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Mamta Patel
Department of Agricultural Economics College of Agriculture Raipur, IGKV, Raipur, Chhattisgarh, India

Dr. MR Chandrakar
Professor Department of Agricultural Economics College of Agriculture Raipur IGKV, Raipur Chhattisgarh, India

Sneha Pandey
Department of Agricultural Economics College of Agriculture Raipur, IGKV, Raipur, Chhattisgarh, India

Sumit B Wasni
Department of Agricultural Economics College of Agriculture Raipur, IGKV, Raipur, Chhattisgarh, India

Jwala Parte
Department of Agricultural Economics College of Agriculture Raipur, IGKV, Raipur, Chhattisgarh, India

Corresponding Author
Mamta Patel
Department of Agricultural Economics College of Agriculture Raipur, IGKV, Raipur, Chhattisgarh, India

Growth performance and instability of major oilseeds in Chhattisgarh

Mamta Patel, Dr. MR Chandrakar, Sneha Pandey, Sumit B Wasnik and Jwala Parte

Abstract
The present study was conducted to examine the pattern of growth and instability of major oilseeds in Chhattisgarh. The time series secondary data on area, production and productivity of groundnut, soybean and rapseed-mustard were collected for Chhattisgarh from the period of 2004 to 2021. Statistical tool like compound growth rate for calculating annual growth rate and Cuddy Della Valle Index for instability index were used. Results showed that area of groundnut in Chhattisgarh insignificant negative result but production was found to be non-significant and the productivity was found to be significant growth rate in Chhattisgarh and instability of area, production and productivity of groundnut was low. Soybean area under Chhattisgarh showed significant growth rate but the production of soybean showed non – significant growth rate and the productivity showed significant negative result and instability of area, production and productivity of soybean was medium to high. In the same way productivity of rapseed-mustard showed positive significant growth rate but area, production and productivity of rapseed-mustard in Chhattisgarh was found to be low instability.

Keywords: Compound growth rate, non-significant, significant, area, production, productivity, instability

Introduction
Oilseed crop have been the backbone of several agricultural economies from antiquity and play a prominent role in agricultural industries and trade through the world. India is one of the largest producer of oilseeds accounting about 20% of the global area and 10% of the global production in the world and occupied fourth position in the Indian agriculture economy (NABARD 2014). India produce a variety of crops belonging to cereals, pluses, oilseeds, fruits and vegetable, condiments, sugar, fibre, narcotics etc. oilseed crops are the most important commercial crops of India (Soni Kumari, 2012). In terms of acreage, production and economic value, these crops are second after food grain (Narayan, 2016). There are 9 important oilseed crops grown in India out of which 7 are edible oils (soybean, groundnut, rapseed-mustard, sunflower, sesame, safflower and niger) and 2 of them are non-edible (castor and linseed). India rank 1st in the production of groundnut, 3rd in rapseed-mustard and 5th in soybean. Indian vegetable oil economy is the 4th largest economy in the world. The country accounts for 12-15% of global oilseeds area 6-7% of vegetable oil production (next to USA, China and Brazil) and 9-10% of total edible oils consumption (FAO 2011) [3]. Currently India accounts for 6.8% of the oil meal production, 5.9% of the oil meal export 6.1% of the vegetable oil export 9.0% of the vegetable oil import and 9.3% of the edible oil consumption of the world (Sonnad *et al.* 2011) [9]. India rank 1st in the production of minor oilseeds (castor, niger safflower and sesame). In the case of major oilseeds also groundnut, rapseed-mustard and soybean account for about 80% of area and 87% of production of oilseed in the country (Naidau and Sankar 2014). Oilseed crops accounts for 13% of gross cropped area, 3% of gross national product 10% of total value of output from agricultural crops and 6.0% of value of output from agriculture and allied sector. The per capita availability of edible oil had increased from 3.5 kg/person/year in 1970-71 to 19.30 kg in 2017-18 (Department of Sugar and Vegetable oils, DG, CI and S, Dept of Commerce, Kolkata). State ranking of oilseeds in 2019-20 are Madhya Pradesh (6244 thousand metric tons), Rajasthan (5711 thousand metric tons), Gujarat (4102 thousand metric tonne) and Maharashtra (2375 thousand metric tonne) (Statista Research Department 2020).

