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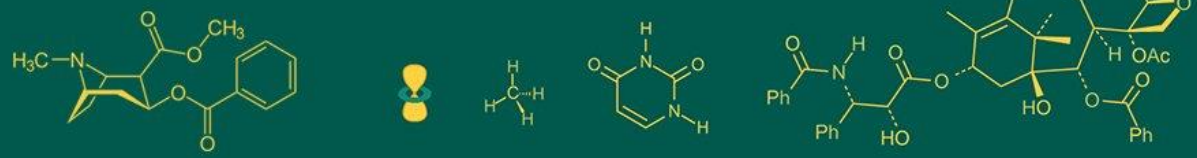

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Shraddha Nayak
Ph.D. Scholar,
Department of Agricultural Economics, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Reena
Ph.D. Scholar,
Department of Agricultural Economics, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Satyanarayan Soni
Ph.D. Scholar,
Department of Agricultural Economics, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Dr. Ravi Shrey
Assistant Professor,
Department of Agricultural Economics, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Dr. Deepak Rathi
Principal Scientist, Deputy Director, Jawahar Lal Nehru Krishi Vishwavidyalaya, Jabalpur, Madhya Pradesh, India

Corresponding Author:
Shraddha Nayak
Ph.D. Scholar,
Department of Agricultural Economics, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

To analyse the trend, growth rate in area, production and productivity of major vegetable crops in Chhattisgarh plain zone

Shraddha Nayak, Reena, Satyanarayan Soni, Dr. Ravi Shrey and Dr. Deepak Rathi

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Abstract
The area, production and productivity of brinjal crop in Chhattisgarh plain and Chhattisgarh state was found to be positive and highly significant. The area, production and productivity of tomato crop in Chhattisgarh plain and Chhattisgarh state was found to be positive and highly significant. The area, production and productivity of potato crop in Chhattisgarh plain and Chhattisgarh state was found to be positive and highly significant. The area, production and productivity of okra crop in Chhattisgarh plain and Chhattisgarh state was found to be positive and highly significant. The area and production of onion crop in Chhattisgarh stateand Chhattisgarh plain were found to be positive and highly significant, but productivity of onion crop was positive. The area, production and productivity of other vegetable in Chhattisgarh state were found to be positive and highly significant. The area of other vegetable cropin Chhattisgarh plain were found to be positive and highly significant, production was found positive and significant, but productivity of other vegetable crop was positive. The area, production and productivity of total vegetable crop in Chhattisgarh plain and Chhattisgarh state was found to be positive and highly significant.

Keywords: Trend, growth rate, area, production, productivity

Introduction
Horticulture is a part of agriculture. As the State and the whole country is moving towards modernization, the agricultural sector also changed from traditional to modern agriculture. The changing dietary pattern of the population made diversification in agriculture. The cropping pattern changed from traditional to high valued crops and the horticultural crops got prime importance in cropping pattern. Small holdings comprising 78 per cent of the total holdings with an area share of 33 per cent, contribute more than half of the production of fruits and vegetables. Smallholders have a distinct advantage in vegetable production; vegetable cultivation is labour intensive and small holders have abundant labour. Moreover, most of the vegetables have a short crop-cycle and therefore provide returns round the year.

Material and Methods
Selection of area
Chhattisgarh state of India was considered purposely for study purpose and all the 3 agro-climatic zones *viz* Chhattisgarh plain, Bastar plateau and northern hills were considered for detail investigation. Out of the three agro-climatic zones, the Chhattisgarh plain zone was selected only because the major vegetable area and production to be covered more than 60 percent of the Chhattisgarh state.

Selection of Crop
The major vegetable crops viz potato, okra, brinjal, onion and tomato were selected for the study as area covered in this vegetable was found to be more than 60 percent in Chhattisgarh plain zone of Chhattisgarh state as compared to other vegetable in the Chhattisgarh plain zone of state.

