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To analyse the projection in area, production and productivity in major vegetable in Chhattisgarh plains and Chhattisgarh state

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Abstract
Projection of area, production and productivity was made using the trend equation of area, production and productivity of the major vegetable crops underlying the assumption technology of vegetable production will remain unchanged upto 2050AD, keeping the existing trend of area in mind. Timely and trust worthy projection of vegetable production is crucial for the formulation of an effective marketing and vegetable policy. Therefore, in this section projection of area, production and productivity of vegetable based on trend equation of area, production and productivity for the seventeen years period i.e. from 2004-05 to 2020-21 was worked out for the different vegetable of Chhattisgarh plains and Chhattisgarh state. On the basis of the trends fitted, projections were made for area, production and productivity of vegetables under study with reference to three time periods i.e. Short term, medium term and long term.

Keywords: Projection, area, production and productivity

Introduction
Vegetable "projections" in Chhattisgarh are not straightforward, but trends show positive growth in the area, production, and productivity of vegetables like tomato, brinjal, okra, and potato over the past two decades, driven primarily by improvements in yield. The state is promoting a rice-vegetable cropping system to enhance productivity and is a significant producer of vegetables including brinjal, tomato, okra, potato, and onion.

Materials 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 these 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

Projection of area, production and productivity was made using the trend equation of area, production and productivity of the major vegetable crops underlying the assumption technology of vegetable production will remain unchanged upto 2050AD, keeping the existing trend of area in mind.

Therefore,

The Linear trend,

$\hat{Y}p = a_p + bx$

Obtained for major vegetable crop will be period upto 2050 AD.

Result and Discussion

Area = Thousand ha

Production = Thousand MT

Productivity = Tones/ha

Table 1: Short term, medium term and long term projections of area, Production and Productivity of major vegetables in Chhattisgarh plains and Chhattisgarh state

Crop	Indication	Chhattisgarh plains			Chhattisgarh state		
		2030	2040	2050	2030	2040	2050
1. Brinjal	Area	36.88	45.63	54.37	56.36	71.20	86.08
	Production	822.79	1069.90	1317.02	1145.79	1502.90	1860.1
	Productivity	22.31	23.45	24.22	20.33	21.10	21.61
2. Tomato	Area	60.45	75.03	89.60	90.38	113.57	136.56
	Production	1404.43	1874.01	2374.01	1866.28	2487.42	3108.56
	Productivity	23.23	24.98	26.19	20.65	21.90	22.73
3. Potato	Area	35.33	44.58	58.83	65.62	81.95	98.28
	Production	589.40	765.41	941.52	1019.20	1300.16	1581.12
	Productivity	16.68	17.17	17.49	15.23	15.87	16.09
4. Okra	Area	27.77	33.44	39.11	44.50	55.09	65.68
	Production	330.10	411.98	493.86	491.77	623.90	756.02
	Productivity	11.89	12.32	12.63	11.05	11.33	11.51
5. Onion	Area	26.22	35.10	43.98	44.64	60.18	75.72
	Production	456.01	615.86	775.72	737.35	1000.13	1262.91
	Productivity	17.39	17.54	17.64	16.52	16.62	16.68
6. Other vegetables	Area	322.19	416.83	511.46	458.00	596.21	734.43
	Production	4209.92	5563.32	6916.71	6112.89	8143.34	10573.78
	Productivity	13.07	13.35	13.52	13.35	13.66	13.85
7. Total vegetable	Area	508.86	650.61	792.35	759.88	978.93	1197.98
	Production	7812.54	10300.48	12788.42	11377.74	15066.01	18754.28
	Productivity	15.35	15.83	16.14	14.97	15.39	15.65

Projection of vegetable of Chhattisgarh plain and Chhattisgarh state

The short, medium and long term projections for area, production and productivity of vegetable up to 2050 were made, which point out that area, production and productivity level are likely to go up remarkably.

Projection of vegetable of Chhattisgarh plain

Short term projections

As observed that the acreage of vegetable i.e. brinjal, tomato, potato, okra, onion, other and total vegetable crop in Chhattisgarh plain is expected to increase by 36.88, 60.45, 35.33, 27.77, 26.22, 322.19 and 508.86 thousand hectares, respectively by the year 2030. The production of brinjal, tomato, potato, okra, onion, other and total vegetable crop in Chhattisgarh plain is expected to increase by 822.79, 1404.43, 589.40, 330.10, 456.01, 4209.92 and 7812.54 thousand tones, respectively by the year 2050. The productivity of brinjal, tomato, potato, okra, onion, other and total vegetable crop in Chhattisgarh plain is expected to increase by 22.31, 23.23, 16.68, 11.89, 17.39, 13.07 and 15.35 tones/hectares, respectively by the year 2030.