Groundnut is a leguminous plant that is widely cultivated in the tropics and subtropics. It is valued for its high-oil edible seeds and as such it is the fourth most important source of edible

oil and a third most important source of vegetable protein in the world. Globally groundnut cover 295 lakh hectares with the production of 487 lakh tonnes with the productivity of 1647 kg hectare (FAOSTAT, 2019) [3]. With annual all-season coverage of 55.6 lakh hectare globally, India rank first in groundnut acreage and is the second largest producer of groundnut in the world with 101 lakh tonnes with a productivity of 1816 kg/hectare in 2020-21 (agricoop. nic.in). India is among the top three producing countries of groundnut in the world. It second next to China (37% of the total oilseed production in the country during 2020-21. The area under groundnut constitutes approximately 3.3% of the net sown area in India. In India groundnut is mainly grown in five states, Andhra Pradesh, Gujarat, Tamil Nadu, Karnataka and Maharashtra and together they account for more than 90 percent of the crops total area. Gujarat was the largest producer contributing 25 percent of the total production followed by Tamil Nadu (22.48%), Andhra Pradesh (18.81%), Karnataka (12.64%) and Maharashtra (10.09%) during 2006-07. (Rabadiya V. D. 2019). Groundnut can be cultivated in both rabi and kharif season in Chhattisgarh. Total area of groundnut in Chhattisgarh is 67.7 thousand /ha with the production of 70.2 thousand tonnes and the productivity of 103 kg/ha respectively.

Soybean is considered to be worlds most important oilseed crop. In India of time are 113.98 lakh ha area is cultivated during kharif 2019-20. The major soybean growing state are Madhya Pradesh, Maharashtra, Rajasthan, Karnataka and Telangana. According to the first advance estimates, Govt of India soybean production is estimated at 135.05 lakh tonnes during kharif 2019-20. Soybean is one of the important pulse crop of Chhattisgarh with an area of 107.77 thousand ha, production 111.86 thousand tonnes and productivity 1038 kg/ha. Chhattisgarh state with an area of 36.87 thousand ha, production 42.21 thousand tonnes and productivity 1145 kg/ha.

Rapseed-mustard comes under major edible oilseeds in India. Rapseed-mustard oil is consumed in India as food oil and the meal cake left after the extraction of oil forms important cattle feed. rapseed-mustard yields lower in India compared to other rapseed-mustard producing countries such as Germany (3811 kg/ha), France (3240 kg/ha), China (1834 kg/ha) and Canada (1769 kg/ha) as well as the world average (1849 kg/ha) (Kaur 2020). The estimated area, production and yield of rapseed-mustard in the world was 36.59 million hectare, 7237 million tonnes and 1980 kg/ha, during 2018-19. Globally India account for 19.8% and 9.8% of the total acreage and production (USDA). During the last eight years there has been a considerable from 61.64 MT in 2010-11 to 72.42 MT in 2018-19. The production of rapseed-mustard is concentrated in five major states of Rajasthan (46.06%), Haryana (12.60%), Madhya Pradesh (11.38%), Uttar Pradesh (10.49%) and West Bengal (7.81%) during (2019-20). Rapseed-mustard is one of the important rabi oilseeds in India. It accounts for about one-fourth (24.6%) of the total (nine) oilseeds production during triennium ending (TE) 2016-17. Hence there is need to fill this gap between production and consumption of oilseed due to the increased demand. Therefore, this study on major oilseeds becomes important for the policy makers and planners to emphasize on these crops to fulfill the per capita need through increased production via latest technologies and high yielding varieties. The present paper was undertaken with the objective to examine the pattern of growth and instability of major oilseeds in Chhattisgarh.

Materials and Methods

The study was finite to Chhattisgarh state. Major oilseeds will be selected purposively based on the contribution of the area under oilseed crops in Chhattisgarh, So three major oilseeds i.e. groundnut, soybean and rapseed-mustard contributing area which is 15842 ha-1, 81553 ha-1 and 12865 ha-1 to the total area of oilseed crops in Chhattisgarh respectively. The present study was based on secondary data. The required time series data were collected from Directorate of Economics and Statistics. The period of the study from the year 2004 to 2021.

Statistical tools

Statistical tool like compound growth rate were used to analyze growth rate in area, production and productivity of major oilseeds in Chhattisgarh plain.