Nature and sources of data
This study is based on secondary data which is obtained from the website of Government of Chhattisgarh Agriculture Development and Farmer Welfare and Bio – Technology Department (agriportal.cg.nic.in).

Period of Study
The data was collected for the period of 17 Years from 2004-05 to 2020-21.

Analytical tools
Trend analysis
To analyses the growth rates of major vegetable crop in the Chhattisgarh plain zone trend analysis was carried out using linear trend method.

Linear trend, $Y = a + b\ x$

Where,
Y= Dependent variables (Area, Production and productivity)
a = Intercept
b = Regression co-efficient
x = Period (years)
N=number of observation.

Simple Growth Rate (SGR)

SGR (%) = $b/\bar{y} \times 100$

Compound Growth Rate (CGR)
The compound growth rates (CGR) used to examine the growth rate in area, production and productivity of major vegetable crop in Chhattisgarh state as a whole, using the exponential growth function of the following form.

$Y = ab^t$

Where,
Y= Dependent variable to be estimated (area, production, productivity)
A= Intercept
B= Regression Coefficient
t = Time variable

The equation will be estimated after transforming as follows

$\text{Log } Y = a + b^t$

Where,
a = Log A
b = Log B
Then, the % compound growth rate (G) was calculated using the relationship

CGR = [(Antilog of b) -1] x 100

Results and Discussion
Growth performance of major vegetable crops in Chhattisgarh plain and Chhattisgarh state.
Area = thousand hectare
Production = thousand MT
Productivity = Tone per Hectare

Table 1: Growth performance of major vegetable crops in Chhattisgarh plain

Crop	Chhattisgarh Plains								
	Area			Production			Productivity		
	Coeff. b	SGR	CGR	Coeff. b	SGR	CGR	Coeff. b	SGR	CGR
1. Brinjal	0.87** (0.13)	4.14	5.06	24.71** (2.43)	6.54	8.52	0.52** (0.07)	3.01	3.29
2. Tomato	1.46** (0.31)	4.26	5.53	46.97** (2.28)	8.40	10.48	1.46** (0.12)	4.11	4.70
3. Potato	0.92** (0.17)	4.95	6.89	17.60** (2.58)	6.46	9.39	0.31** (0.08)	2.17	2.34
4. Okra	0.57** (0.16)	3.23	4.60	8.19** (1.40)	4.48	5.77	0.11* (0.05)	1.06	1.12
5. Onion	0.89** (0.08)	8.67	11.46	15.99** (1.44)	9.50	13.23	0.22 (0.13)	1.35	1.59
6. Other vegetables	9.46** (0.95)	6.23	9.33	135.34* (9.20)	7.63	9.33	0.17 (0.10)	1.50	1.68
7. Total vegetable	14.17** (1.29)	5.59	6.72	248.79** (12.86)	7.46	9.26	0.29** (0.06)	2.23	2.38

Table 2: Growth performance of major vegetable crops in Chhattisgarh state

Chhattisgarh State								
Area			Production				Productivity	
Coeff.b	SGR	CGR	Coeff.b	SGR	CGR	Coeff.b	SGR	CGR
0.49** (0.12)	4.65	5.86	35.71** (2.25)	6.60	8.98	0.44** (0.05)	2.51	2.90
2.32** (0.26)	4.39	5.46	62.11** (2.36)	7.68	10.11	0.59** (0.07)	3.69	4.41
1.63** (0.24)	4.21	5.76	28.10** (4.01)	5.13	7.15	0.17* (0.06)	1.16	1.32
1.06** (0.14)	3.63	4.81	13.21** (1.20)	9.87	5.91	0.10** (0.03)	7.93	1.06
1.59** (0.12)	8.64	12.34	26.65** (1.71)	9.20	13.65	0.16 (0.08)	1.08	1.17
13.82** (0.85)	6.61	8.04	203.04** (8.94)	8.26	10.26	0.22** (0.05)	1.96	2.05
21.90** (1.27)	5.99	7.14	368.83** (16.70)	7.78	9.63	0.08** (0.04)	2.20	2.32

** = Significant at 1% level of significance,
* = Significant at 5% level of significance,
Figure in Parenthesis shows standard error of b
Note:- SGR = Simple growth rate,
CGR= Compound growth rate and
Coeff. b = coefficient of b

1 Brinjal crop

The simple growth rate in area production and productivity of brinjal was found to be 4.14, 6.54 and 3.01 percent per annum in Chhattisgarh plain and 4.65, 6.60 and 2.51percent per annum in Chhattisgarh state.

