



E-ISSN: 2278-4136  
P-ISSN: 2349-8234  
[www.phytojournal.com](http://www.phytojournal.com)  
JPP 2020; 9(2): 772-776  
Received: 12-01-2020  
Accepted: 15-02-2020

**Nisha**  
Ph.D., Scholar, Department of  
Agricultural Economics,  
CCSHAU, Hisar, Haryana, India

**DP Malik**  
Professor and Head, Department  
of Agricultural Economics,  
CCSHAU, Hisar, Haryana, India

**VP Mehta**  
Professor, Department of  
Agricultural Economics,  
CCSHAU, Hisar, Haryana, India

**Ritu**  
Ph.D. Scholar, Department of  
Agricultural Economics,  
CCSHAU, Hisar, Haryana, India

**Corresponding Author:**  
**Ritu**  
Ph.D. Scholar, Department of  
Agricultural Economics,  
CCSHAU, Hisar, Haryana, India

## Growth and trends in cultivation of sugarcane in Haryana vis-à-vis India

**Nisha, DP Malik, VP Mehta and Ritu**

### Abstract

The present study was carried out with the objectives to analyze the trend in area, production and productivity of sugarcane in India vis-a-vis Haryana. The study was based on secondary data. The time-series data related to area, production and productivity of sugarcane in India as well as Haryana for the period 1971-2018 was gathered from different published sources and to compute growth rate and trends by using linear trend equation were computed. The outcomes of the study revealed an increasing trend in the area, production and productivity of sugarcane at the national level with CAGRs values of 1.52, 0.84 and 2.37 per cent, respectively. Whereas, in Haryana, the trend in area indicated decreasing trend (-0.79%) over the study period while production and productivity illustrated increasing trend with CAGRs values of 0.74 and 1.55 per cent, respectively.

**Keywords:** Area, production, productivity, trend and CAGR

### Introduction

Sugarcane (*Saccharum officinarum*) is one of the major commercial crops grown in the world. It is the most important source of sucrose or sugar. It is indigenous to tropical South and Southeast Asia. Different species have different origins, with *Saccharum barberi* originated in India while *Saccharum edule* and *Saccharum officinarum* are indigenous to New Guinea. Sugarcane was first domesticated as a crop in New Guinea around 6000 BC.

Sugarcane is cultivated in about 25.98 million ha of land with cane production of 1.84 billion tonnes and productivity of 70.89 tonnes ha<sup>-1</sup> in the world in 2017 (FAO, 2019). It is cultivated in 10.02 million ha (38.57%) of area in the whole Asia with total production of 685.78 million tonnes (37.24%) and about 68.41 tonnes ha<sup>-1</sup> of productivity. The major sugarcane growing countries are Brazil, India, China, Thailand, Pakistan, Mexico and Colombia. All these seven countries contributed about 76.42 per cent of total area and 78.52 per cent of total production in the world. Brazil ranked first in the world and contributed about 39.18 and 41.19 per cent of the total area and production in the world, respectively. About 80 per cent of the total world sugar requirement came from sugarcane while 20 per cent came from sugar beet.

Sugarcane plays a crucial role in the agro-industrial economy of India. India has 4.95 million ha of area under sugarcane cultivation in the world and it is the world's second largest producer of sugarcane after Brazil with cane production of 352.16 million tonnes. Sugarcane cultivation in India is broadly classified into two agro-climatic regions i.e. sub-tropical and tropical. The sub-tropical zone includes four states i.e. Uttar Pradesh (2.16 million ha), Bihar (0.24 million ha), Punjab (0.09 million ha) and Haryana (0.10 million ha) while tropical zone consists of five states i.e. Maharashtra (0.63 million ha), Andhra Pradesh (0.10 million ha), Tamil Nadu (0.21 million ha), Gujarat (0.17 million ha) and Karnataka (0.35 million ha). The tropical region has about 45 per cent of area and contributed 55 per cent of the total sugarcane production in the country. Thus, sub-tropical region accounted for 55 per cent of area and shared 45 per cent of total production of sugarcane. The production scenario in India indicated that Uttar Pradesh, Maharashtra, Karnataka and Tamil Nadu are the major sugarcane states of India (Brar and Kataria, 2015) [3]. In Northern region, Sugarcane is planted in the months of January-February and October for spring and autumn seasons, respectively. The sugarcane requires 10-18 months for maturity in India but on an average 12 month crop duration is most prevalent. In sub-tropical region, planting seasons are autumn (October), spring (February–March) and summer (April–May). In peninsular region of country, planting is done in the months of January-February. Spring planted crop is also known as Suru in Maharashtra and Eksali in Gujarat and Andhra Pradesh. Autumn Planting in peninsular zone is done during October–November. Autumn planting is also known as pre-seasonal planting in Maharashtra and Gujarat. The pre-seasonal crop maturity is 13-15 months and sugarcane is supplied during early crushing period.