Compound growth rate

It is calculated as;

$$C.G.R\ (\%) = (\text{Antilog } b - 1) * 100$$

Where, b = regression coefficient

To analyze the Instability index we use the Cuddy Della Valle Instability index (Cuddy and Della Valle 1978) is a modification of coefficient of variation to accommodate trend present in the data, which is commonly present in economic time series data. This method is superior over the scale dependent measures such as standard deviation. The Cuddy Della Valle index (CDVI) is calculated as follows:

$$\text{Cuddy Della Valle Index } (\%) = C.V. * \sqrt{(1-R^2)}$$

Where, C.V. = Coefficient of Variation

R^2 = Coefficient of multiple determination

The ranges of CDVI (Sihmar, 2014) are given as follows:

Low instability = between 0 to 15

Medium instability = greater than 15 and lower than 30

High instability = greater than 30

Results and Discussion

Growth rate in area, production and productivity of major oilseeds in Chhattisgarh

Table 1 Depicted the extent of growth rate in area, production and productivity of groundnut in Chhattisgarh state during the year 2004 to 2021. The compound growth rate of groundnut in area under Chhattisgarh showed insignificant negative result with growth rate of -2.394 per cent per annum. In the same way production of groundnut in the state also showed non-significant result with growth rate of -0.708 per cent per annum. But the productivity of groundnut in the state showed highly significant growth rate of 1.727 per cent per annum. According to results of Gayathri (2018) [4].

In the same way the compound growth rate of soybean in area under Chhattisgarh showed significant growth rate of 5.220 per cent per annum, but the production of soybean in the state showed non –significant growth rate of 1.880 per cent per annum and the productivity of soybean in the state showed insignificant negative result with growth rate of -3.174 per cent per annum. As found in results of Dhurwey *et al.*, (2019) [2]. In the same way the compound growth rate of rapseed-

mustard in area under Chhattisgarh showed insignificant negative growth rate of -2.641 per cent per annum. In the same way production of rapseed-mustrad in the state showed non-significant growth rate -0.877 per cent per annum. But the productivity of rapseed-mustard showed positive significant growth rate of 1.812 per cent per annum. According to Kumar *et al.*, (2018) [7].

Table 1: Growth of area, production and productivity of groundnut, soybean and rapseed-mustard in Chhattisgarh state during 2004 to 2021

	CGR (%)		
Chhattisgarh	**Area**	**Production**	**Productivity**
Groundnut	-2.394***	-0.708^{NS}	1.727***
Soybean	5.220**	1.880^{NS}	-3.174*
Rapseed-Mustard	-2.641***	-0.877^{NS}	1.812***

Source: Department of Agriculture, Cooperation and Farmers Welfare, Ministry of Agriculture and Farmers Welfare, Government of India, New Delhi

*** Significant at 1 per cent level, ** Significant at 5 per cent level, * Significant at 10 per cent level, NS = Non-Significant