The compound growth rate in area production and productivity of brinjal was found to be 5.06, 8.52 and 3.29percent per annum in Chhattisgarh plain and 5.86, 8.98 and 2.90 percent per annum in Chhattisgarh state.

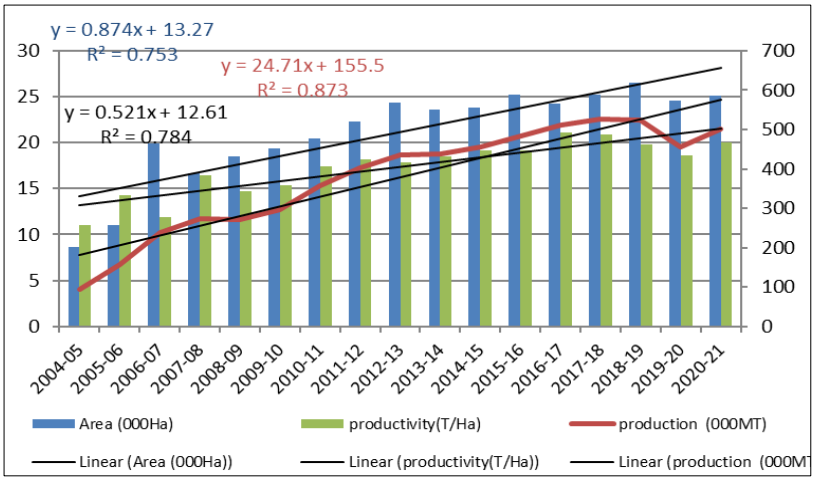

Fig 1: Trend of area, production and productivity of brinjal in Chhattisgarh plain

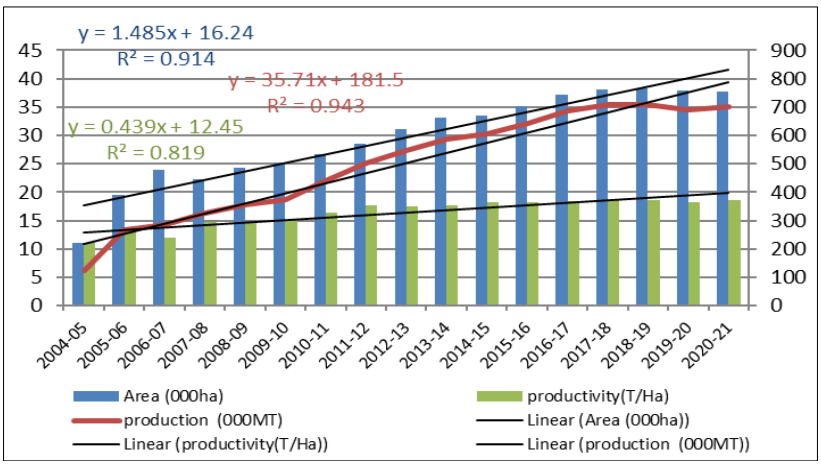

Fig 2: Trend of area, production and productivity of brinjal in Chhattisgarh State.

2 Tomato crop

The simple growth rate in area production and productivity of tomato was found to be 4.26, 8.40 and 4.11 percent per annum in Chhattisgarh plain and 4.39, 5.46 and 3.69percent per annum in Chhattisgarh state.