Adsali planting is preferred in Maharashtra and Karnataka and done during July-August and the crop matures after 16-18 months with higher sugar recovery. The duration of sugarcane and recovery of sugar from sugarcane varied in different agro-climatic conditions of country.

Haryana has shown a tremendous progress in the sugarcane cultivation during the last few years mainly due to expanded irrigation facilities. Haryana state is sharing 2.33 per cent of the total area and contributing 2.84 per cent of total production of sugarcane in India. Sugarcane alone cultivated on 1.14 lakh ha sharing 2.48 per cent of total cropped area with production of 8.71 million tonnes in the state during 2018. It is an important cash crop grown on fertile and irrigated areas of eastern zone of the state. Its cultivation is limited in districts of western zone of state as sugarcane is water intensive annual crop.

### Materials and Methods

The information related to area, production and productivity in major sugarcane growing countries in the world for period 2007-2017 was collected from FAO website. The time-series data related to area, production and productivity of sugarcane in India for the period 1971-2018 were scanned from various published sources i.e. Agricultural Statistics at Glance of Directorate of Economics & Statistics, Ministry of Agriculture & Farmers Welfare, New Delhi. While the time-series data related to area, production and productivity in Haryana state were collected from various issues of Statistical Abstract of Haryana, Department of Economics & Statistical Analysis, Govt. of Haryana for the period 1970-2017.

The various statistical tools like average, percentage, Benefit-Cost ratio (B-C ratio), Compound Annual Growth Rate (CAGR) etc. were calculated to draw valid inferences from the study.

For studying the CAGR in area, production and yield of sugarcane for India vis-a-vis Haryana were calculated for the period of forty eight years i.e. 1970-71 to 2017-18.

### Analytical tools and techniques

The CAGR was calculated to show the trends in area, production and productivity as under:

$$Y = AB^t U_t$$

Taking log i.e.,

$$\log Y = \log A + t \log B + \log U_t$$

$$\text{i.e. } y = a + bt + u_t$$

### Where

y = area, or production or productivity,

a = constant,

b = regression coefficient,

$u_t$  = disturbance term,

t = time in years starting from the base year 1970-71

The CAGR (%) was computed by using the formula

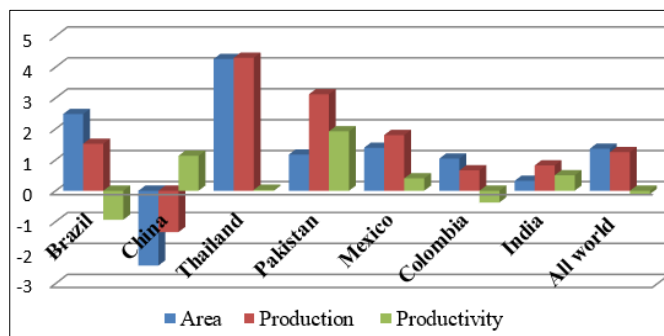
$$r = \{ \text{antilog}(b) - 1 \} \times 100$$

### Results and Discussion

#### Sugarcane scenario at global level

Sugarcane is grown on 25.98 million ha of land in the world with a total production of 1841.53 million tonnes and yield of 70.89 tonnes ha<sup>-1</sup> in the year 2017. Brazil occupies first position at global level with 10.18 million ha of area under sugarcane having total production of 758.55 million tonnes and 74.48 tonnes ha<sup>-1</sup> of yield. The reason behind the highest

