



# AN ANALYSIS OF GROWTH IN AREA, PRODUCTION AND PRODUCTIVITY OF MAJOR VEGETABLES IN BILASPUR DISTRICT OF CHHATTISGARH STATE, INDIA

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## Abstract

The study revealed that the growth in area, production and productivity of selected vegetables in Bilaspur were found positive. Tomato appeared to be most growing vegetable as CGR for area, production and productivity of tomato worked out to be 9.01, 22.33 and 12.22 per cent respectively with high coefficient of variation. The growth in area, production and productivity of selected vegetable in Chhattisgarh were found positive. Cauliflower and cabbage were having maximum growth rates in area as 11.58, 13.62 per cent and in production 18.10 and 17.96 per cent, respectively. The growth in productivity recorded maximum in tomato crop as 5.69 per cent while least in okra crop as 0.69 per cent.

**Key words :** CGR coefficient of variation growth in area, production and productivity.

## Introduction

India is the second largest producer of vegetables in the world after China and accounts for 14.47% of production with 15.7% of the area of the world. More than 40 kinds of vegetables from different groups are grown in India. Tomato, onion, brinjal, cabbage, cauliflower, okra and pea are among the most important vegetables grown in India. According to the Horticulture Data Base (2011), published by National Horticulture Board during the year 2010-11 India's vegetable production was 146.554 million metric tonnes with an area of 8.495 million hectares which are 60.93% and 38.92% of the total horticultural crops, respectively. India's vegetable productivity is at par to the world as 17.3 metric tonnes/ha to 18.8 metric tonnes/ha.

In Chhattisgarh State, there is remarkable gap between actual harvested yield and potential yield of vegetable crops. Hence, scope for harnessing/exploiting potential fully still exists. In the State, during 2010-11 vegetables occupied an area of 0.346 million hectares with the production 4.25 million metric tonnes, which accounted 4.1 and 2.9 per cent over the national figures, respectively. The productivity of State 12.3 metric tonnes is quite less than the national average *i.e.* 17.3 metric

tonnes. Vegetables are produced more or less in all the districts of the State, most prominent areas are of tomato (12.81%), potato (10.87%), brinjal (7.97%), okra (7.53%), cauliflower (5.49%), cabbage (4.39%), cowpea (3.68%) and onion (3.34%). Production wise these crops follow same sequence of position in the State. According to the data from Directorate of Horticulture, Chhattisgarh the coverage of vegetables in the year 2010-11 was maximum in Bilaspur as 68348.76 hectares, which was 20.41 percent of total area in the State followed by Durg, Surguja and Raipur with 14.82, 14.21 and 11.09 per cent, respectively. Whereas, Durg ranked first in production by 88930 metric tonnes, which was 21.42 per cent of total production in the State followed by Bilaspur, Surguja and Raipur with 16.32, 14.53 and 10.10 per cent, respectively. Instead of the large area of vegetables in Bilaspur district the productivity *i.e.* 9.91 metric tonnes per hectare does not coincide with its coverage.

The State has to go long way in vegetable production. Importance of vegetable is now much recognized and understood by agricultural community due to its wide range of utility. It has been observed that economic returns to vegetables are better than other several crops. The yield per unit area is high and suitable for intensive farming lead generation of supplement incomes and expands

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employment through it. Vegetables support many other industries like processing, seed industry, fertilizer, pesticide and farm machinery industry. Vegetables support export and international trade. Vegetables are always been a better choice of crop diversification because of good productivity and much higher returns from a unit area. The diversification in favour of these crops improves exports, reduce trade deficit, besides creating more direct and indirect employment. Therefore, looking to the importance of vegetables the has been undertaken to see the trend and variability.

### Materials and Methods

The study on growth in area, production and productivity of major vegetable was purposively taken up in Bilaspur district of Chhattisgarh State, India. The secondary data on area and production under different vegetables were used to analysed the trends. The time series data on area and production of vegetables were available from the year 2004-05 onwards. Hence, the analysis was covered for the period from 2004-05 to 2014-15. The data used for the study were collected from Directorate of Horticulture, Raipur.

The method used for estimating the growth rate has been described below:

#### Measurement of Compound Growth Rate (CGR)

The specific functional form was used to estimate the growth rate *i.e.*

$$Y_t = \alpha \beta^t U_t$$

Where,

$Y_t$  = The value of the variable in period  $t$  for which growth rate is to be estimated.

$\alpha$  = Initial value of  $Y$ .

