

# Trends in area, production and productivity of castor in Telangana.

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## ABSTRACT

**Aims:** To analyse the trends in area, production and productivity of castor in Telangana and major erstwhile districts of Telangana. The purpose of the study is to understand the growth rate of castor in Telangana since castor oil has various applications in industries.

**Methodology:** The secondary data of the area, production and productivity of castor from 2001-02 to 2022-23 were collected from the Directorate of Economics and Statistics. Compound Annual Growth Rate (CAGR) was used to analyse the time-series data. CAGR was calculated for 3 periods -Period I (2001-02 to 2011-12), Period II (2012-13 to 2022-23), Overall Period (2001-23).

**Results:** The results showed a decreasing trend in both castor area and production. But castor productivity observed a positive growth rate in Telangana and the major erstwhile castor-growing districts like Mahbubnagar and Medak. However, few districts like Rangareddy, Nalgonda, and Warangal showed negative trends in productivity during Period I.

**Conclusion:** The study highlighted that the decline in the castor area is a major concern and appropriate actions should be taken by the concerned authorities

*Keywords: CAGR, area, production, productivity, districts, Telangana.*

## 1. INTRODUCTION

Castor (*Ricinus communis* L.) is an important non-edible oilseed crop belongs to the family Euphorbiaceae. The economic significance of castor is the castor seed oil which is widely used as a raw material for various industries (Anjani, 2014)<sup>[1]</sup>. It is originated from Eastern Africa, particularly Ethiopia (Bhatt *et al.*, 2018)<sup>[2]</sup>. It is a perennial crop but for commercial purposes, it is grown as an annual crop. Castor grows in varied climatic conditions from hot to humid tropical climate. It is a small plant about 1-7 meters tall and has well-developed roots, and green and red stems that darken with age. Its fruit is a spherical capsule with small brown-speckled grey seeds (Pawar *et al.*, 2020)<sup>[3]</sup>. Castor seed contains a high oil content ranging from 40 per cent to 60 per cent (Vashist and Ahmad, 2011)<sup>[4]</sup>. Indian castor beans have an oil content of 48 percent and can be extracted up to 42 percent while castor cake retains the rest (Shrirame *et al.*, 2011)<sup>[5]</sup>. It is used in the manufacture of laundry soaps, lubricants, laxatives, surfactants, rubber chemicals, nylon, hydraulic brake fluids, paints and polymers, perfumery products and oils, biodiesel, etc. (Tadesse, 2015)<sup>[6]</sup>. Castor cake, a by-product of castor oil, is also used as manure in agriculture (Naik *et al.*, 2018)<sup>[7]</sup>. Since castor has high potential in value addition, it is necessary to study the trends in area, production, and productivity of castor in Telangana and major erstwhile districts of Telangana.

### 1.1 World castor scenario

In 2022, world castor production was 18.53 million tonnes. India is the world's largest producer, contributing 16.18 million tonnes. Mozambique is the second largest producer with 0.0735 million tonnes. Other important castor-producing countries were Brazil (0.025 million tonnes), China (0.024 million tonnes), Myanmar (0.012 million tonnes), and Thailand (0.012 million tonnes) (FAOSTAT, 2022) [8].

### 1.2 Castor scenario in India

In India, castor is cultivated in an area of 10.07 lakh hectares with production of 19.73 lakh tonnes in the year 2022-23. Gujarat is the leading castor producing state, having 71 per cent of the total castor area with 7.15 lakh hectares and production of 16.03 lakh tonnes. Rajasthan and Andhra Pradesh are the second and third largest producers contributing 22.9 percent and 4.5 percent of the total castor area, with production of 3.47 and 0.14 lakh tonnes, respectively. Other major castor-producing states include Telangana (0.04 lakh tonnes), Tamil Nadu (0.018 lakh tonnes) (DACNET, 2023) [8].