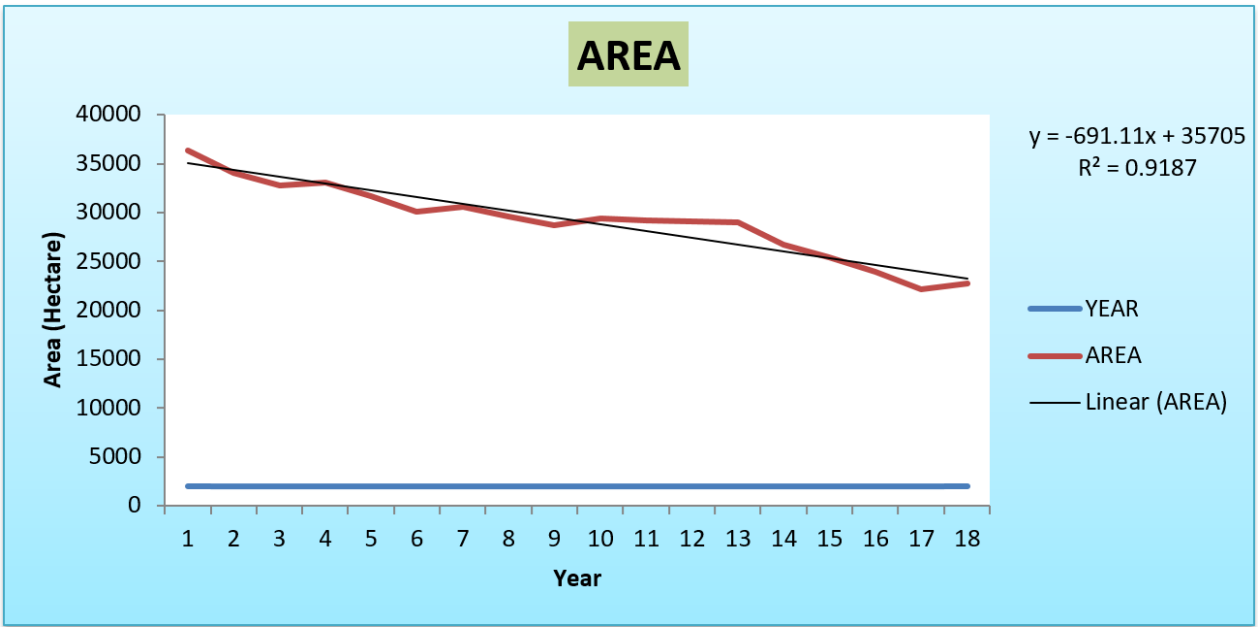

Fig 1: Trend in area of groundnut in Chhattisgarh

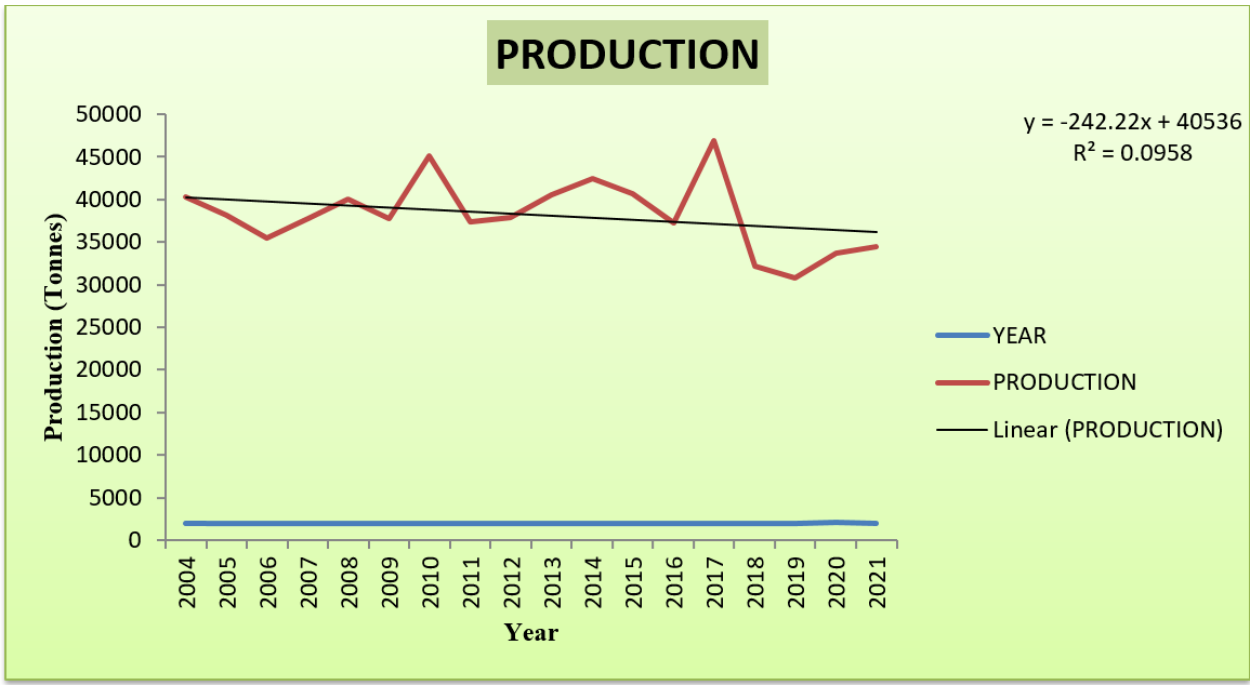

Fig 2: Trend in production of groundnut in Chhattisgarh

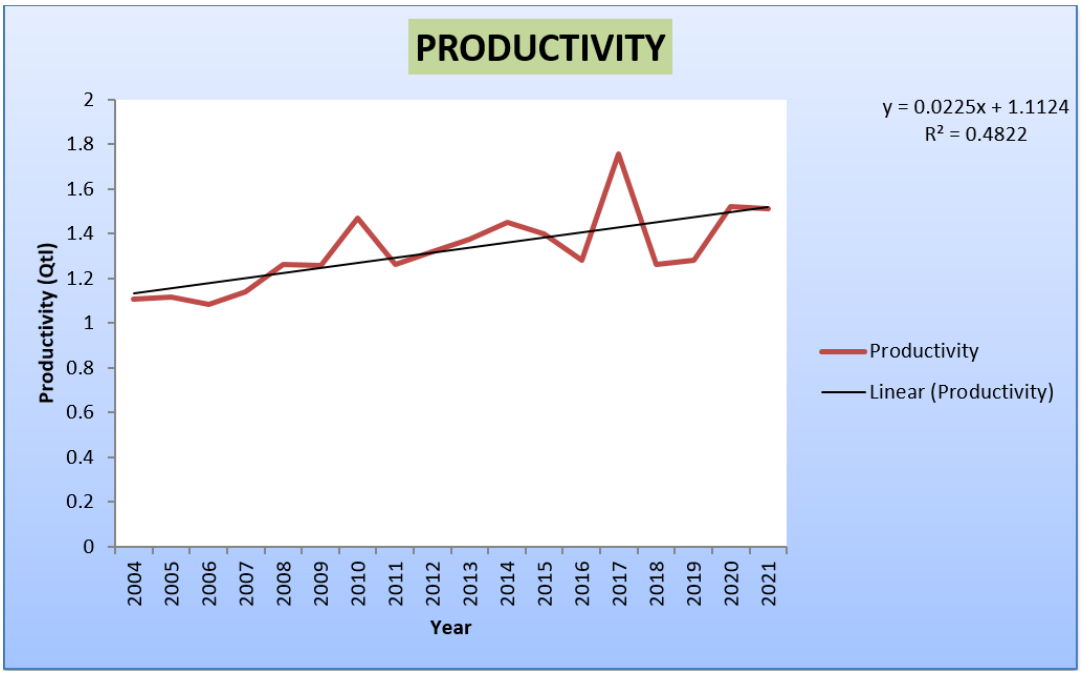

Fig 3: Trend in productivity of groundnut in Chhattisgarh

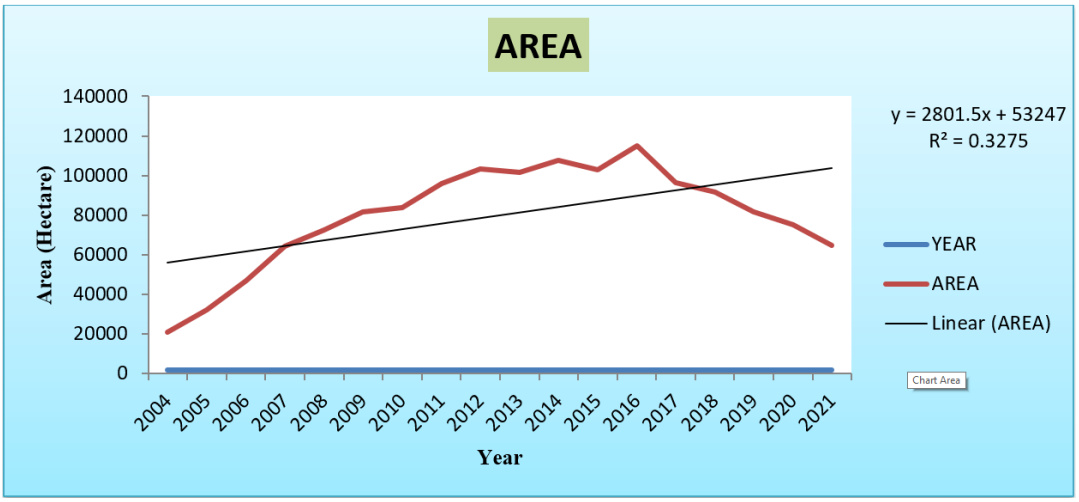

Fig 4: Trend in area of soybean in Chhattisgarh

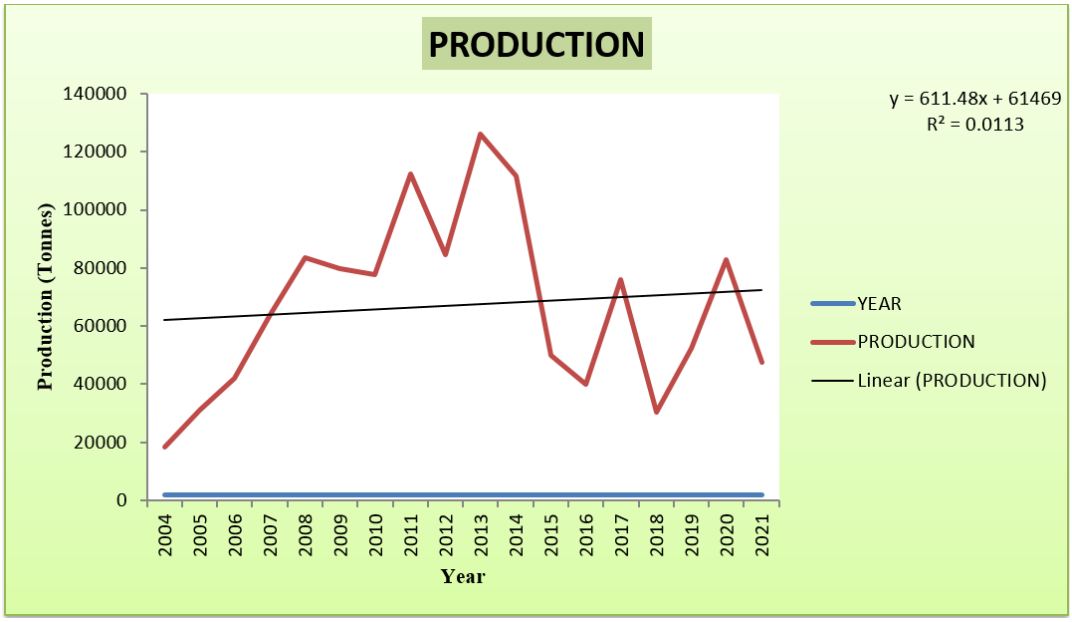

Fig 5: Trend in production of soybean in Chhattisgarh

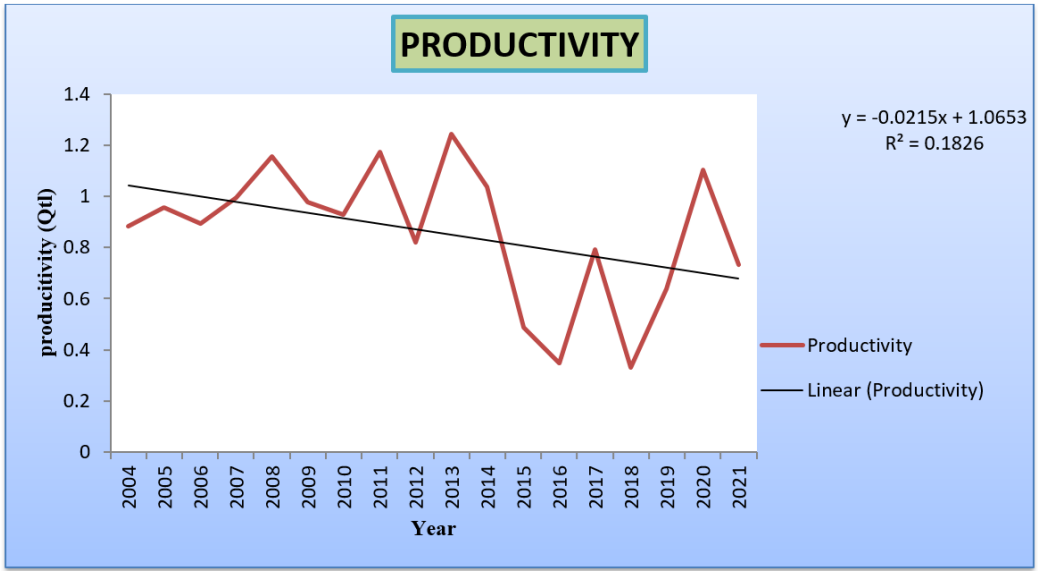

Fig 6: Trend in productivity of soybean in Chhattisgarh

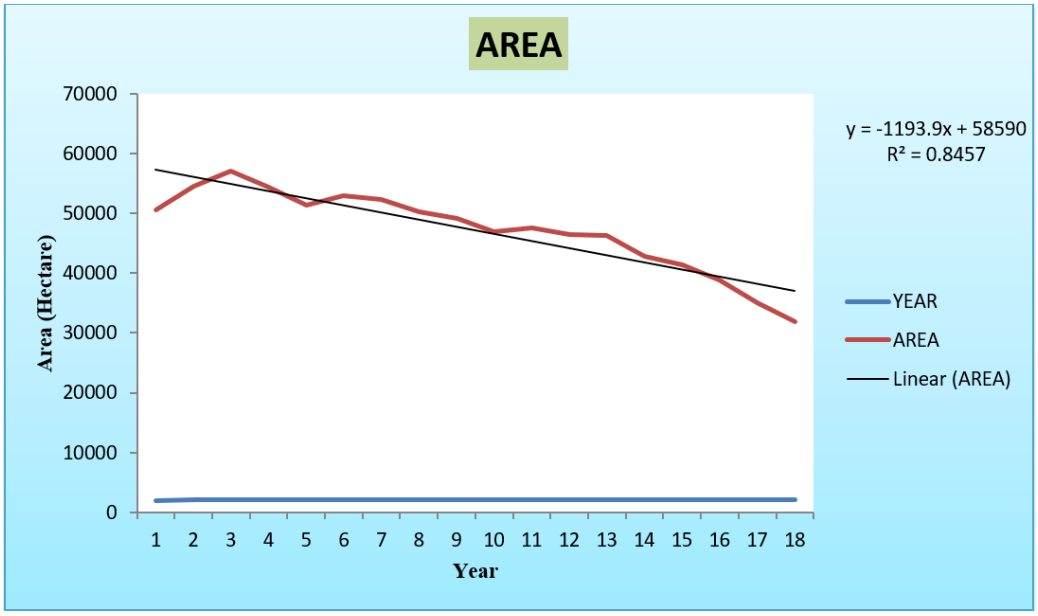

Fig 7: Trend in area of rapseed-mustard in Chhattisgarh

