Original Research Article

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

ABSTRACT

Aims: To analyse the trends in area, production and productivity of castor in Telangana and major erstwhile districts of Telangana. The main purpose of the study is to understand the growth rate of castor in a region of Telangana, as India is the largest exporter of castor oil, which has multiple industrial applications.

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. The Compound Annual Growth Rate (CAGR) was used to analyse the time-series data of castor. 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. The study highlighted a decline in the castor area due to the incidence of diseases like Botrytis, shifting to other crops such as cotton and climate variability.

Conclusion: The study indicated that the decline in the castor area is a major concern and this study will be u

seful in agricultural policy making to take appropriate actions to reverse the declining trends of castor cultivation in Telangana.

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 oil which is widely used as a raw material for various industries (Mubofu, 2016)[1]. It is originated from Eastern Africa, particularly Ethiopia (Bhatt *et al*., 2018)[2]. 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)[3]. Castor seed contains a high oil content ranging from 40 per cent to 60 per cent (Vashist and Ahmad, 2011)[4]. 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)[5]. In India, only 10% of the total castor oil production is used for value addition at the base levels, while the remaining 80% is exported to other countries for further value addition (Trivedi *et al*., 2022) [6]. The castor oil is mainly 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)[7]. Castor cake, a by-product of castor oil, is also used as manure in agriculture (Naik *et al*., 2018) [8]. Since castor oil has high potential in value addition, the objective of the study is to calculate the trends in area, production, and productivity of castor in Telangana and major erstwhile districts of Telangana.

Hypothesis : The growth rate in area, production and productivity of castor changing over the specified time period.

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) [9].

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) [10].

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 based on technological advancements in castor (Avinash & Patil, 2018)[11].

Period 1 - 2001-02 to 2011-12

Period 2 – 2012-13 to 2022-23

The Compound Annual Growth Rate (CAGR) was used to study about the parameter over specified time period and it 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.

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

where Y^t= area, yield, or production of crops in year t

t = year which takes values 1,2……..n

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

log transformation of the above i.e

Log Y_t = Log Y_o +t log (1+r), assuming Log Y_o = log A, Log(1+r)=b

Log Y_t = log A +bt

By differentiating

d(log Yt)/dt =b

Since b =log (1+r)

Antilog b = 1+r

r = (Antilog b) – 1

r = CAGR

CAGR in per cent =[(Antilog b)-1]*100

3. RESULTS AND DISCUSSION

Compound growth rate of area, production, and productivity were calculated to understand the trends of castor in Telangana and its major erstwhile districts. These growth rates were estimated for the overall period from 2001-02 to 2022-23, as well as for two specific sub-periods: Period-I (2001-02 to 2011-12), and Period-II (2012-13 to 2022-23). The growth rate of castor in Telangana state is presented in the Table 1.

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

For the overall period (2001-02 to 2022-23), negative and significant growth was observed in the area (-16.81 %) and production (-13.19 %) of castor, while productivity increased at a significant rate of 4.37 percent. In periods I (2001-02 to 2011-12) and II (2012-13 to 2022-23), negative and significant growth was observed in both the area and the production of castor in Telangana. However, productivity of castor showed positive and non-significant growth in both period I and period II. The study also found that the decline in both the area and production of castor were more rapid in Period II than in Period I. The significant increase in castor productivity is mainly due to the development of several high-yielding hybrids (Anjani, 2014) [12]. The reduction in castor area in Telangana is mainly due to the reasons being farmers shifting to competitive crops like cotton, the incidence of diseases such as *Botrytis ricini* which is reducing the yield of castor and climate variability (Archana *et al*., 2013) [13].

Table 1. Growth rate of castor in Telangana state

Particulars	CAGR (in %)		
	Period-I (2001-02 to 2010-11)	Period-II (2011-12 to 2020-21)	Overall period (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***

*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. The value of 'b' is negative (-13366) which indicates the decreasing trend of castor area in Telangana (Ritu and Bhatia, 2022) [14].