### 1.3 Castor scenario in Telangana

In Telangana, castor is cultivated in an area of 4,510 acres, with a total production of 4,438 tonnes in the year 2022-23. The major castor-growing districts in Telangana are Mahbubnagar, Wanaparthy, Narayanapet, Gadwal and Nagarkurnool districts. Among the major districts, Gadwal ranks first in terms of both area and production of castor, which is followed by Narayanapet and Nagarkurnool. Mahbubnagar ranks fourth in the castor area, followed by Wanaparthy. Jogulamba also has the highest castor productivity, followed by Narayanapet and Nagarkurnool.

## 2. METHODOLOGY

To analyse the trends, secondary data on area, production, and productivity of castor from the year 2001-02 to 2022-23 were collected from the Directorate of Economics and Statistics, Telangana. The time series data contains the area, production, and productivity of castor for Telangana state and major erstwhile districts of Telangana. For analysis, the overall period was divided into two periods (Avinash & Patil, 2018)<sup>[10]</sup>.

Period 1 - 2001-02 to 2011-12

Period 2 – 2012-13 to 2022-23

The Compound Annual Growth Rate (CAGR) was calculated for the two periods and the overall period. This study aimed to assess the growth rate in the area, production, and productivity of castor. The compound growth rates were estimated using the following formula.

$$Y^t = \dots Ae^{bt} \dots \dots \dots 1$$

where Y<sup>t</sup> = area, yield, or production of crops in year t

t = year which takes values 1,2,.....n

$$Y_t = Y_0(1+r)^t$$

log transformation of the above i.e

$$\text{Log } Y_t = \text{Log } Y_0 + t \text{ log } (1+r), \text{ assuming } \text{Log } Y_0 = \text{log } A, \text{ Log}(1+r)=b$$

$$\text{Log } Y_t = \log A + bt$$

By differentiating

$$d(\log Y_t)/dt = b$$

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

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

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

$$r = \text{CAGR}$$

$$\text{CAGR in per cent} = [(\text{Antilog } b) - 1] * 100$$

### 3. RESULTS AND DISCUSSION

Compound growth rates of acreage, production, and productivity were calculated to evaluate the performance of castor in both the erstwhile districts of Telangana and the Telangana state as a whole. These growth rates were calculated for the entire period from 2001-02 to 2022-23 and two periods: Period I (2001-02 to 2011-12) and Period II (2012-13 to 2022-23) and the results are presented in the table 1 and table 2.

#### 3.1 Trends in area, production and productivity of castor in Telangana state.

From the table 1, it was observed that during periods I and II, there was a negative growth rate in both the area under cultivation and the production of castor in Telangana state. However, productivity experienced a positive growth rate. The study showed that an increase in productivity was observed in Period II than in Period I. It was observed that the decline in both area and production of castor was more in Period II than in Period I. For overall period (2001-02 to 2022-23), the area and production of castor decreased at the rates of 16.81 percent and 13.19 percent, respectively at 1 percent level of significance, while productivity increased at a rate of 4.37 percent at 1 percent level of significance.

**Table 1. Growth performance of castor in Telangana state**

Particulars	CAGR (in %)		
	Period-I	Period-II	Overall period
	(2001-02 to 2010-11)	(2011-12 to 2020-21)	(2001-02 to 2020-21)
Area(ha)	-10.69***	-26.78***	-16.81***
Production(t)	-8.42**	-22.93***	-13.19***

Productivity(kg/ha)	2.58(ns)	5.20(ns)	4.37***
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CAGR – Compound Annual Growth Rate, \*\*\*, \*\*, \* are significant at 1%, 5% and 10%, respectively, ns- non-significant.

Figure 1 shows the trend in the area of castor in Telangana state. It revealed that the regression equation for the time-series data of castor area was  $y = -13366x + 264690$  where  $x$  is the independent variable (Year) and  $y$  is the dependent variable (area),  $R^2 = 0.8892$  and the model was statistically significant at 1 per cent level of significance.

Figure 2 indicates the trend in the production of castor in Telangana state. It observed that the regression equation for time-series data of castor production was  $y = -4832.8x + 106546$  where  $x$  is the independent variable (Year) and  $y$  is the dependent variable (production),  $R^2 = 0.7729$  and the model was statistically significant at 1 per cent level of significance.