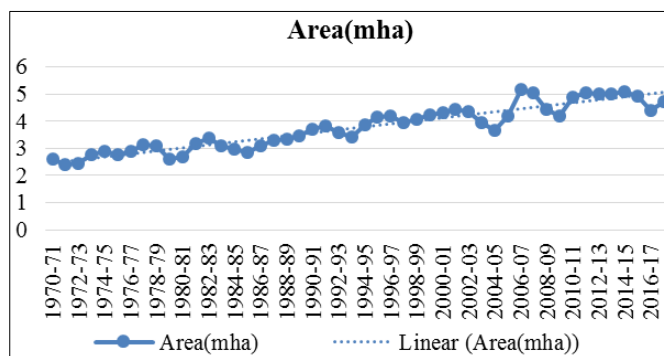
area and production under sugarcane in Brazil is the most favourable climatic conditions and low production cost of sugarcane. At the global level, the decadal growth rates of area, production and productivity found to be 1.36, 1.25 and -0.11 per cent, respectively.



**Fig 1:** Decadal CAGR of area, production and productivity of major sugarcane growing countries

#### Trends in the area, production and productivity of sugarcane in India

The area under sugarcane in India fluctuates considerably from year to year for the period 1970-2018. This effect is seen maybe due to the varied climatic conditions, fluctuations in prices of gur and khandasari, dependency of crop cultivation on the rainfall and increasing returns from the competing crops such as rice and cotton in kharif season and wheat and mustard in rabi season. Regardless of these factors, the acreage under sugarcane has increased since 1970 to 2018 as depicted by the upward movement of the area under sugarcane. The average area under sugarcane increased from 2.49 million ha in TE 1970-73 to about 4.97 million ha in TE 2010-13 which further decreased to 4.68 million ha in TE 2015-18 showing a dampening nature due to sharp decline in demand and price in world market.

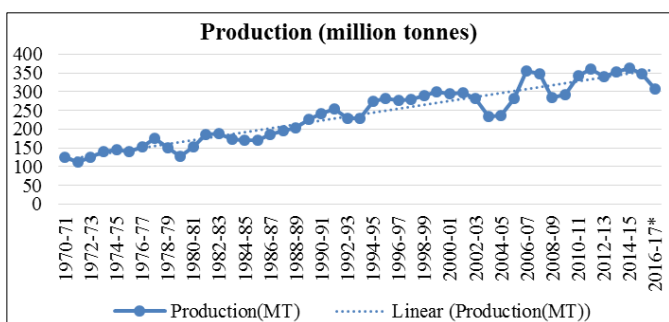


**Fig 2:** Trends in area of sugarcane in India

The year of superfluous production of sugar causes surfeit leading to decrease in the prices of sugarcane. This creates problems for farmers as well as sugar mills which further leads to the reduced area under sugarcane and ultimately resulted into the reduced production. This reduced production causes shortage leading to increase in the prices motivating farmers again to increase the area under sugarcane. These reasons originate the cyclical fluctuations in the sugarcane acreage in India.

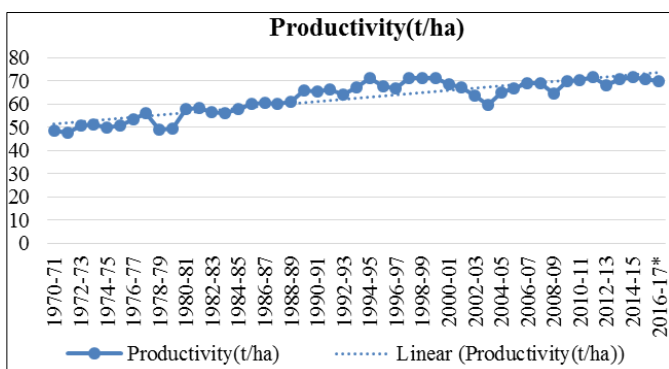
The production of sugarcane has also showed somewhat cyclical trend during 1970-2018. However, as a whole, the production of sugarcane in India has showed an increasing trend from the past six decades. This was the result of combined effect of area expansion and higher productivity. In

TE 1970-73, the production of sugarcane was 121.60 million tonnes increased to 348.20 million tonnes in TE 2010-13 followed by a slight decrease in the TE 2015-18 to 344.02 million tonnes. The slight decline in production may be attributed due to severe drought conditions in the country during years 2014-15 and 2015-16, fall in international prices of sugar and existing large stock in the country.