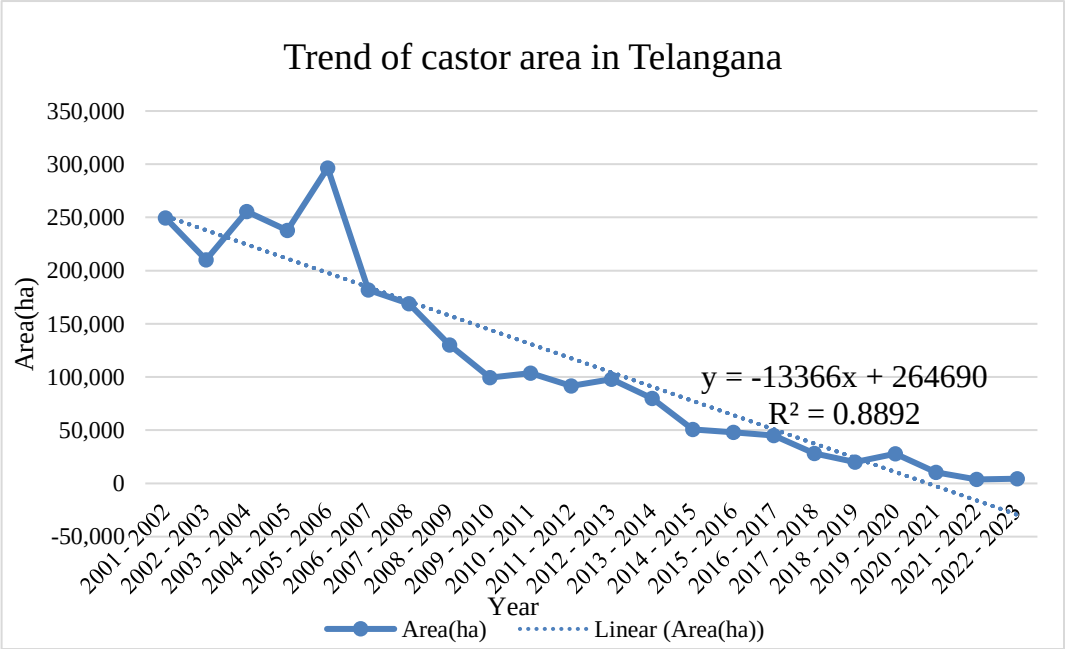

Figure 1. Trend of castor area (ha) in Telangana

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. The value of 'b' is negative (-4832.8) which indicates the decreasing trend of castor production since area and production area are correlated.

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) and R^2 = 0.4575. Similar negative growth rate in castor cultivation area and production have also been observed in Madhya Pradesh (Baghel *et al*., 2022) [15].