The compound growth rate in area production and productivity of tomato was found to be 5.53, 10.48 and 4.70 percent per annum in Chhattisgarh plain and 5.46, 10.11 and 4.41 percent per annum in Chhattisgarh state.

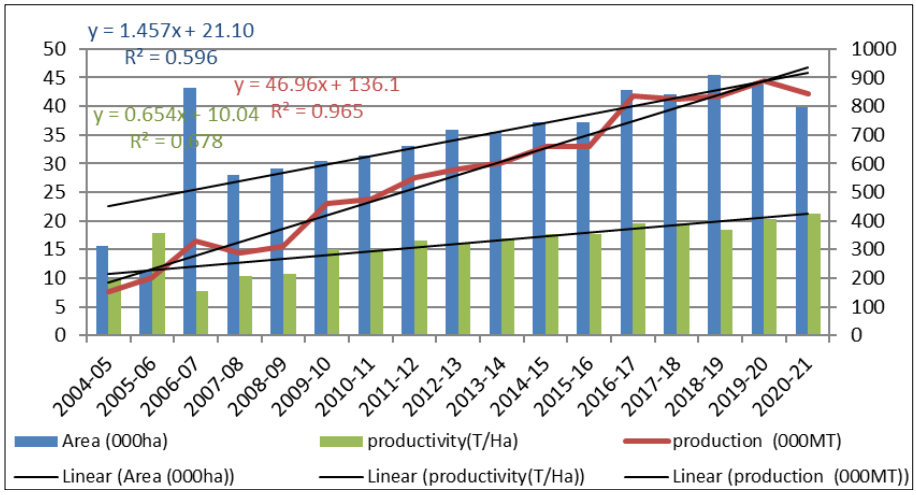

Fig 3: Trend of area, production and productivity of Tomato in Chhattisgarh plains

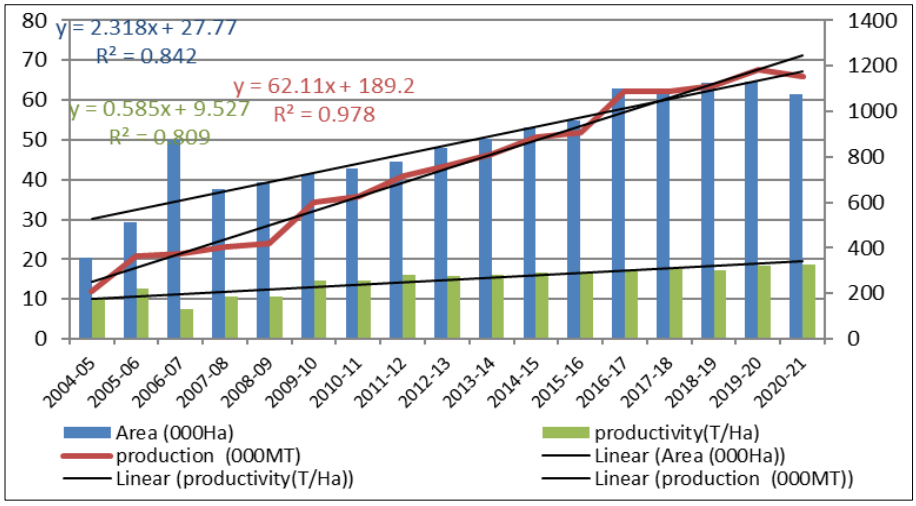

Fig 4: Trend of area, production and productivity of Tomato in Chhattisgarh state.

3 Potato crop

The simple growth rate in area production and productivity of potato was found to be 4.95, 6.46 and 2.17 percent per annum in Chhattisgarh plain and 4.21, 5.13 and 1.16percent per annum in Chhattisgarh state.

The compound growth rate in area production and productivity of potato was found to be 6.89, 9.39 and 2.34percent per annum in Chhattisgarh plain and 5.76, 7.15 and 1.32 percent per annum in Chhattisgarh state.

