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Growth Analysis of Area, Production and Yield of Okra in Chhattisgarh, India

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A B S T R A C T

The research on the okra was the analysis of growth is usually used to find out the trend analysis of area, production and yields over a period of time. The growth in the area, production and yield of okra crop in Chhattisgarh was estimated using the compound growth rate and production function of the five year data. The area under okra has recorded mild annual increment and growth was negative significant. Most of the districts of Chhattisgarh in case of the cultivation of okra was found negative trend for area, production and yield.

Introduction

Okra (*Abelmoschus esculentus*) is one of the principal horticultural crops in Chhattisgarh. There has been consistent in area under okra due to extension of its cultivation to entire parts of the state. Models have been fitted for the area, production and yield of the crop separately for the districts of Chhattisgarh.14th districts of the state are undertaken for study on the basis of availability of secondary data during 2009-10 to 2013-14. The total area and production of the vegetables crops in the state was 185186.13 ha and 1569180.54 MT. respectively during 2011-12. According to National Horticulture Mission (NHM) and Department of Horticulture, Raipur, Chhattisgarh. The partial compound growth rates of the area, production and yield of the okra have estimated and discussed. It was observed that the compound annual growth rate of okra in terms of yield is negative during the 2009-10 to 2013-14 periods, even though the area under the cultivation of Okra crop and its production was positive.

Materials and Methods

Prediction model for periodic effect and annual trend

The periodic Effect variable 'P' was introduced to measure the periodic trend along with the annual effect variable 'T' to measure

annual trend with in each period. So, the following multiple regression models was finalized and fitted in all cases using stepwise regression technique as described-

ln Y = ln t + bp P + bt T + $\in$ ….(1a)

Or ln $\hat{Y}$ =ln t + bp P + bt T ……(1b)

Where, ln $\hat{Y}$= expected value of the natural logarithm of the response variable.

Y = area, yield (i.e. yield) or production of given a region.

ln t = intercept.

P= periodic time variable, taking values from 2009-10 to 2013-14,

T = annual time variable taking values from for any period.

bp = partial linear regression coefficient corresponding to variable P.

bt = partial linear regression coefficient corresponding to variable T.

$\in$ = error/disturbance component.

Production = Area × Yield... (2)

However, in actual practice the area, production and yield are not always reported to be accurate enough to equal to above product, due to probably rounding errors and many a times due to human error in recording the data. Therefore, assuming that actual area, production and yield are some powers of the reported data and representing the residual discrepancies with an error term, this identity can be written in the functional form. Then, after taking natural logarithms, denoting the error compound by $\in$ ' ~ N (0,$\sigma^2_{\in'}$) and then introducing the intercept term we can have the following linear statistical model

$\widehat{ln}$ P (A, Y) = c_0 + c_1 ln A + c_2 ln Y + $\in$ ' …… (3a) or,

$\widehat{ln}$ P (A,Y) = c_0 + c_1 ln A + c_2 ln Y …….(3b) or,

$\hat{P}$ (A,Y) = d_0 A^{c1} $Y^{c2,}$ d_0 = e^{c0} ……..(3c)

Where A, Y and $\hat{P}$ (A, P) denote the area, yield and estimated production of a given region. The constant c_0 is the intercept and (c_1, c_2) are the partial regression coefficients corresponding to variables ln A and ln Y, respectively.

Results and Discussion

To determine the results in area, production and yield of okra in Chhattisgarh for the year 2009-10 to 2013-14 are presented in Table 1. It is evident from the table that increasing trend was observed but not regular.

Partial compound growth rate

The performance of Okra for under partial compound growth rate for area in Raipur (39.24 percent), Bilaspur (51.98 percent) and Korba (-39.75 percent), Kawardha (-77.76 percent) Koria (-99.78 percent) found statistically significant at 1% level and remaining districts had registered non significant. The annual partial compound growth rate for area in Dhamtari (-16.12 percent) and significant at 1% level, whereas remaining district had registered non significant.

In the case of production under Okra we find that the periodic partial compound growth rate in Kanker (17.52 percent) found statistically significant at 1% level and Dhamtari (-62.12 percent) found significant at 5% level, Rest districts was registered non significant.

Table.1 Prediction models (w.r.t time) of area, production and yield under Okra in Chhattisgarh

