



TRENDS IN GROWTH RATES IN AREA, PRODUCTION AND PRODUCTIVITY OF SUGARCANE IN HARYANA

Satinder Kumar*

Surender Singh*

Abstract: *State agriculture has undergone spectacular change after using new agriculture technology during green revolution. The present study initiates and analyzes the trends in area, production and productivity of sugarcane crop in Haryana state at the district and regional levels covering the most recent period from 2000-01 to 2009-10 by using simple descriptive statistics; linear growth rates (compound annual growth rates). The results of this study about the growth rates in the area, production and productivity of sugarcane crop show interesting results in Haryana at the district and regional levels.*

Key Words: *CAGR (Compound Annual Growth Rate), Area, Production and Productivity.*

*Research Scholar, M.D.U Rohtak (Haryana)



INTRODUCTION:

The agriculture sector continues to remain more important than industry in the states in a way to provide employment (about 70 percent of the population is engaged in agriculture directly or indirectly to earn their livelihood), generating income, providing raw materials to the industrial sector and ensuring food security to the poor. Thus, agricultural development holds the key to overall development of the state. The agriculture sector has always been an important contributor to the Gross State Domestic Product (GSDP), although the share of this sector in the Gross State Domestic Product is declining continuously. The composition of Gross State Domestic Product (at constant 1999-00 prices) reveals that the share of agriculture and allied sector has declined from 32.0 percent during 1999-00 to 20.5 percent during 2007-08. It came down further to 16.7 percent (at constant 2004-05 prices) and 19.5 percent (at current prices) in the State GDP during 2010-11 (Figure 3.1). However, the growth of the agriculture and allied sector continued to be a critical factor in the overall performance of the state economy. The growth of agriculture sector in state GDP grew significantly after the inception of the state. In the 11th five year plan, the average annual growth of agriculture and allied sector of the state recorded 3.9 percent, which is even slightly higher than that achieved at all India level (3.7 percent). The adoption of Green Revolution technology has given a major boost to the growth of agriculture sector in Haryana. The structural transition of the State economy over the years and overall infrastructure development has contributed in agriculture development in Haryana. Agriculture sector still continues to occupy a significant position in state economy.

The present study initiates and analyzes the trends in growth rates in area, production and productivity of sugarcane of Haryana state at the district and region levels covering the most recent period from 2000-01 to 2009-10. Sugarcane is an important commercial crop of the state occupying 143 thousand hectares of the total cultivated land in the state. It is only 4 per cent of the total cultivated area. Sugarcane also supports the agro based industry, like sugar industry which is the second largest agro based industry after textiles. Sugarcane also supports two important rural and cottage industries like Gur and Khandsari industries.

A considerable literature has examined the trends in growth rates in area, production and productivity in Indian agriculture. These studies have also outlined the factors that cause/influence these trends and variations. Sirohi et al., (1983) examined the trend of



production and productivity of wheat per hectare in India. The study showed that productivity of wheat has significantly increased during the study period (1970-71 to 1981-82). Singh and Gangwar (1986) also examined the trends and variability in area, production and productivity of coarse grains and pulses in Haryana for the years 1966-67 to 1980-81. Larson et al. (2004)'s study has examined the instability in area, yield and production for the major crops in India by dividing the period 1950-51 to 2001-02 into pre-green revolution (1951-1965) and post-green revolution (1968-2002) periods.

RESEARCH METHODOLOGY

The present study is based on secondary sources of data. A different range of data set on agriculture activities is used in the study, including area, production, and productivity/yield of sugarcane. The data information on these items is not readily available in one published report or document. The data information therefore collected different published secondary sources. In this study, consider all the districts of Haryana. Presently, Haryana consist 21 districts. The limitation of this study is that the data information for some districts is not available either because of its new creation or others and some districts like Mewat and Palwal. Therefore, data information for the earlier period was not available for these districts. These districts therefore are merged in their parent districts. To make the data more consistent, some others districts, namely Panchkula, Jhajjar and Fatehabad, which came into existence during nineties, are also merged in their parent districts. So effectively, the results for 16 districts are presented in the study. As per agro-climatic regions, Haryana is divided into two agro-climatic zones namely Eastern Zone and Western Zone (Table 1.1). These zones have different characteristics in term of agricultural dominance, land fertility, land use pattern and irrigation facility. Therefore, it is a fair idea to study the trends in growth rates in area, production and productivity of sugarcane by agro-climatic regions of states.

