trend in yield during post reform period 1993 to 2013 (John and Mali 2016). The comparative CGRs for sugarcane area, production and yield during pre and post-liberalization reform period indicated that the number of states registered poor and negative growth trend were more during post liberalization reform period (Gangwar *et al.* 2014).

Western region of Uttar Pradesh comprises of 30 districts out of 75 districts of the state. During post WTO era (1993 to 2013) compound annual growth rate in area, production and yield of sugarcane was declined as compared to pre-WTO era (1970 to 1990) in Uttar Pradesh. Decreasing size of land holding, decreasing underground water level, degradation of land fertility, crop rotation and delay in payment for the sugarcane crushed by the sugar factories are the many reasons for decline in area and production of sugarcane in the state. The overall yield level as reflected by current growth is not enough to attain the desired level of sugarcane production. Keeping in view the limitations of area under sugarcane, yield level needs to be increased to the tune of 110 tons per hectare by 2030 AD. Present study is undertaken to examine the growth trend in area, production and yield of sugarcane in the western region of Uttar Pradesh, during post WTO era.

MATERIALS AND METHODS

In order to find out major crops, cropping pattern followed in the region has been examined. To analyze the changes in area, production and yield of sugarcane in western region of Uttar Pradesh during 1995-96 to 2014-15 i.e. post WTO era, compound annual growth rates (CAGR) are estimated. For this purpose, the year wise data were drawn from various volumes of divisional Statistical bulletin of Uttar Pradesh for the period from 1995-96 to 2016-17. Based on the availability divisional data in area, production and yield of sugarcane of western region of Uttar Pradesh, the entire period of 20 years from 1995-96 to 2014-15 has been divided into two sub periods also, as indicated viz. Period I: 1995-96 to 2004-05, Period II: 2005-06 to 2014-15 and entire period: 1995-96 to 2014-15.

Analysis of data

In the present study, the compound annual growth rates (CAGR) in area, production and yield of sugarcane in western region of Uttar Pradesh are estimated by fitting exponential growth function as follows:

$$Y_t = ae^{bt}$$

or

$$\text{Log}_e Y = \text{Log}_e a + bt$$

Where,

Y = Area/production/productivity of sugarcane (hectares/tons/ Q/ha) in period t.

a = Constant

b = Trend co-efficient

t = Time variable

$$\text{CAGR (\%)} = (\text{Antilog } b-1) \times 100$$

The significance of the estimated trend coefficient is statistically tested with the help of student 't' test. Non-significant trend coefficient indicates that there is no change in the variable over the respective study period.

RESULTS AND DISCUSSION

The cropping pattern followed in the region is depicted the (Table 1). Different crops are grown in different seasons in the region the table reveals that wheat, paddy, pearl millet and sugarcane are the most important crops of the region. According to the statistics of the year 2014-15, wheat is the most important crop occupied an area of 36.45 lakh hectares followed by paddy. Sugarcane emerged as third most important crop occupied an area of 13.08 lakh ha (13.87 per cent of the gross cropped area). The table also depicts that pearl millet, potato, maize; black gram and barley are the other major crops of the western region.

The compound annual growth rates in area, production and yield of sugarcane in western region of Uttar Pradesh during two sub periods and entire period are presented in (Table 2). The table reveals that the area under sugarcane in the region has increased at the rate of 0.48 per cent per annum during the entire period of 20 years i.e. 1995-96 to 2014-15. Thus, the area under sugarcane in western region of Uttar Pradesh increased during overall period. The compound annual growth rate in area during I sub period i.e. from 1995-96 to 2004-05 is 0.92 per cent indicating that during I sub period area increased with higher magnitude than in the overall period. There is wide fluctuation in area under sugarcane due to the different climatic and non-climatic factors. The production of sugarcane in the region has increased at the rate of 0.74 per cent per annum during the entire period of this study i.e. 1995-96 to 2014-15. Whereas no any significant change has been observed in its production during the two sub periods.