Figure 3 shows the trend in productivity of castor in Telangana state. It revealed that the regression model for the castor productivity was  $y = 27.578x + 264.68$  where  $x$  is the independent variable (Year) and  $y$  is the dependent variable (productivity),  $R^2 = 0.4575$  and the model was significant at 1 per cent level of significance. The decrease in castor cultivation in Telangana is mainly due to farmers shifting to other commercial crops like cotton, the incidence of diseases such as Botrytis, and climate variability (Archana *et al.*, 2013)<sup>[11]</sup>.

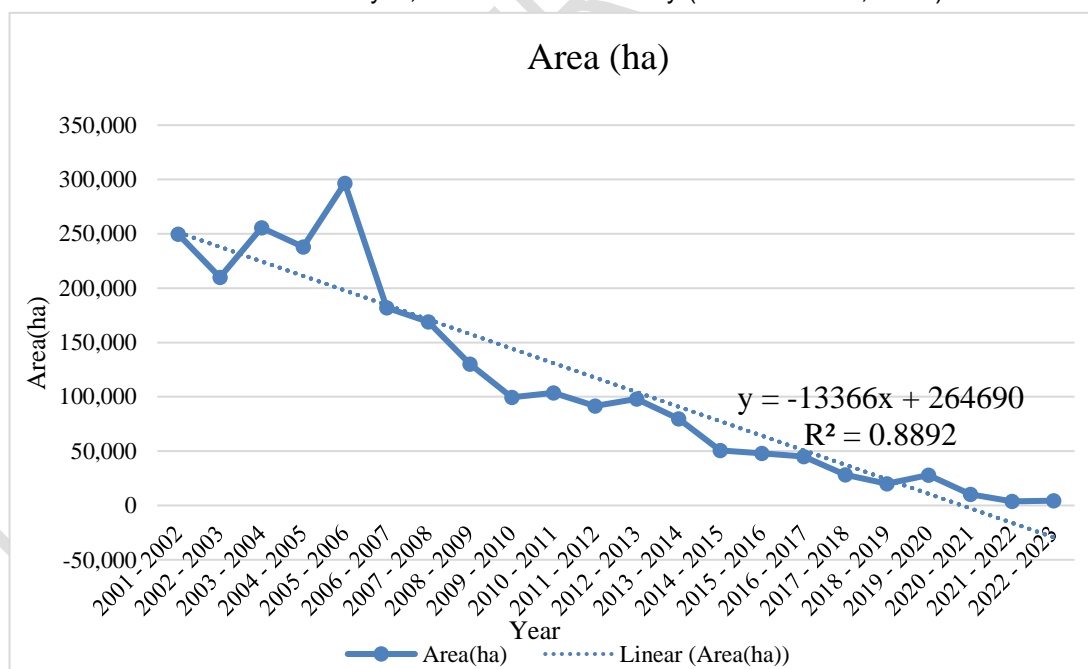
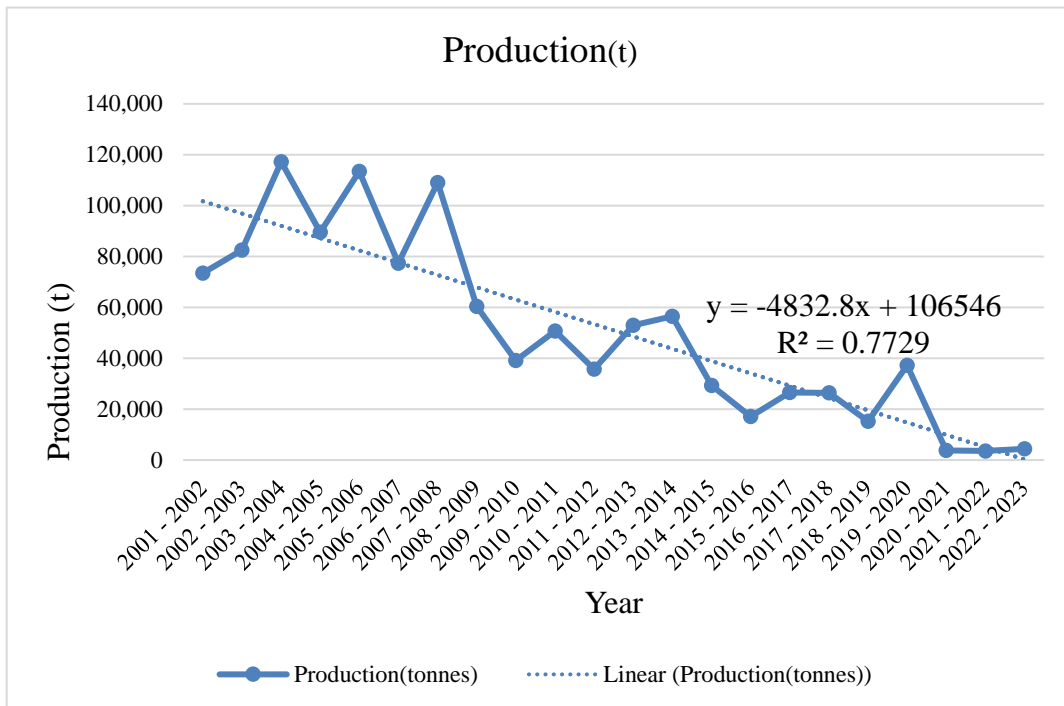
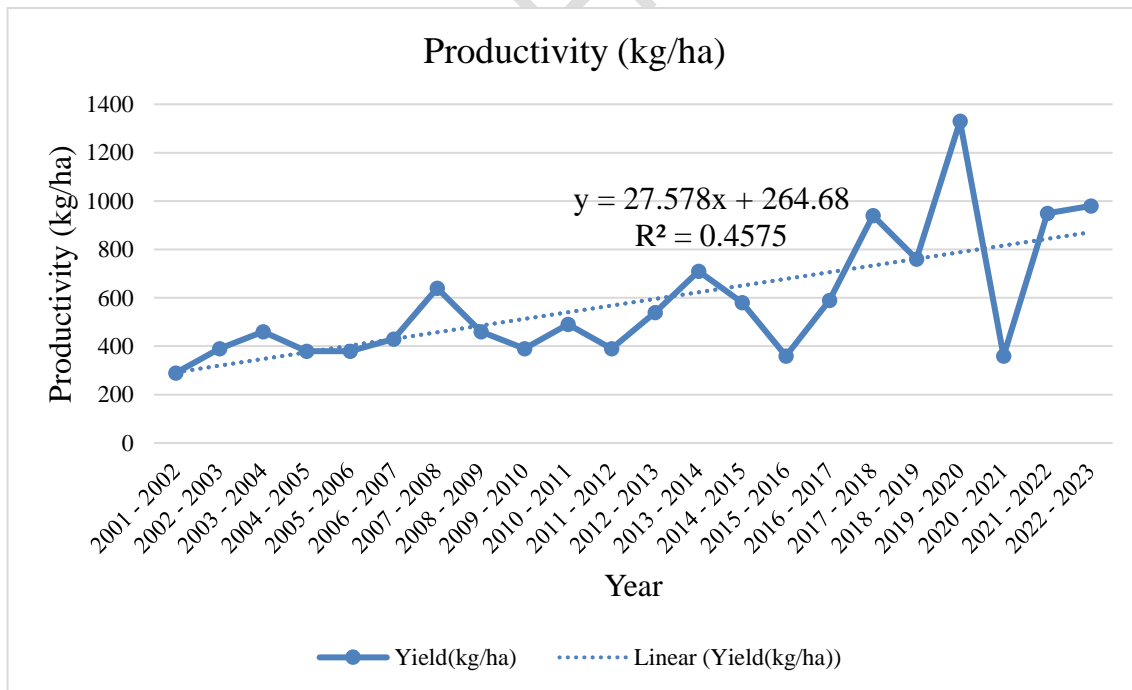