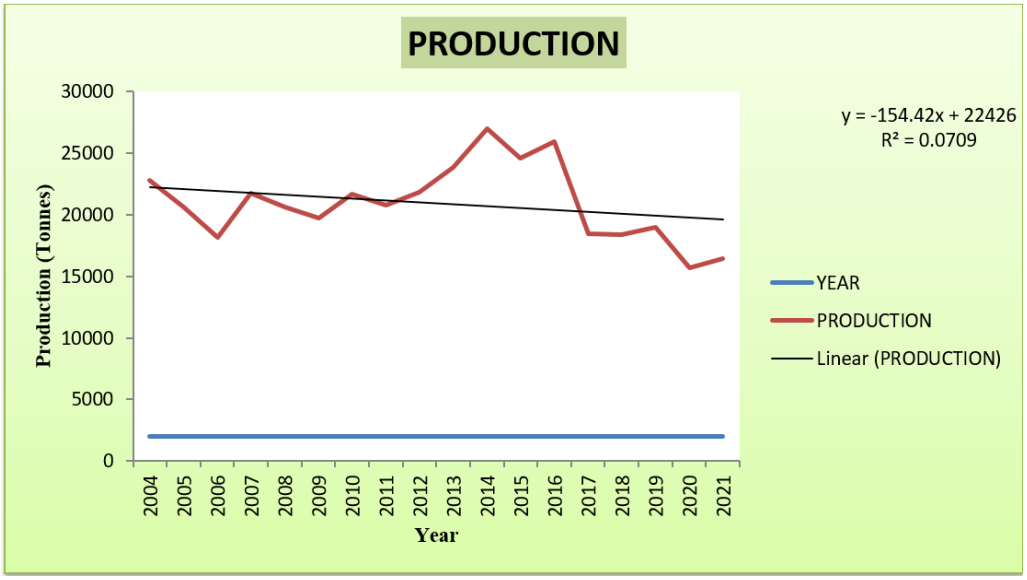

Fig 8: Trend in production of rapseed-mustard in Chhattisgarh

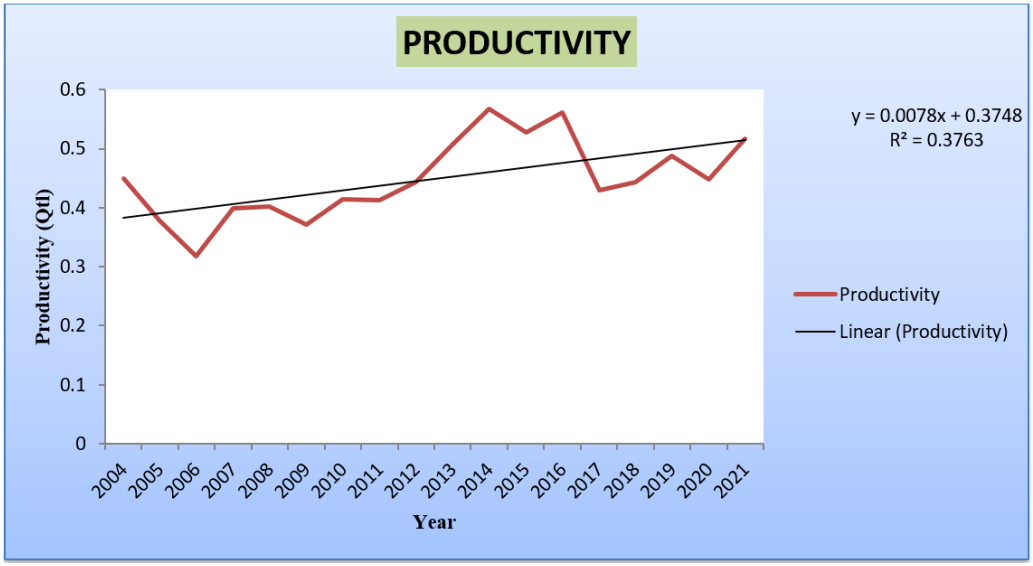

Fig 9: Trend in productivity of rappseed-mustard in Chhattisgarh

Instability Index for groundnut, soybean and rapseed-mustard in Chhattisgarh

Table 2 Depicted the instability index was calculated by Cuddy Della Valle index for area, production and productivity of groundnut, soybean and rapseed-mustard in state Chhattisgarh. Result show that in Chhattisgarh area, production and productivity instability of groundnut was found to be low with 3.881, 10.711 and 8.751 per cent according to Pallab *et al.