Table 1.1: Agro-Climatic Zones of Haryana

Haryana	Eastern Zone	Ambala, Faridabad, Jind, Kaithal, Karnal, Kurukshetra, Panipat, Rohtak, Sonipat, Yamunanagar
	Western Zone	Gurgaon, Bhiwani, Hisar, Mahendergarh, Rewari, Sirsa

The trends in growth rates in area, production and productivity for sugarcane is estimated by using Compound Annual Growth Rates (CAGR).



The Compound Annual Growth Rates are estimated by using the following formula:

The exponential compound annual growth rates are estimated by using log linear functions on the time series data on area, production and productivity for sugarcane. The semi log exponential functional form is used to analyze the trend in growth rate, which is one of the appropriate functional forms to estimate the growth rate. That is, the growth rate is estimated by using the following semi log functional form:

$$\log Y_t = a + bt \dots\dots\dots (1)$$

This equation (1) can be elaborated in details as:

$$Y_t = Y_0 (1+r)^t \dots\dots\dots (i)$$

Taking log on both sides, we get

$$\text{Log } Y_t = \text{Log } Y_0 + t \text{ Log } (1+r) \dots\dots\dots (ii)$$

Equation (ii) can be rewrite as

$$Y = a + bt \dots\dots\dots (iii)$$

Where $Y = \text{Log } Y_t$; $a = \text{Log } Y_0$; $b = \text{Log } (1+r)$,

In equation (iii)

$Y_t = \text{area/production/ productivity}$, as the case may be, of sugarcane as discussed above

$a = \text{constant}$

$t = \text{Time variable in year } (1, 2, \dots, n)$

$b = \text{Regression Coefficient that shows the rate of change or growth rates in a series}$

The annual compound growth rate (s) can be worked out by using:

$$\text{Antilog } (b) = \text{Antilog } (\log (1+r)).$$

$$\text{Antilog } (b) = 1+r$$

and

$$r = \text{Antilog } b - 1$$

When multiplied by 100, it gives the percentage growth rate in area, production and productivity of sugarcane. That is, Compound Annual Growth Rate (CAGR) (%) = $r = (\text{Antilog } B - 1) \times 100$.

RESULTS AND DISCUSSION:

The growth rate trends in area, production and productivity depend on many factors. For instance, the agricultural productivity in most cases depends on area sown under the crops and total production of that particular crop. The production of a crop not only depends on



area sown under the crop but also affected by technology adopted therein, entrepreneurship and economics of production. Table 1.2 and figure 1.1 shows the growth rates (CAGR) from 2000-01 to 2009-10 in the area, production and productivity of sugarcane at the regional level.

Table 1.2: Zone-wise Trends in Growth Rates in Area, Production and Productivity of Sugarcane in Haryana: 2000-01 to 2009-10

Regions	Area	Production	Productivity
Eastern Zone	-5.45	-2.97	3.01
Western Zone	-14.8	-13.77	-0.15
Total	-5.94	-3.5	2.12