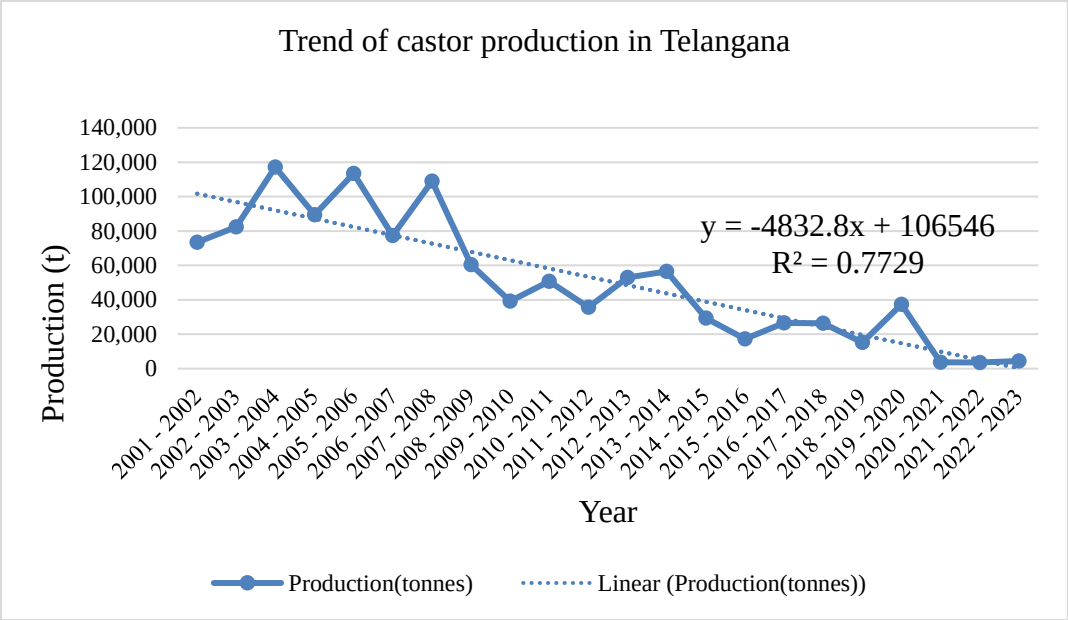

Figure 2. Trend of castor production (t) in Telangana

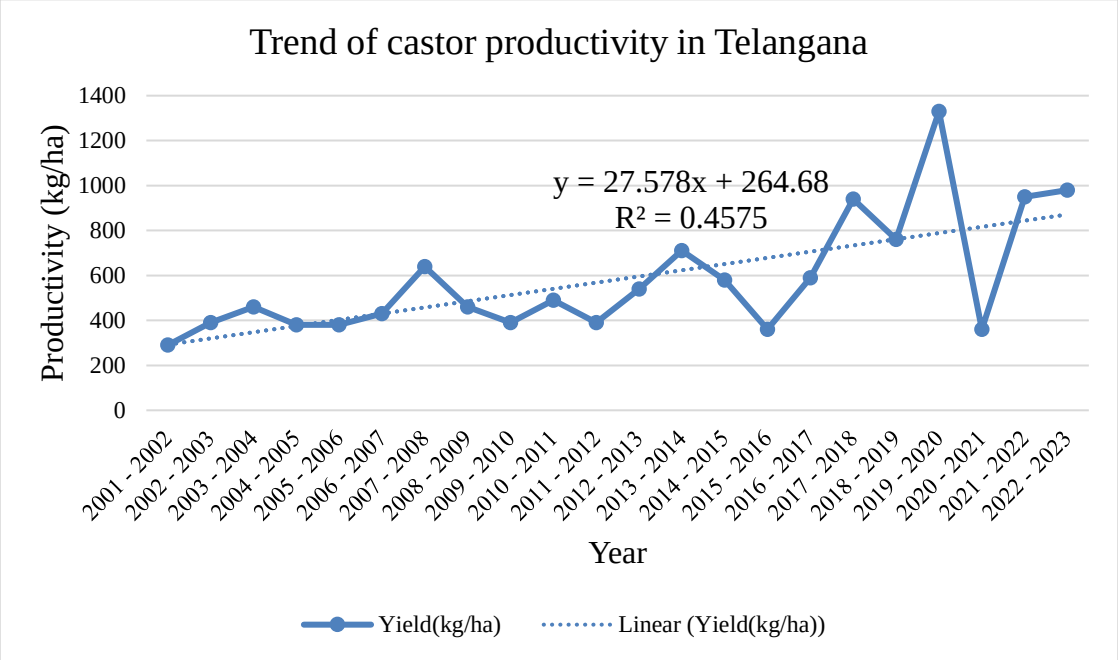

Figure 3. Trend of castor productivity (kg/ha) in Telangana

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

The growth rate of castor in major castor growing erstwhile districts of Telangana state is depicted in the Table 2. It is observed that during the first period (2001-02 to 2011-12), there were negative growth in castor area and production of castor in all major erstwhile districts of Telangana *i.e.,* Mahbubnagar, Rangareddy, Nalgonda, Warangal, and Medak. Nalgonda had the highest decrease in area (-20.66%), followed by Medak (-16.91%), Warangal (-16.42%), Rangareddy (-12.44%), and Mahbubnagar (-7.47%) districts. In terms of production, Nalgonda recorded 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 had a decline in castor productivity.