District/Region		Lnt	bp	%r_1 @	bt	% r_2 @	% R^2
Raipur	A	6.59	0.33**	39.24***	0.22**	25.83	16.06
	Y	7.73	-0.09**	-12.87	-0.20	-19.09	13.44
	P	9.72	0.23	26.51	0.02***	-11.00	97.76
Mahasamund	A	5.50	0.74	21.68	-0.32**	-16.45	59.91
	Y	5.67	-0.12	-11.33	0.31	36.39	0.41
	P	6.56	0.62	87.19	-0.02	-0.01	-10.03
Dhamtari	A	5.50	0.74	18.86	-0.32	-16.12***	59.91
	Y	5.67	-0.12	-11.33	0.31	-19.69	41.74
	P	6.56	0.62	-62.12**	-0.01**	-1.40	50.77
Durg	A	8.51	-0.15**	-1.25	-0.01**	6.38	13.60
	Y	5.45	0.42**	53.56	0.19	-13.74	94.81
	P	9.37	0.26**	-37.13	0.17	-8.69	13.61
Rajnandgaon	A	6.04	0.32	21.46	0.09	-46.46	81.40
	Y	6.63	6.89	-0.02	-2.87	-31.75	9.29
	P	8.34	0.29	34.73	0.08	-1.02	79.39
Kawardha	A	5.5	0.06	-77.7***	0.13	64.59	79.63
	Y	5.12	0.78	10.91	0.05	-57.14	35.23
	P	6.02	0.85	8.30	0.02	0.02	43.78
Jagdalpur	A	5.51	0.18	20.91	0.14	15.05	15.98
	Y	7.53	-0.29	-25.48	-0.11	-10.4	7.13
	P	8.45	-0.10	-9.87	-0.13	20.02	71.5
Kanker	A	6.08	0.36	43.8	-0.03**	-3.05	97.06
	Y	2.75	2.12	46.74	-0.09	-9.06	9.96
	P	4.21	2.49	17.52***	-0.28	-24.8	99.88
Bilaspur	A	5.95	0.41	51.98***	-0.001***	-99.61	86.63
	Y	4.62	0.41	19.82	0.19	21.97**	0.97
	P	5.96	0.41	51.98	0.02	-85.72	21.50
Janjgir	A	6.55	-0.09***	2.78**	0.18**	19.75	46.60
	Y	4.9	0.70	10.18	0.13	-22.41	7.53
	P	6.9	0.60	-14.04	0.32	37.72	66.02
Korba	A	6.99	0.36	-39.75***	-0.02**	-2.06	37.74
	Y	2.70	1.45	-76.7	0.33	39.39	34.06
	P	0.32	1.82	25.00	0.3	-6.24	42.24
Raigarh	A	4.82	0.9**	-45.63	0.12	-61.27	86.30
	Y	7.16	-0.2	-18.15	0.12	4.82	26.06
	P	7.38	0.79	1.20	0.24	95.39	51.7
Jashpur	A	6.26	-0.18	-16.51	-0.02	-1.10	60.03
	Y	7.74	-0.83	-56.6	0.17	19.10	58.07
	P	9.40	0.41	-1.01	0.14	-15.48	73.03
Koria	A	4.75	0.009***	-99.78***	0.11	-19.58	80.27
	Y	6.52	0.23	26.99*	0.09	-21.9	79.31
	P	6.66	1.15	2.17	0.21	23.56	80.4

***, **, *significant at 1%, 5% and 10% level of significance respectively

@ % r1 & r_2 indicate the partial compound growth rates (in percentage) corresponding to bp (partial linear regression coefficient corresponding to periodic effect variable 'P') and bt (partial linear regression coefficient corresponding to time variable 'T') respectively.

Table.2 Production function as influenced by the area and yield of okra in Chhattisgarh

DISTRICT	PRODUCTION FUNCTION								(1)*	(2)$	(3)@
Raipur	ln P (A, Y) =	1.185	+	1.36	ln A	+	1.07	ln Y	-2.14	42.56	40.41
Mahasamund	ln P (A, Y) =	-4.62	+	1.02	ln A	+	1.02	ln Y	60.97	2.67	3.28
Dhamtari	ln P (A, Y) =	-4.60	+	0.97	ln A	+	0.982	ln Y	48.00	55.50	10.35
Durg	ln P (A, Y) =	-4.59	+	1.02	ln A	+	0.96	ln Y	5.03	1.28	1.78
Rajnandgaon	ln P (A, Y) =	-4.57	+	0.94	ln A	+	0.96	ln Y	-12.70	32.60	19.90
Kawardha	ln P (A, Y) =	-4.61	+	1.01	ln A	+	0.95	ln Y	34.71	89.51	12.42
Jagdalpur	ln P (A, Y) =	-4.61	+	0.97	ln A	+	0.95	ln Y	-10.43	**46.10**	**55.06**
Kanker	ln P (A, Y) =	-4.84	+	1.03	ln A	+	0.99	ln Y	22.62	**39.85**	**62.48**
Bilaspur	ln P (A, Y) =	-4.60	+	1.05	ln A	+	0.970	ln Y	17.7	7.14	24.91
Janjgir	ln P (A, Y) =	-4.60	+	1.02	ln A	+	1.03	ln Y	13.06	-13.43	11.71
Korba	ln P (A, Y) =	-4.61	+	1.012	ln A	+	1.02	ln Y	1.31	-1.34	-3.29
Raigarh	ln P (A, Y) =	-4.60	+	0.97	ln A	+	1.12	ln Y	2.86	11.73	14.60
Jashpur	ln P (A, Y) =	-4.61	+	1.89	ln A	+	1.17	ln Y	-6.35	2.51	1.88

* percent sum of squares explained by ln A, i.e. area effect
$ percent sum of squares explained by ln Y, i.e. yield effect
@ Total percent sum of squares explained by ln P(A, Y) i.e. by the model (3)

Annual partial compound growth rate of production in Raipur, Mahasamund, Dhamtari, Durg, Rajnandgaon, Kawardha, Janjgir, Bilaspur, Korba and Raigarh had registered non significant.

Under the yield of Okra, the partial compound growth rate and annual partial compound growth rate in Chhattisgarh observed non significant.

Production function of okra

It was observed from the Table 2 that in Chhattisgarh as for as districts are concern the production function as influenced by area, production and yield of Okra district of Kanker (62.48 per cent) has covered most significant under production and(39.85 per cent) with yield. Later on Jagdalpur (55.06 per cent) in production and (46.10 per cent) in yield was found significant.

It is concluded that the trend in area, production and yield of okra in Chhattisgarh were investigated by using the data published by Statistical Abstract of National Horticulture Mission (NHM) Raipur, Chhattisgarh. The results of the investigation are presented and discussed above. The CGR for area, production and yield of okra worked out to be 3.71, 6.83 and 2.84 per cent. The performance of Okra for the partial compound growth rate for area in Bilaspur were found maximum (51.98 percent) and under the production Kanker (17.52 percent) found statistically significant at 1% level. For the yield of okra, the CGR and annual partial compound growth rate in Chhattisgarh observed non significant.

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