Figure 1. Trend of castor area (ha) in Telangana



**Figure 2. Trend of castor production (t) in Telangana**



**Figure 3. Trend of castor productivity (kg/ha) in Telangana**

### 3.2 Trends in area, production and productivity of castor in major erstwhile districts of Telangana

From the table 2, during the first period (2001-02 to 2011-12), negative growth was observed in the major erstwhile districts of Telangana in terms of both area and production of castor. Among the districts, Nalgonda had the highest rate of decline in the area (-20.66%), followed by Medak (-16.91%), Warangal (-16.42%), Rangareddy (-12.44%), and Mahbubnagar at (-7.47%). In terms of production, Nalgonda again had the highest rate of decrease (-25.15%), followed by Warangal (-12.2%), Rangareddy (-8.39%), Medak (-8.19%) and Mahbubnagar (-4.70%). However, productivity increased in Mahbubnagar (3.13%) and Medak (2.35%), while the other districts experienced a decline in castor productivity.

During period- II (2012-2013 to 2022-2023), the reduction in area and production of castor increased than period-I. All the major erstwhile districts showed a negative growth rate in both area and production of castor. Warangal (-36.23%) had the highest rate of decline in the castor area, followed by Nalgonda (-32.42%), Rangareddy (-28.76%), Mahbubnagar (-26.73%), and Medak (-24.89%). For production of castor, Warangal again showed the highest decline rate (-33.31%) followed by Rangareddy (-27.26%), Medak (-23.51%), Mahbubnagar (-23.09%) and Nalgonda (-17.07%). Despite these declines, castor productivity increased across all districts during Period II. Nalgonda led with the highest increase in productivity at 19.90%, followed by Warangal (4.69%), Mahbubnagar (4.58%), Medak (4.20%) and Rangareddy (3.43%).

For overall period, it was concluded that both the area and production of castor showed negative growth rates in all districts from 2001-02 to 2022-23. But castor productivity was at a positive growth rate across all the districts. Nalgonda (-33.43%) had the highest decline in castor area, followed by Warangal (-29.21%), Rangareddy (-21.61%), Medak (-16.92%) and Mahbubnagar (-14.68%). In terms of production, Nalgonda (-29.81%) again faced the steepest decline followed by Warangal (-27.93%), Rangareddy (-18.99%), Medak (-13.26%), and Mahbubnagar (-11.31%). Despite these declines, productivity in castor increased, with Nalgonda leading at 4.4%, followed by Medak (4.2%), Mahbubnagar (3.89%), Rangareddy (3.24%) and Warangal (0.56%). Figure 4, figure 5, and figure 6 showed the trends in area, production and productivity of castor in major erstwhile districts of Telangana for overall period (2001-02 to 2022-23). It was concluded that the decline in castor area was mainly due to reasons like climate variations, farmers shifting to high-remunerative crops and the prevalence of Botrytis disease (Ramanjaneyulu *et al.*, 2017)<sup>[12]</sup>.

**Table 2. Growth rate of castor in major erstwhile districts of Telangana state**

Districts	Particulars	CAGR (in %)			
		Period-I (2001-02 to 2011-12)	Period-II (2012-13 to 2022-23)	Overall to	period (2001-02 to 2022- 23)

<b>Mahbubnagar</b>	Area (ha)	-7.47***	-26.73***	-14.68***
	Production (t)	-4.70(ns)	-23.09***	-11.31***
	Productivity (kg/ha)	3.13(ns)	4.58(ns)	3.89***
<b>Rangareddi</b>	Area (ha)	-12.44***	-28.76***	-21.61***
	Production (t)	-16.49***	-27.26***	-18.99***
	Productivity (kg/ha)	-4.37(ns)	3.43(ns)	3.24(ns)
<b>Nalgonda</b>	Area (ha)	-20.66***	-32.42***	-33.43***
	Production (t)	-25.15***	-17.07(ns)	-29.81***
	Productivity (kg/ha)	-5.79(ns)	19.90***	4.40**
<b>Warangal</b>	Area (ha)	-16.42**	-36.23**	29.21***
	Production (t)	-17.97**	-33.31**	-27.93***
	Productivity (kg/ha)	-1.87(ns)	4.69(ns)	0.56(ns)
<b>Medak</b>	Area (ha)	-16.91**	-24.89***	-16.92***
	Production (t)	-14.97**	-23.51***	-13.26***