$\beta = (1 + g)$  Parameter

$g$  = Rate at which  $Y$  grows every year in relation to its value in the preceding year.

$t$  = number of years (1, 2, ...,  $n$ ).

$U_t$  = Disturbance term.

On the logarithmic transformation  $\log Y_t = \log \alpha + t \log \beta + \log U_t$

Can be expressed as  $Y_t^* = \log Y_t$ ,  $\alpha^* = \log \alpha$ ,  $\beta^* = \log \beta$  and  $U_t^* = \log U_t$

OLS estimate of  $\beta^*$  can be obtained as

$$\hat{\beta}^* = \frac{\sum y^* t'}{\sum t'^2}$$

Where,  $y^* = \log Y_t - \frac{\sum \log Y_t}{n}$ ,  $t' = (t - \bar{t})$  and

$$\bar{t} = \frac{\sum t}{n}$$

Then the estimate of compound growth rate

$$\hat{g} = (\text{Anti log } \hat{\beta}^* - 1)$$

Expression of CGR in percentage (100)

$$\hat{g} = \left[ (\text{Anti log } \hat{\beta}^* - 1) \right] \times 100 \text{ terms as}$$

### Results and Discussion

#### Growth in area, production and productivity of vegetables in study area

Table 1 revealed that the growth in area, production and productivity of major vegetables in Bilaspur district for the period 2004-05 to 2014-15. The study observed annual growth in the area of selected vegetables appeared to be maximum as 9.01 per cent in tomato with mean area of 8183.76 ha followed by cabbage with 8.41 per cent significant annual growth having mean area 1069.12 ha while, okra showed minimum as 6.93 per cent significant growth with mean area 1897.43 ha. The coefficient of variation was estimated to be least as 25.25 per cent in okra while large variation appeared in area of tomato as 64.65 per cent. The same trend found in production as significant positive growth was found to be 22.33 per cent in tomato followed by cabbage as 16.20 per cent while least growth found in okra with 12.56 per cent. Growth in productivity appeared to be maximum statically non significant in tomato as 12.22 per cent followed by cabbage with 7.18 per cent significant at 1 per cent level of confidence and least in okra as 5.26 per cent.

Table 2 showed growth in area, production and productivity of major vegetables in Chhattisgarh State for the period 2004-05 to 2014-15. The annual growth in area of selected vegetables appeared to be significant in cabbage as 13.62 per cent with mean area of 12913.82 ha followed by cauliflower as 11.58 per cent with mean area of 15736.92 ha. The least growth in area was found in tomato as 6.74 per cent annually with mean area 41337.30 ha. The fluctuation in the area under selected vegetables in the State observed maximum in cabbage as 37.12 per cent followed by cauliflower as 32.65 per cent and least variation found in okra with 22.68 per cent. The growth trend in production appeared to be significant

**Table 1 :** Growth in area, production and productivity of major vegetables in Bilaspur district of Chhattisgarh. (2004-05 to 2014-15)

Vegetables	Mean area (ha)	CV %	LGR %	CGR %	Mean production (MT)	CV %	LGR %	CGR %	Mean productivity (MT)	CV %	LGR %	CGR %
Cauliflower	1123.07	30.63	4.39 (35.13)	7.45 (32.28)	15893.77	44.03	12.60** (71.67)	15.10** (55.34)	13.55	24.38	8.66** (77.51)	7.12** (75.96)
Cabbage	1069.12	31.52	5.53* (43.85)	8.41* (37.58)	15702.89	47.01	15.56** (73.30)	16.20** (58.63)	13.99	25.71	9.19** (73.70)	7.18** (75.02)
Brinjal	1803.21	43.01	5.81 (8.16)	8.07 (20.01)	22585.54	44.62	19.72** (57.16)	15.44* (46.77)	12.48	26.84	7.64** (58.74)	6.82* (52.29)
Okra	1897.43	25.25	8.23** (54.57)	6.93* (47.48)	15213.98	42.26	11.83** (63.86)	12.56* (48.45)	7.92	30.21	3.18 (19.93)	5.26 (15.97)
Tomato	8183.76	64.65	1.60 (0.23)	9.01 (12.93)	76584.16	55.91	25.20** (83.38)	22.33** (61.26)	10.67	42.53	9.63* (45.65)	12.22 (29.70)

Note- Figures in parentheses show R<sup>2</sup> (%) values.

\*\* t-ratio is significant at 1% level of significance. \* t-ratio is significant at 5% level of significance.