Source: Various Issues of Statistical Abstracts of Haryana

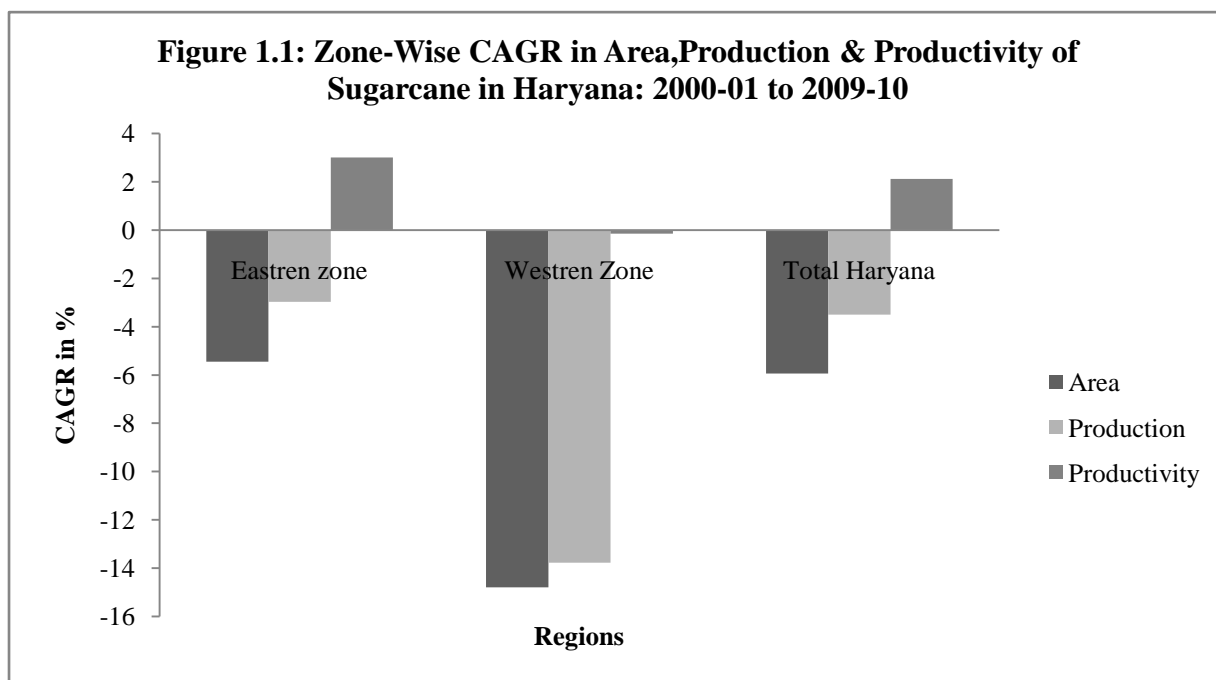


Table 1.2 and figure 1.1 shows negative growth rates in area and production of sugarcane at Haryana level, -5.94 per cent and -3.5 per cent, respectively. If we see the growth rate at regional level the Western Zone show highly negative growth rates in area and production of sugarcane as compare to total Haryana and Eastern Zone. This region (Western Zone) notified as less availability of irrigation facility compare to the Eastern Zone. The growth rate in productivity of sugarcane shows positive growth rate at total Haryana level and in Eastern



Zone , 2.12 per cent and 3.01 per cent, respectively, but negative growth rate (-0.15 per cent) in Western Zone.

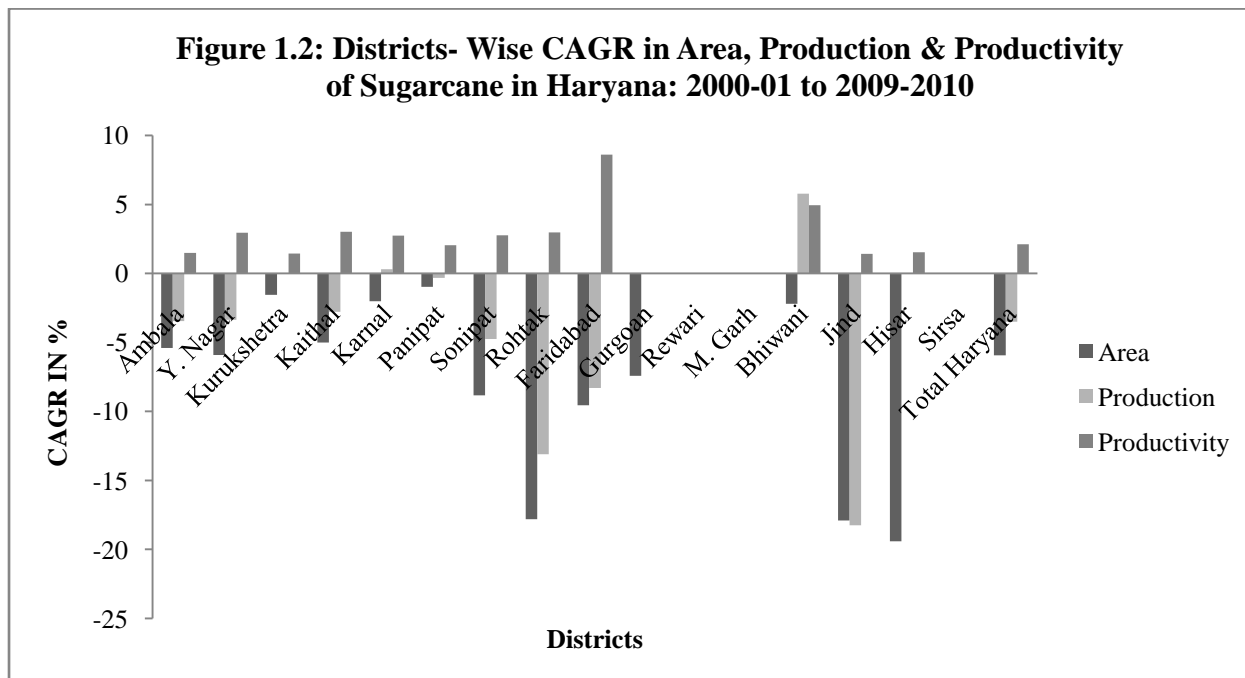
Growth Rates in Area, Production and Productivity of Sugarcane at District Level:

Table1.3 and figure1.2 show the growth rates in area, production and productivity of sugarcane at district level. A comparative analysis of growth rates in area, production and productivity of sugarcane at district level of Haryana show more robust result for policy suggestion. The growth rates in the area, production and productivity of sugarcane crop show interesting results. The growth rate in area of sugarcane shows negative growth rate in almost all the districts of Haryana.

Table1.3: District-Wise Trends in Growth Rates in Area, Production and Productivity of Sugarcane in Haryana: 2000-01 to 2009-10.

Districts	CAGR IN%		
	Area	Production	Productivity
Ambala	-5.41	-3.46	1.49
Y. Nagar	-5.90	-3.37	2.94
Kurukshetra	-1.55	-0.02	1.43
Kaithal	-5.00	-2.78	3.01
Karnal	-2.01	0.30	2.74
Panipat	-0.96	-0.32	2.05
Sonipat	-8.83	-4.76	2.76
Rohtak	-17.8	-13.11	2.97
Faridabad	-9.55	-8.30	8.60
Gurgoan	-7.41	-	-
Rewari	-	-	-
M. Garh	-	-	-
Bhiwani	-2.21	5.79	4.94
Jind	-17.9	-18.25	1.42
Hisar	-19.4	-	1.54
Sirsa	-	-	-
Total Haryana	-5.94	-3.5	2.12

Source: Various Issues of Statistical Abstracts of Haryana.



This growth rate is highly negative in Hisar, followed by Jind and Rohtak as compare to other districts. The growth rate in some districts like Rewari, M.Garh and Sirsa is negligible during the study period. As far as the growth rate in production of sugarcane is concern, out of 16 districts only two districts Bhiwani and Karnal show positive growth rate, 5.79 per cent and 0.30 per cent, respectively. Jind district shows highly negative growth rate in production followed by Rohtak, Faridabad, Sonipat and other districts. The growth rate in productivity of sugarcane shows positive growth rate in all the districts of Haryana except Gurgaon, Rewari, M.Garh and Sirsa districts. The growth rate in productivity is noticeable in Faridabad and Bhiwani districts and other districts, (except Gurgaon, Rewari, M.Garh and Sirsa) show almost same growth rate.

CONCLUSION:

Analyzing the growth rate trends in the agricultural area, production and productivity across space and time have remained issues of significant concern for researchers as well as policy makers. It has been argued that analysis of the growth rate trends help us to identifying the changing pattern of crops and land use pattern under different crop and rate of change in area production and productivity of a crop and further help in designing the appropriate agricultural policy for a region or state. The growth rates in the area, production and productivity of sugarcane crop show interesting results. The growth rate in the area of sugarcane crop was found noticeably negative in both the region and in most of the districts



of Haryana. A similar picture of the growth rate in the production of sugarcane was seen in almost all the districts except Bhiwani and Karnal. On the contrary, the growth rate of productivity of sugarcane crop found positive in most the district of Haryana. This indicates that rate of change in area of sugarcane crop is higher than the rate of change in production in most of the Haryana districts.

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