Productivity (kg/ha)	2.35(ns)	1.83(ns)	4.20***
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CAGR – Compound Annual Growth Rate, \*\*\*, \*\*, \* are significant at 1%, 5% and 10% level respectively, ns- non-significant.

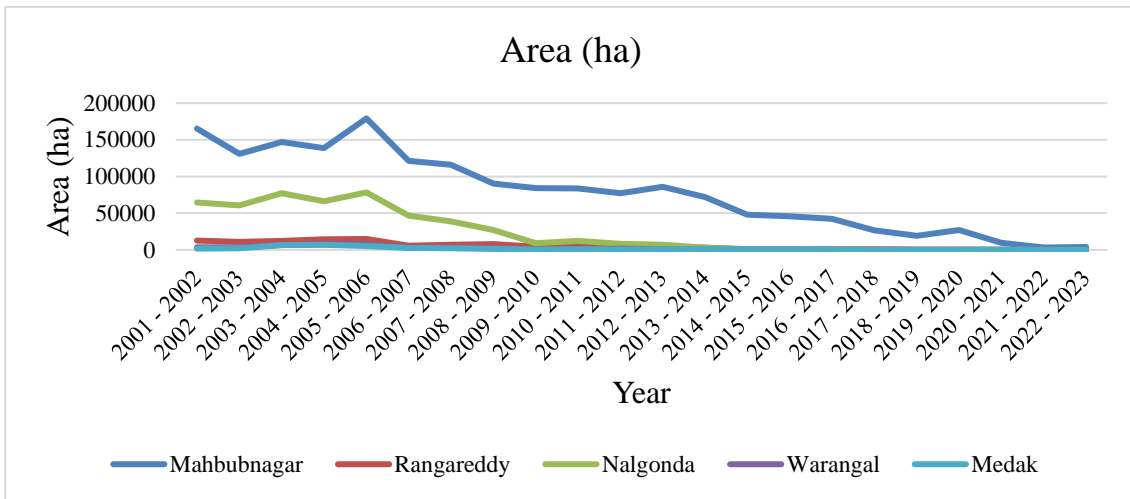


Figure 4. Trend of castor area (ha) in major erstwhile districts of Telangana (2001-23)