**Table 2 :** Growth in area, production and productivity of major vegetables in Chhattisgarh State. (2004-05 to 2014-15)

Vegetables	Mean area (ha)	CV %	LGR %	CGR %	Mean production (MT)	CV %	LGR %	CGR %	Mean productivity (MT)	CV %	LGR %	CGR %
Cauliflower	15736.92	32.65	25.06** (89.15)	11.58** (79.69)	256391.71	45.52	55.25** (94.30)	18.10** (83.21)	15.11	17.71	6.44** (71.56)	4.95** (68.93)
Cabbage	12913.82	37.12	30.60** (95.91)	13.62** (87.58)	217980.83	45.33	57.16** (97.29)	17.96* (85.83)	16.15	15.79	4.98* (51.77)	3.64* (50.65)
Brinjal	25127.89	25.29	16.08** (87.46)	8.34** (75.69)	393649.53	37.58	35.19** (95.03)	13.42** (84.49)	14.79	14.53	4.65** (63.23)	3.65** (63.39)
Okra	22982.60	22.68	13.78** (80.50)	7.42** (67.39)	233890.50	36.96	22.33** (76.09)	10.56** (81.34)	9.40	8.32	0.65 (7.41)	0.69 (7.50)
Tomato	41337.30	23.46	11.40** (63.07)	6.74** (60.00)	559803.84	39.08	31.43** (97.00)	13.67** (91.97)	12.98	22.04	6.72** (62.32)	5.69** (57.20)

Note- Figures in parentheses show R<sup>2</sup> (%) values.

\*\* t-ratio is significant at 1% level of significance. \* t-ratio is significant at 5% level of significance.

**Table 3 :** Comparative growth in area, production and productivity of vegetables in Bilaspur and Chhattisgarh State. (2004-05 to 2014-15)

Particulars	Bilaspur			Chhattisgarh		
	Area (ha)	Production(MT)	Productivity (MT)	Area(ha)	Production(MT)	Productivity (MT)
Mean	60413.25	500001.14	8.23	301168.37	3400322.90	10.98
CGR %	19.98*(50.48)	25.46**(71.55)	4.57(17.87)	10.24**(82.38)	18.68*(43.11)	7.66(10.45)
LGR %	34.72(74.73)	42.96**(93.08)	3.15(20.75)	20.77**(93.28)	37.53**(80.57)	5.33(24.44)
CV %	54.15	64.32	27.87	29.25	50.97	32.93

Note- Figures in parentheses show R<sup>2</sup> (%) values.

\*\* t-ratio is significant at 1 % level of significance. \* t-ratio is significant at 5 % level of significance.

as 18.10 per cent in cauliflower followed by cabbage as 17.96 per cent and minimum in okra as 10.56 per cent. The growth in productivity observed significantly maximum as 5.69 per cent in tomato followed by cauliflower as 4.95 per cent and least was observed in okra as 0.69 per cent.

Table 3 showed a comparative growth in area, production and productivity of vegetable in Bilaspur and Chhattisgarh. The compound growth in area and production of vegetables in Bilaspur appeared to be positively significant 19.98 and 25.46 per cent against growth figures of State as 10.24 and 18.68 per cent respectively. The fluctuation in area and production observed to be low in Chhattisgarh as CV estimated 29.25 and 50.97 per cent against fluctuation in Bilaspur as 54.15 and 64.32 per cent respectively.

### Conclusion

The growth in area, production and productivity of selected vegetables in Bilaspur were found positive. Tomato appeared to be most growing vegetable as CGR for area, production and productivity of tomato worked out to be 9.01, 22.33 and 12.22 per cent, respectively with high coefficient of variation. Growth in area, production and productivity of cabbage were registered statistically significant as 8.41, 16.20 and 7.18 respectively.

The growth in area, production and productivity of selected vegetable in Chhattisgarh were found positive. Cauliflower and cabbage were having significant growth rate in area as 11.58, 13.62 per cent and in production 18.10 and 17.96 per cent, respectively. The growth in productivity recorded significantly maximum in tomato crop as 5.69 per cent while least in okra crop as 0.69 per cent.

In a comparison the growth in vegetables between Bilaspur and Chhattisgarh, Bilaspur showed additional growth in area and production as accounted to be 9.74 and 6.78 per cent over Chhattisgarh but productivity of vegetables in the State accounted incremental growth as 3.09 per cent over to Bilaspur.

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