The simple growth rate in area production and productivity of okra was found to be 3.23, 4.48 and 1.06 percent per annum in Chhattisgarh plain and 3.63, 9.87 and 7.93percent per annum in Chhattisgarh state.

The compound growth rate in area production and productivity of okra was found to be 4.60, 5.77 and 1.12 percent per annum in Chhattisgarh plain and 4.81, 5.91 and 1.06 percent per annum in Chhattisgarh state.

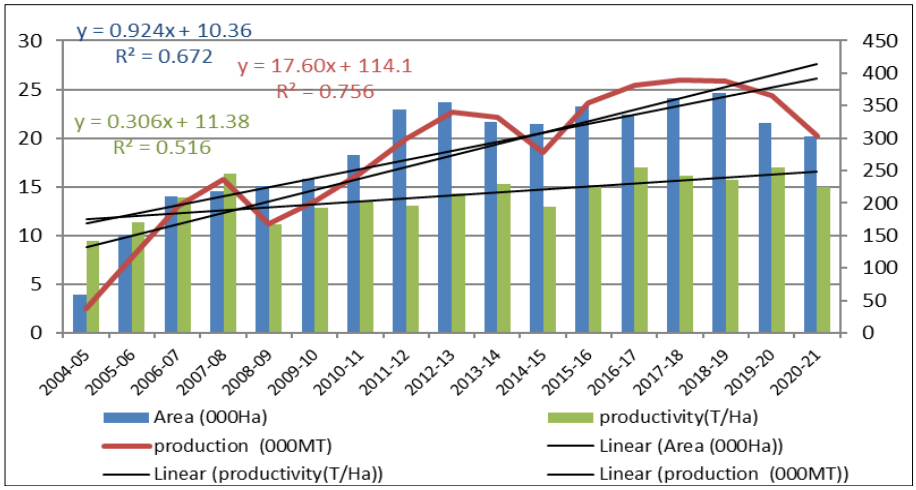

Fig 5: Trend of area, production and productivity of Potato in Chhattisgarh plains

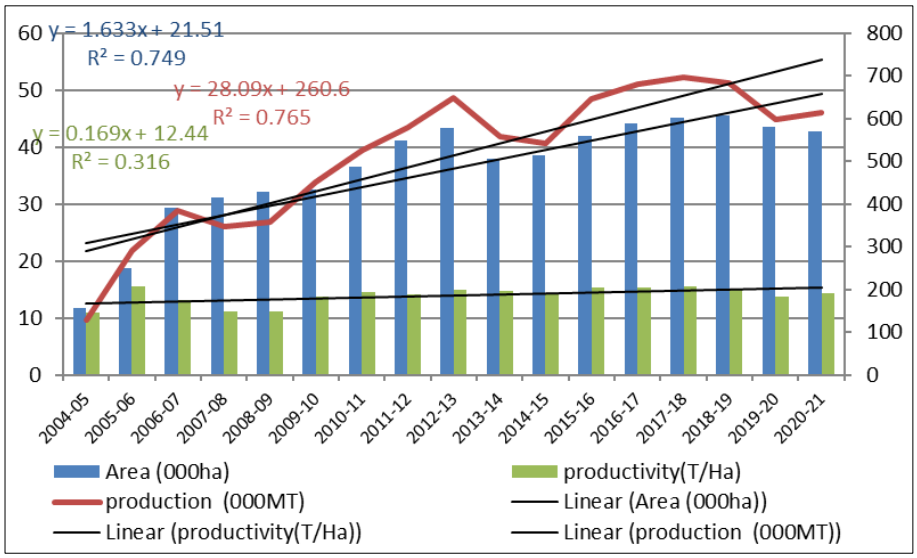

Fig 6: Trend of area, production and productivity of Potato in Chhattisgarh state.

4 Onion crop

The simple growth rate in area production and productivity of onion was found to be 8.67, 9.50 and 1.35 percent per annum in Chhattisgarh plain and 8.64, 9.20, and 1.08percent per annum in Chhattisgarh state.