It is noticed from the table 2 that in period- II (2012-2013 to 2022-2023), the decline in area and production of castor are rapid in period II compared to the period-I. All districts recorded a negative growth rate in both area and production of castor. Warangal (-36.23 %) showed the highest decline in castor area, followed by Nalgonda (-32.42 %), Rangareddy (-28.7 %), Mahbubnagar (-26.73 %), and Medak (-24.89 %). For production of castor, Warangal again had the highest decline rate (-33.31%) followed by Rangareddy (-27.26%), Medak (-23.51 %), Mahbubnagar (-23.09 %) and Nalgonda (-17.07 %) districts. Despite the decline in area and production, castor productivity increased across all the districts of Telangana during Period-II (2012-2013 to 2022-2023).

It is evident from the above Table that both the area and production of castor showed negative growth rates in all districts throughout the overall period from 2001-02 to 2022-23, However, castor productivity had positive growth rates across the districts. The highest rate of decline in castor area was noticed in Nalgonda (-33.43%), followed by Warangal (-29.21%), Rangareddy (-21.61%), Medak (-16.92%) and Mahbubnagar (-14.68%).

In terms of production, Nalgonda (-29.81%) again showed 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 in Nalgonda (4.4%), followed by Medak (4.2%), Mahbubnagar (3.89%), Rangareddy (3.24%) and Warangal (0.56%). It is 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) [16]. The increasing rate of productivity in castor might be due to technological advancements. This study confirms that the null hypothesis of the growth rate of castor area, production and productivity changing over the period I, Period II and overall Period.

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 period (2001-02 to 2022-23)
Mahbubnagar	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***
Rangareddi	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)
Nalgonda	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**
Warangal	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)

Medak	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***

CAGR – Compound Annual Growth Rate, ***, **, * are significant at 1%, 5% and 10% level respectively, ns- non-significant.

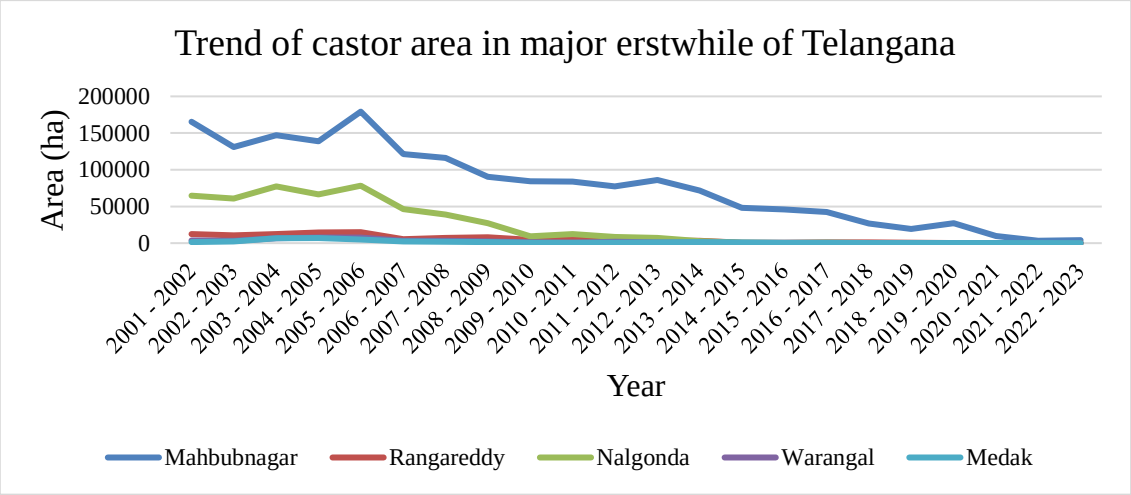

Figure 4. Trend of castor area in major erstwhile districts of Telangana (2001-23)