Medium term projections

As observed that the acreage of vegetable i.e. brinjal, tomato, potato, okra, onion, other and total vegetable crop in Chhattisgarh plain is expected to increase by 45.63, 75.03, 44.58, 33.44, 35.10, 416.86 and 650.61 thousand hectares, respectively by the year 2040. The production of brinjal, tomato, potato, okra, onion, other and total vegetable crop in Chhattisgarh plain is expected to increase by 1069.90, 1874.01, 765.41, 411.98, 615.86, 5563.32 and 10300.48 thousand tones, respectively by year 2050. The productivity of brinjal, tomato, potato, okra, onion, other and total vegetable crop in Chhattisgarh plain is expected to increase by 23.45, 24.98, 17.17, 12.32, 17.54, 13.35 and 15.83 tones/hectares, respectively by the year 2040.

Long term projections

The acreage of vegetable i.e. brinjal, tomato, potato, okra, onion, other and total vegetable crop in Chhattisgarh plain is expected to increase by 54.37, 89.60, 58.83, 39.11, 43.98, 511.46 and 792.35 thousand hectares respectively by year 2050. The production of vegetable brinjal, tomato, potato, okra, onion, other and total vegetable crop in Chhattisgarh plain is expected to increase by 1317.02, 2374.01, 941.52, 493.86, 775.72, 6916.71 and 12788.42 thousand tones respectively by year 2050. The productivity of brinjal, tomato, potato, okra, onion, other and total vegetable crop in Chhattisgarh plain is expected to increase by 24.22, 26.19, 17.49, 12.63, 17.64, 13.52 and 16.14 tones/hectares respectively by year 2050.

Projection of vegetable of Chhattisgarh state

Short term projections

As observed that the acreage of vegetable i.e. brinjal, tomato, potato, okra, onion, other and total vegetable crop in Chhattisgarh state is expected to increase by 56.36, 90.38, 58.83, 39.11, 43.98, 511.46 and 759.35 thousand hectares, respectively by the year 2030. The production of brinjal,

tomato, potato, okra, onion, other and total vegetable crop in Chhattisgarh state is expected to increase by 1145.79, 1866.28, 1019.20, 491.77, 737.35, 6112.89 and 12788.42 thousand tones, respectively by the year 2050. The productivity of brinjal, tomato, potato, okra, onion, other and total vegetable crop in Chhattisgarh state is expected to increase by 20.33, 20.65, 15.23, 11.05, 16.52, 13.35 and 14.97 tones/hectares, respectively by the year 2030.

Medium term projections

As observed that the acreage of vegetable i.e. brinjal, tomato, potato, okra, onion, other and total vegetable crop in Chhattisgarh state is expected to increase by 71.20, 113.57, 81.95, 55.09, 60.18, 596.21 and 978.93 thousand hectares, respectively by the year 2040. The production of brinjal, tomato, potato, okra, onion, other and total vegetable crop in Chhattisgarh state is expected to increase by 1502.90, 2487.42, 1300.16, 623.90, 1000.13, 8143.34 and 15066.01 thousand tones, respectively by year 2050. The productivity of brinjal, tomato, potato, okra, onion, other and total vegetable crop in Chhattisgarh state is expected to increase by 21.10, 21.90, 15.23, 11.05, 16.52, 13.35 and 14.97 tones/hectares, respectively by the year 2040.

Long term projections

As observed that the acreage of vegetable i.e. brinjal, tomato, potato, okra, onion, other and total vegetable crop in Chhattisgarh state is expected to increase by 86.08,136.56, 98.28, 98.28, 75.72, 734.43 and 1197.98 thousand hectares, respectively by the year 2050. The production of brinjal, tomato, potato, okra, onion, other and total vegetable crop in Chhattisgarh state is expected to increase by 1860.10, 3108.56, 1581.12, 2437.15, 1262.91, 10573.78 and 18754.28 thousand tones, respectively by the year 2050. The productivity of brinjal, tomato, potato, okra, onion, other and total vegetable crop in Chhattisgarh state is expected to increase by 21.16, 22.73, 16.09, 38.93, 16.68, 13.85 and 15.64 tones/hectares, respectively by the year 2050.

Conclusion

The stability in area, production and yield of vegetable are low. There are least fluctuations in the area under vegetable while production of vegetable has fluctuated the most leading to the increasing imports to fulfil the short term demand and volatile vegetable prices. Yield of almost all the vegetable has shown higher fluctuations that may be due to its vulnerability to the weather as vegetable are mainly cultivated in rain fed areas. The stagnancy in the area of vegetable along with the high fluctuations in yield may be the reasons for poor performance of vegetable.

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