The compound growth rate in area production and productivity of onion was found to be 11.46, 13.23 and 1.59 percent per annum in Chhattisgarh plain and 12.34, 13.65 and 1.17percent per annum in Chhattisgarh state.

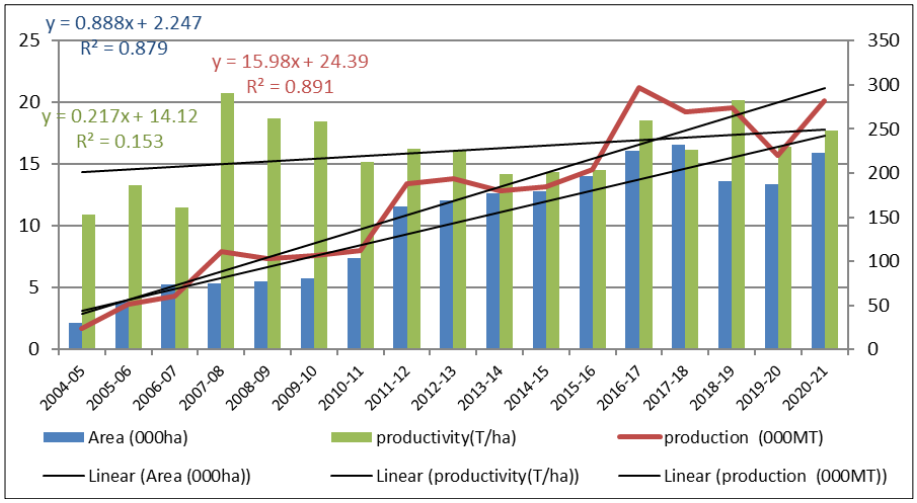

Fig 7: Trend of area, production and productivity of Onion in Chhattisgarh plains.

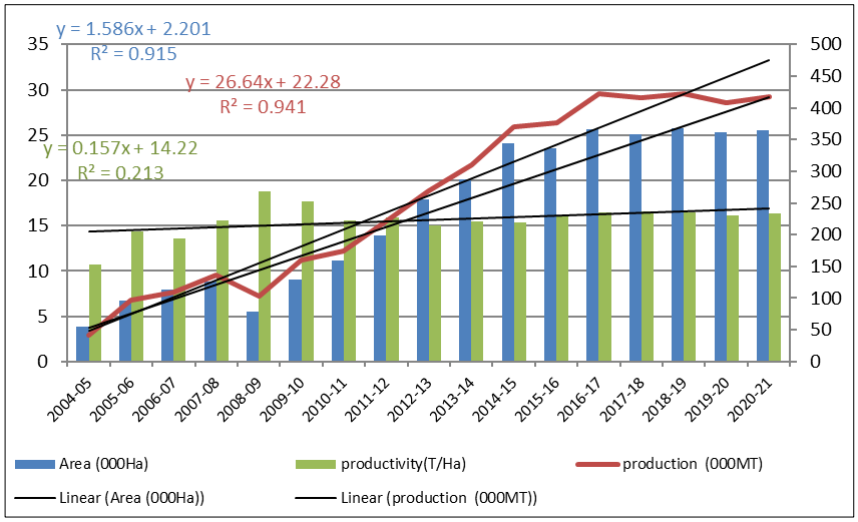

Fig 8: Trend of area, production and productivity of Onion in Chhattisgarh State.

5 Other vegetable crop

The simple growth rate in area production and productivity of other vegetable was found to be 6.23, 7.63 and 1.50 percent per annum in Chhattisgarh plain and 6.61, 8.26 and 1.96percent per annum in Chhattisgarh state.

The compound growth rate in area production and productivity of other vegetable was found to be 9.33, 9.33 and 1.68 percent per annum in Chhattisgarh plain and 8.04, 10.26 and 2.05 percent per annum in Chhattisgarh state.