**Fig 3:** Trends in production of sugarcane in India

The productivity of sugarcane also exhibited an increasing trend over the whole period i.e. 1970-2018. But if year to year fluctuations are taken into account, it has shown a quite stagnant trend with national average of 62.84 tonnes ha<sup>-1</sup> in 2017-18. Productivity per hectare rose by more than 50 per cent from an average of 48.92 tonnes in TE 1970-73 to 73.40 tonnes in TE 2015-18. Increase in productivity may be attributed due to adoption of improved production and protection technologies, use of high yielding cultivars, balanced use of nutrients, newer method of planting, assured irrigation facilities etc.

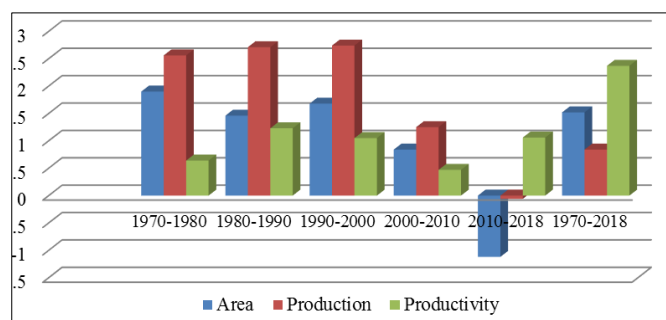


**Fig 4:** Trends in productivity of sugarcane in India

**Decadal CAGRs of area, production and productivity of sugarcane in India**

The decadal compound annual growth rates of area, production and productivity of sugarcane in India were worked out from 1970-2018. During first four decades, the

CAGRs of area, production and productivity were found to be positive. But in decade-V (2010-18), the CAGRs of area as well as production exhibited negative signs i.e. -1.12 and -0.06 per cent with productivity exhibiting positive sign i.e. 1.06 per cent. For the overall period, the CAGRs of sugarcane for the area, production and productivity were found to be 1.52, 0.84 and 2.37 per cent, respectively. The results were supported by study conducted in Uttar Pradesh showed similar findings (Arti and Rai, 2017). They reported similar results in their study conducted in Uttar Pradesh that the increase in area under sugarcane has significantly attributed to higher production but the productivity of sugarcane has remained stagnant.

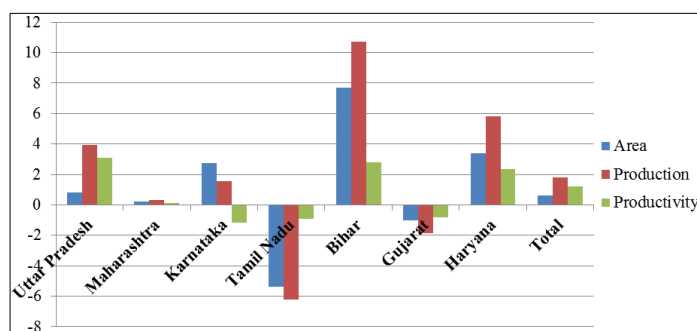


**Fig 5:** Decadal CAGRs of area, production and productivity of sugarcane in India

**Area, production and productivity in major sugarcane growing states**

Uttar Pradesh ranked first both in area and production with decadal average of 2.15 million ha of land under sugarcane and total production of 133.19 million tonnes. Because of humid climatic conditions and longer duration of crop, Tamil Nadu ranked first in productivity with an average yield of 103.32 tonnes ha<sup>-1</sup>. The productivity of sugarcane mainly depends upon duration of crop, type of soil, climatic conditions of the area, rainfall pattern, availability of irrigation water, agronomic practices etc.

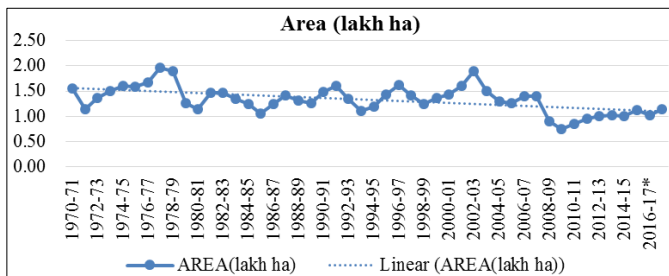
The acreage growth rate for all the major states was found positive except Gujarat (-1.04 %) and Tamil Nadu (-5.37%), whereas, the growth rate of productivity exhibited negative sign for the states of Gujarat (-0.81%), Karnataka (-1.15 %) and Tamil Nadu (-0.92%). However, in case of production, except Gujarat (-1.84%) and Tamil Nadu (-6.24%), the growth rate showed positive sign. The decline in production in both Gujarat and Tamil Nadu states was due to decline in both acreage and productivity. The CAGRs for area, production and productivity for country as whole for the same period were 1.52, 0.84 and 2.37 per cent, respectively. This indicates that sugarcane crop is performing well in the country.