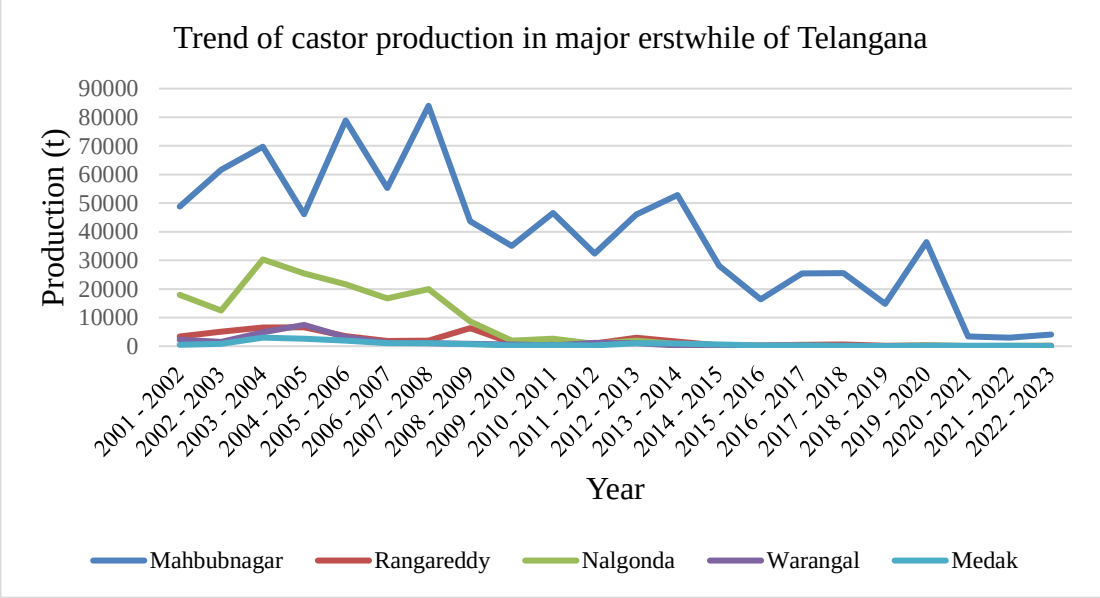

Figure 5. Trend of castor production in major erstwhile districts of Telangana (2001-23)

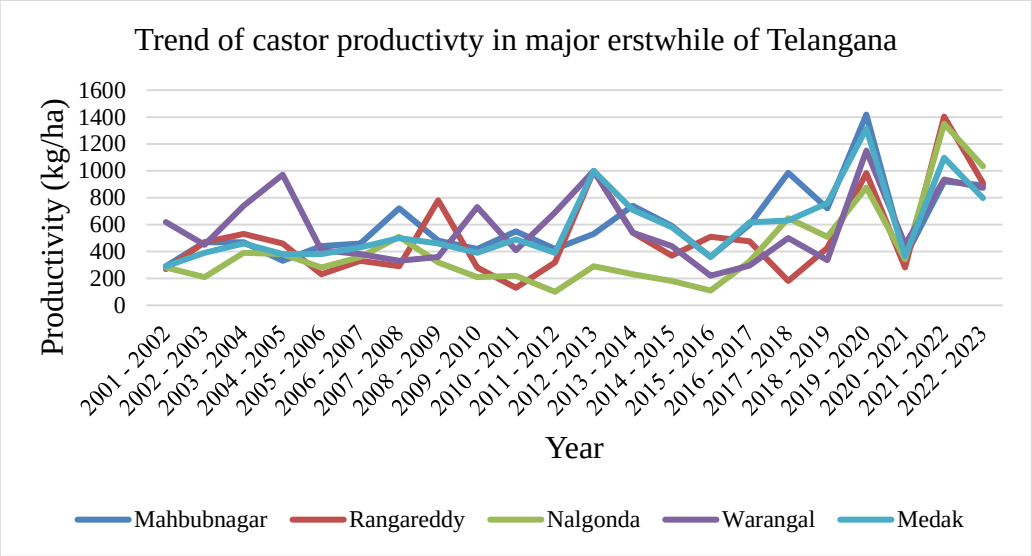

Figure 6. Trend of castor productivity in major erstwhile districts of Telangana (2001-23)

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 decreasing 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 decreasing trend of castor area is a major concern since it is industrial raw material and it has multiple applications in various industries like cosmetics, pharmaceutical etc., Hence, there is an immediate need to reverse the trends of castor crop in Telangana by appropriate measures such as the use of high-yielding and disease-resistant varieties of castor, adopting Integrated pest and disease management and extension activities can be undertaken to make awareness about the cultivation practices of castor.

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