*, (2015). In Chhattisgarh CDVI result depicted that variation in area under soybean was having medium instability with 27.664 per cent but production and productivity of soybean in the state during study period showed variations of high instability with 46.782 per cent and medium instability with 29.020 per cent. Area, production and productivity of rapseed-mustard in Chhattisgarh was found to be low instability with 5.939, 14.679 and 12.303 per cent as found by results of Kumar *et al.*, (2018) [7].

Table 2: Instability Index (in %) of groundnut, soybean and rapseed-mustard in Chhattisgarh during 2004 to 2021

	CDVI (%)		
Chhattisgarh	**Area**	**Production**	**Productivity**
Groundnut	3.881	10.711	8.751
Soybean	27.664	46.782	29.020
Rapseed-Mustard	5.939	14.679	12.303

Conclusion

It is concluded that the groundnut, soybean and rapseed-mustard which play important role in total oilseed production for food and nutritional security of the growing population in the state of Chhattisgarh as well as in India. India is the largest producer of oilseeds in the world and oilseed sector occupies an important position in the agricultural economy of the country. It can be noted from the study that groundnut showed insignificant negative result in terms of area and production was found to be non-significant but the productivity was found to be significant growth rate in Chhattisgarh but the instability was low in terms of area, production and productivity also. It can be noted from the study that soybean has performed well in terms of area. But the production of soybean in the Chhattisgarh showed non – significant growth rate and the productivity of soybean in the state showed insignificant negative result but the instability was found to be medium to high in production and yield which indicated irregular rainfall. In case of rapseed-mustrad area of Chhattisgarh showed negative result and production was found to be non-significant but the productivity of rapseed-mustard showed positive result and also the instability was low.

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