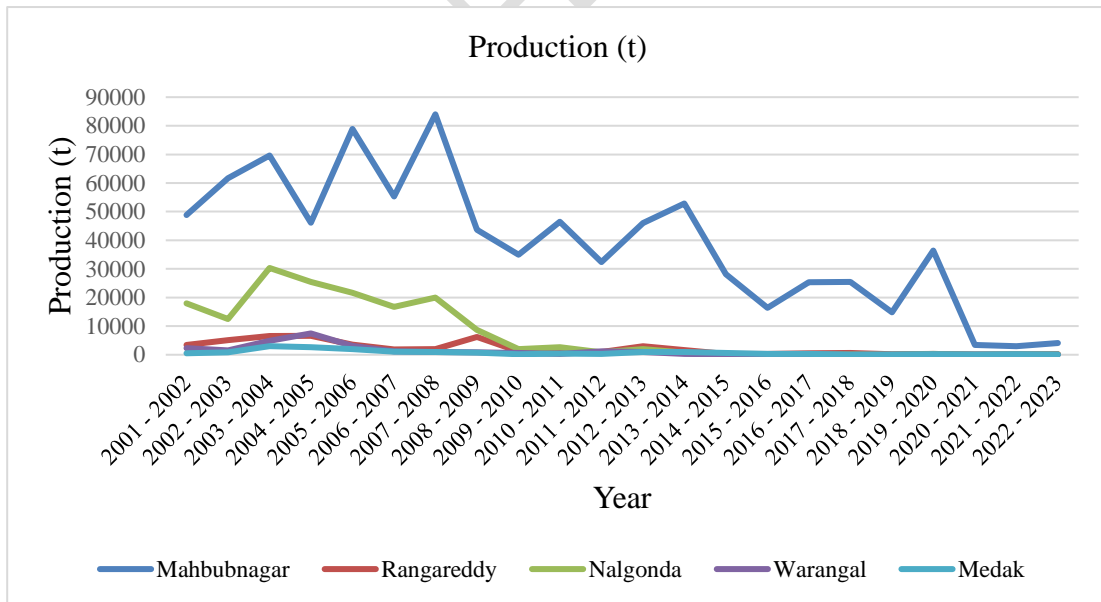
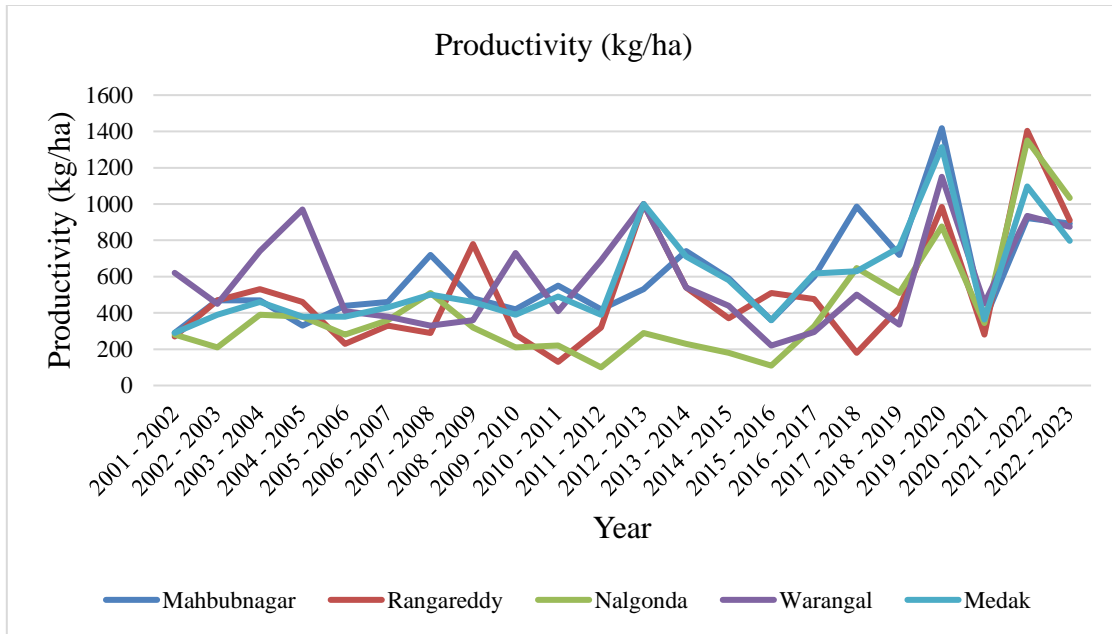


Figure 5. Trend of castor production (t) in major erstwhile districts of Telangana (2001-23)



**Figure 6. Trend of castor productivity (kg/ha) in major erstwhile districts of Telangana (2001-23)**

#### 4. CONCLUSION

The present study entitled trend analysis of area, production and productivity of castor in Telangana state has revealed that the castor area and production have been declining in Telangana state and major erstwhile districts of Telangana while the productivity of castor has a positive trend in Telangana state and major erstwhile districts like Mahbubnagar and Medak. But other districts like Rangareddy, Warangal and Nalgonda showed a positive trend in the overall period and period-II and a negative trend in period-I. The use of high-yielding and disease-resistant varieties of castor can be suggested and extension activities should be undertaken to increase the castor area in Telangana as the crop has high potential in various industries like pharmaceutical, paints and soaps, etc.,

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