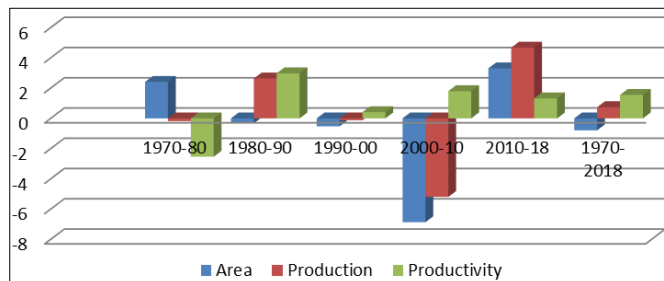
**Fig 6:** Trends in the area, production and productivity of sugarcane in Haryana

The area under sugarcane in Haryana has showed decreasing trend from the past six decades 1970-2018. Whereas the production of sugarcane has showed an increasing trend from 1970-2018. Despite of the increasing trend, the production of sugarcane has showed severe ups and downs, so as with the area. The major reasons attributed to the cyclical fluctuations are profitability of rice-wheat and wheat-cotton cropping systems, annual returns, difficulty in disposal of produce in sugar mills etc.

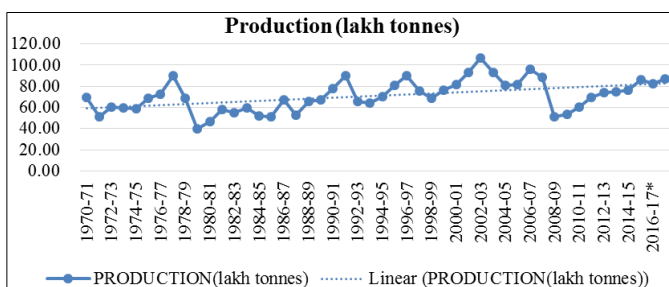
productivity exhibited positive sign for all decades except decade-I (-2.53%). The overall compound growth rate for the period 1970-2018 in area, production and productivity was -0.79 per cent, 0.74 per cent and 1.55 per cent, respectively. This indicates that even after the fall in the acreage, the overall production of sugarcane in the state increased over the period. The similar results were narrated by Kumar and Singh (2014) [3] and Upreti and Singh (2017) [3] in their respective studies.



**Fig 7:** Trends in area of sugarcane in Haryana



**Fig 10:** Decadal CAGR of area, production and productivity of sugarcane in Haryana

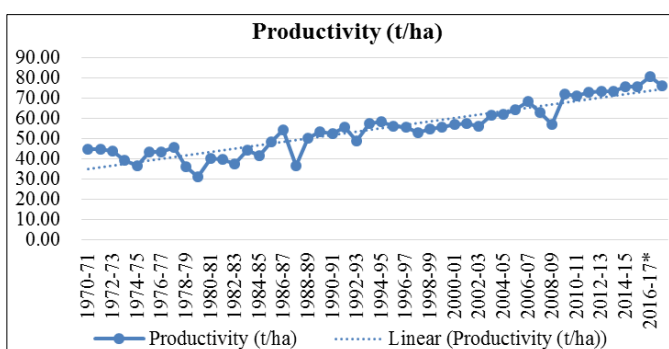


**Fig 8:** Trends in production of sugarcane in Haryana

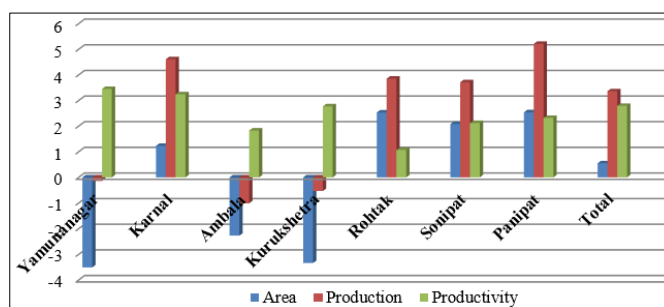
The productivity of sugarcane also exhibited increasing trend from the state average of 45.03 tonnes ha<sup>-1</sup> in 1970-71 to 76.36 tonnes ha<sup>-1</sup> in 2017-18. The development of high yielding varieties, adoption of agronomic practices, adequate irrigation facilities, use of recommended doses of nutrients and better knowledge of plant protection chemicals etc can be the reasons for the increase in productivity of sugarcane.