Yield is the most important criteria for measuring growth of any crop output. The success or failure of any improvement in the art of agriculture is measured by the resultant increase or decrease in the productivity. The yield of sugarcane in the region has increased at the rate of 0.26 per cent per annum during the entire period i.e. 1995-96 to 2014-15. Like production no any significant change has been observed in the sugarcane productivity during the two sub periods.

The area, production and yield of sugarcane in western region of Uttar Pradesh have increased during overall period i.e. 1995-96 to 2014-15, where in yield increased at lowest compound annual growth rate. However, no any significant change has been observed in the sugarcane area, production and yield during the two sub periods, except in area under sugarcane during I sub period. No significant growth in the area, production and yield of sugarcane during II sub period may be due to delay in payment for the sugarcane crushed by the sugar factories, due to cultivating the sugarcane crop on same piece of land year after year with excessive use of irrigation water which led to saline condition of the soil and due to unbalanced use of crucial inputs such as manures, fertilizers, micronutrients etc.

Area, Production and Yield of Sugarcane During Post-WTO Era

Table 1 Area, production and yield of different crops in western region of Uttar Pradesh during 2014-15

Crops	Area (ha)	Per cent of gross cropped area	Production (metric ton)	Yield (Q/ha)
Paddy	1715367	18.18	4195359	24.46
Wheat	3645906	38.64	8159984	22.38
Barley	49774	0.53	109434	21.99
Jowar	8849	0.09	8606	9.73
Pearl millet	800733	8.49	1630660	20.36
Maize	332316	3.52	745327	22.43
Black gram	80892	0.86	58820	7.27
Green gram	33141	0.35	23309	7.03
Lentil	29540	0.31	20269	6.86
Gram	9022	0.10	5905	6.55
Pea	8538	0.09	6903	8.08
Pigeon pea	38772	0.41	30797	7.94
Rapeseed and Mustard	277707	2.94	278261	10.02
Sugarcane	1308263	13.87	90074967	688.51
Potato	397197	4.21	9564942	240.81
Others	699311	7.41	-	-
Gross cropped area	9435328	100.00	-	-

Source: Sankhayiki Patrika, Uttar Pradesh 2016

Table 2 Compound annual growth rates in area, production and yield of sugarcane in western region of Uttar Pradesh

Particular	Initial year observation	End year observation	Trend coefficient	Standard error	Compound annual growth rate (%)
Area (ha)					
a) 1995-96 to 2004-05	1122981	1238430	0.0092**	0.0434	0.92
b) 2005-06 to 2014-15	1323363	1308263	-0.0031	0.0319	-0.31
c) 1995-96 to 2014-15	1122981	1308263	0.0048*	0.0409	0.48
Production (metric ton)					
a) 1995-96 to 2004-05	69910992	80517662	0.0058	0.0546	0.59
b) 2005-06 to 2014-15	81535671	90074967	0.0030	0.0689	0.30
c) 1995-96 to 2014-15	69910992	90074967	0.0074*	0.0596	0.74
Yield (Q/ha)					
a) 1995-96 to 2004-05	622.55	650.16	-0.0033	0.0405	-0.33
b) 2005-06 to 2014-15	616.12	688.51	0.0061	0.0560	0.61
c) 1995-96 to 2014-15	622.55	688.51	0.0025***	0.0484	0.26

*, **, *** Significant at 0.5%, 5% and 10% probability levels, respectively

The results of the study indicated that, the stagnancy and decline in the area, production and yield of sugarcane due to cultivating the sugarcane crop on same piece of land year after year with excessive use of irrigation water which led to saline condition of the soil so using improved

technology, balanced use of organic and inorganic fertilizer, micronutrients and changing crop rotation pattern for increasing production and yield of sugarcane crop and timely payment to the sugarcane growers for the sugarcane crushed by the sugar factories.

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