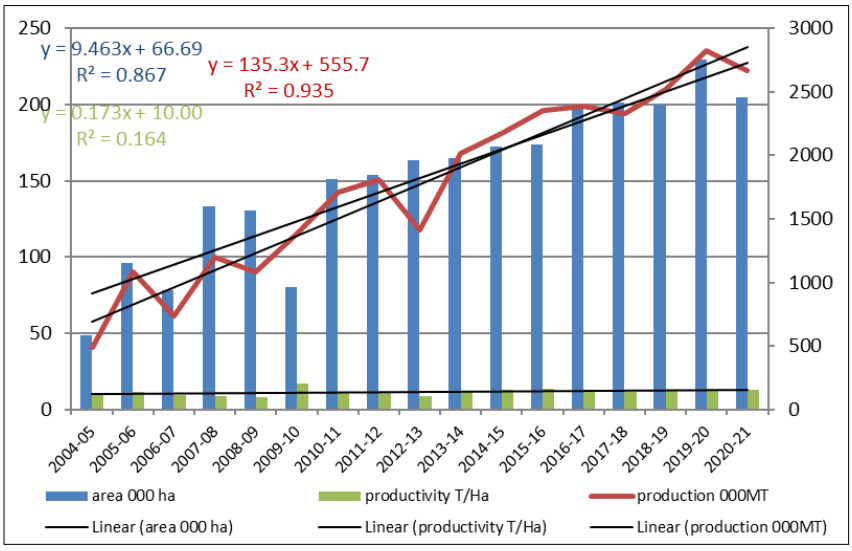

Fig 9: Trend of area, production and productivity of Other Vegetables crops in Chhattisgarh plains.

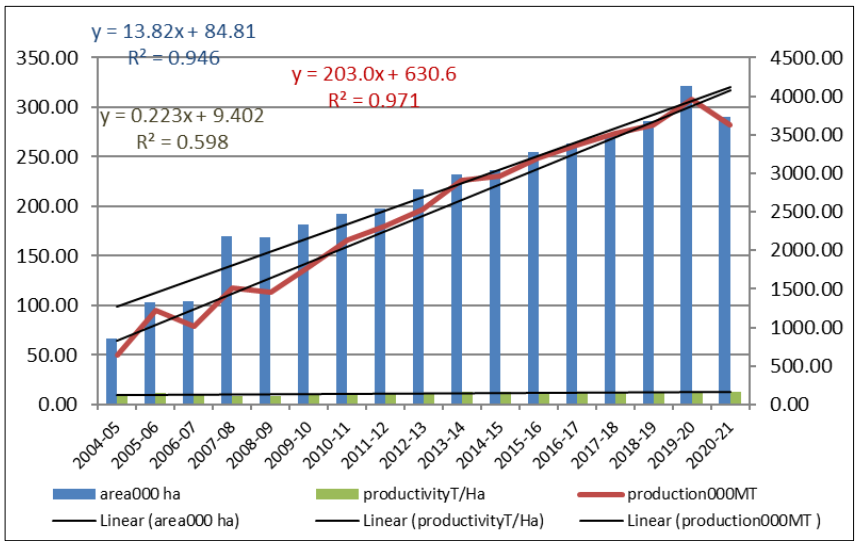

Fig 10: Trend of area, production and productivity of Other Vegetables crops in Chhattisgarh state.

6 Total vegetable crop

The simple growth rate in area production and productivity of okra was found to be 5.59, 7.49 and 2.23 percent per annum in Chhattisgarh plain and 5.99, 7.78 and 2.20percent per annum in Chhattisgarh state.

The compound growth rate in area production and productivity of okra was found to be 6.72, 9.26 and 2.38 percent per annum in Chhattisgarh plain and 7.14, 7.78 and 2.32 percent per annum in Chhattisgarh state.