**Area, production and productivity in major sugarcane growing districts**

The major sugarcane growing districts like Yamunanagar, Kurukshetra, Karnal, Ambala, Rohtak, Sonapat and Panipat contributed 81.51 per cent of total sugarcane acreage in the state. Among all the districts, Yamunanagar sharing 27.57 per cent of total in the state followed by Kurukshetra (11.05%), Karnal (10.77%), Ambala (10.58%) and Rohtak (8.18%). Yamunanagar (1.83 lakh tonnes) also ranked first in terms of production among all the districts followed by Kurukshetra (8.69 lakh tonnes). The productivity pattern reveals that among the top seven districts, Panipat with an average yield of 79.26 quintals ha<sup>-1</sup> (in terms of gur) stood at first position in the state. The major sugarcane growing districts like Yamunanagar, Kurukshetra and Ambala showed negative sign for acreage and production in current decade. In Yamunanagar district, area and production of sugarcane declined annually at rate of 3.51 per cent and 0.14 per cent, whereas, productivity increased at a rate of 3.45 per cent.



**Fig 9:** Trends in productivity of sugarcane in Haryana



**Fig 11:** Decadal CAGR of area, production and productivity of sugarcane in 7 major states

**Decadal CAGRs of area, production and productivity of sugarcane in Haryana**

The compound annual growth rates (CAGRs) of area, production and productivity of sugarcane in Haryana for the period 1970-2018 is presented. Only in decade-I and decade-V, the CAGR of sugarcane were found to be positive i.e. 2.41 and 3.31 per cent, whereas, in case of production, CAGRs were positive in decade-II and decade-V i.e. 2.64 and 4.68 per cent, respectively. However, there was decrease in production in decade-I, decade-III and decade -IV. The sugarcane

This may be attributed to higher returns from competing crops like rice (basmati) and wheat, difficulty in disposal and payment of produce, declining land holding size, scarcity of labour for harvesting, long harvesting period etc., whereas, in the same period, area, production and productivity of sugarcane in Rohtak district increased at rate of 2.53, 3.85 and 1.07 per cent per annum, respectively. The reasons for increase in area, production and productivity in the district were diversion of area from less profitable crops like pulses,

coarse cereals, increase in water table during rainy season, better procurement price, enhanced crushing capacity of sugar mills, demand of cane for juice in metropolitan city Delhi and adjoining state Rajasthan. The productivity of sugarcane exhibited positive sign for all the districts ranging from 1.07 per cent in Rohtak district to 3.45 per cent in Yamunanagar district as a result of the adoption of improved agronomic practices use of quality seed, development of biotic stress cultivars.

### Conclusion

The trends in area, production and productivity of sugarcane for the whole period 1970-2018 at country level showed an increasing trend. The compound annual growth rates were found to be 1.52, 0.84 and 2.37 per cent. The trends in production and productivity of sugarcane in Haryana showed an increasing trend for the time period of 1970-2018. Whereas, it followed, decreasing trend in area under sugarcane for the same period. The compound annual growth rates for the whole period were found to be -0.79, 0.74 and 1.55 per cent.

### References

1. Kumar S, Singh S. Trends in growth rates in area, production and productivity of sugarcane in Haryana. *International Journal of Advanced Research in Management and Social Sciences*. 2014; 3(4):117.
2. Brar AK, Kataria P. Sugarcane Production Scenario in India with particular reference to Punjab. *Indian Journal of Economics and Development*. 2015; 11(4):833-842.
3. Upreti P, Singh A. An economic analysis of sugarcane cultivation and its productivity in major sugar producing states of Uttar Pradesh and Maharashtra. *Economic Affairs*. 2017; 62(4):711-718.
4. Thakur Arti, Rai CK. Growth rate of area, production and productivity of sugarcane crop in Uttar Pradesh. *Research Journal of Agricultural Sciences*. 2017; 8(2):423-425.