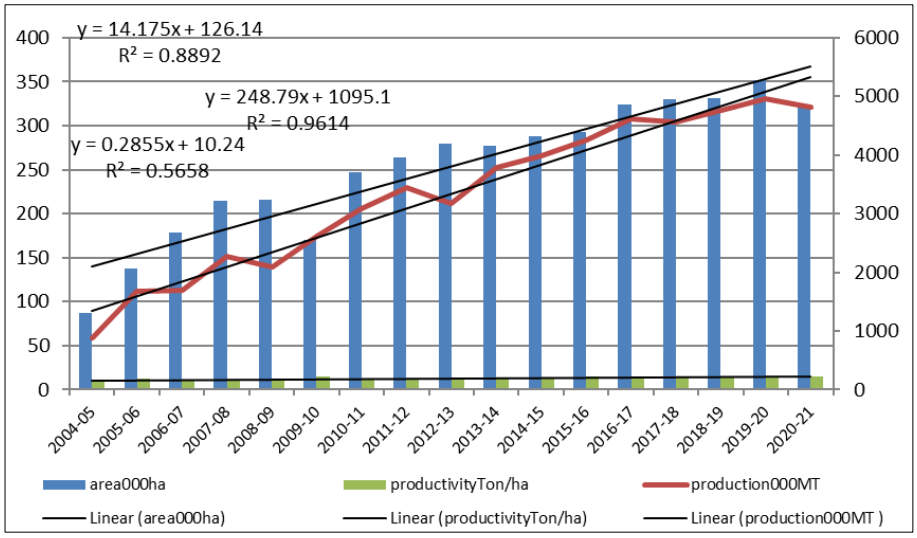

Fig 11: Trend of area, production and productivity of total vegetable crop in Chhattisgarh plains

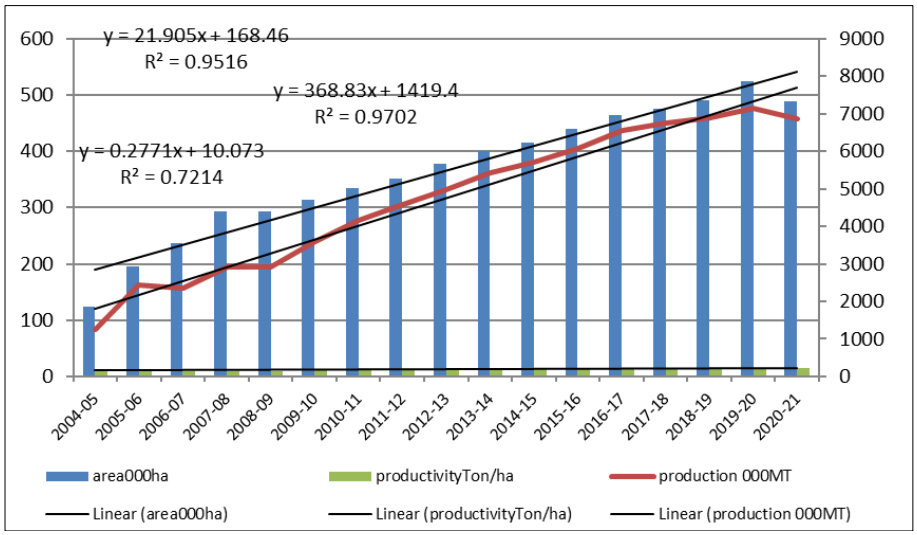

Fig 12: Trend of area, production and productivity of total vegetable crop in Chhattisgarh plains.

Conclusion

The analysis of growth and stability of vegetable has revealed that all the vegetable have recorded a positive and significant growth in area, production and yield during the period but growth rate was found to be low in case of productivity of okra, onion, potato, other vegetable in Chhattisgarh plain as well as Chhattisgarh state.

The total increase in area, production and productivity was mainly brought by the expansion in area and production enhancement which ultimately become possible due to the increase in productivity as compared to the contribution of acreage leads to conclude that the brinjal, tomato, onion and potato producer are adopting the production technologies to some extent in production of these crops.

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