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

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

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

Dr. A Shrivastava
Professor, Department of Agricultural Economics and Farm management, JNKVV, Jabalpur

To analyse the dynamics of variation in area, production and productivity of spices crops in northern hills zone of Chhattisgarh

Reena, Shraddha Nayak, Satyanarayan Soni and Dr. A Shrivastava

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Abstract
The study was conducted in the northern hills zone of Chhattisgarh. The study was based on secondary data from 2004-05 to 2020-21. For the data was collected from the officials site of the Chhattisgarh agriculture development and farmer welfare and bio-technology department.

The area of major spices turned into determined to have turmeric area in increased 325.95 percent, the chilli are reduced by (-) 3.22 percent (-0.08 thousand hectares) and with a fluctuation of 16.39 percent. The other spices production increased by 186.53 percent, the garlic are reduced by 0.19 thousand hectares and with a fluctuation of total spices crop 27.04 percent. The other spices productivity increased 128.74 percent (3.40 metric tones per hectare), with a fluctuation of total spices crop 18.12 percent. The total area of the spice recorded in 2012-13 was 92,769 hectares, with production of 6,32,031 metric tonnes, but now by 2020-21 area under spices yields 4,49,353 metric tonnes in 67,756 hectare of land.

Keywords: Absolute change, relative change, coefficient of variation, area, production, productivity

Introduction
India is known as the "Spice Bowl of the World" for producing a wide variety of high quality spices. Which contributing nearly 75 percent of the world spices production the other major important countries are Turkey, Bangladesh, China and Indonesia. The growth of spices for various purposes has been popular since ancient times. There are records of various spices and their properties in the Vedas from 6000 BC. India is well known for its trade, from the time of the maritime exploration period, due to the variety of spices and high quality, which attracted foreigners to India. This is an important reason why India was invaded by European countries and ruled by war. Thus India is famous for its spices. Chhattisgarh produced 6.1 lakh metric tonnes of spices in 2013-14. The main spices produced are Chilli, Ginger and Turmeric. These three spices make up about 78 percent of the total spices produced in Chhattisgarh. Chilli, Ginger, Garlic, Turmeric, Coriander and Methi are the major spices grown in the state. The total area of the spice recorded in 2012-13 was 92,769 hectares. with production of 6,32,031 metric tonnes, but now by 2020-21 area under spices yields 67,756 hectares. With a production of 4,49,353 metric tonnes.

Materials and Methods
Selection of area
Chhattisgarh State divided into three agro-climate zones. The research was limited to the northern hills region of Chhattisgarh agro-climate zone. Six districts, namely Surguja, Surajpur, Balrampur, Korea, Jaspurnagar and Dharamjaigarh Tehsil of Raigarh region. are covered under the Northern Hill zone. The northern hills region of Chhattisgarh agro-climatic zones including six districts falling under it, namely Surguja, Surajpur, Balrampur, Korea, Jaspurnagar and Dharamjaigarh tehsil of Raigarh region, were chosen purposively for the study. As the hole state was reading under covered and researcher had limited occurs to of his zones.

Corresponding Author:
Reena
Ph.D. Scholar, Department of Agricultural Economics, Indira Gandhi Krishi Vishwavidyalaya, Raipur

Period of the study
The analysis spanned 17 years duration. This research had taken into account data for the period from 2004-05 to 2020-21. To analyze of absolute change, relative change and coefficient of variation related to spices area, production and productivity for overall period.

Nature and Source of data
This study was based on the secondary data obtained from the officials of the Chhattisgarh agriculture development and farmer welfare and bio-technology department. (Officials website. agriportal.cg.nic.in)

Analytical tools
Absolute change (AC)
Equation 1, Absolute change = $Y_n - Y_o$

Where,
Y= Area/Production /Productivity of the selected crop.
n= Average of the last three years of the study period (current year).
o= Average of initial three years of the study period (base year).

Relative change (RC)
Equation 2,

$$\text{Relative change} = \frac{Yn - Yo}{Yo} \times 100$$

Where,
Y= Area/Production /Productivity of the selected crop.
n= Average of the last three years of the study period (current year).
o= Average of initial three years of the study period (base year).

Measure coefficient of variation

$$\text{C.V. (\%)} = \frac{\sigma}{\bar{x}} \times 100$$

Where,
Mean, $(\bar{X})$ = Mean value of the variate and
S.D. (σ) = Standard deviation of the variate.

Results and Discussion
Absolute change, Relative change and coefficient variation in area, production and productivity of major spices crops northern hills zone of Chhattisgarh. Initially an attempt was made to determine the magnitude of change in area production and productivity of important spices crops of northern hills zone of Chhattisgarh taking resources of a simple measurement measuring absolute change, relative change and coefficient of variation at two point of time series, the details of methodology adopted in during at the changes has already been explained in the chapter of methodology. A crop wise discussion on the changes in area, production and productivity of the selected crops has been presented table.

Turmeric
Area of turmeric by 3.31 thousand hectares or 325.95 percent, from 1.01 a thousand hectares in base year to 4.32 a thousand hectares in current year.With a fluctuation of 40.20 percent. During the same period turmeric production increased by 18.16 thousand metric tonnes, from 14.63 thousand metric tonnes in the base year to 32.79 thousand metric tonnes in the current year, with a 38.89 percent variation. The productivity of turmeric decreased by 6.90 metric tonnes per hectare (47.63%), from 14.49 metric tonnes per hectare in base year to 7.59 metric tonnes per hectare in current year during the study period, with a yearly fluctuation of 38.21 percent.

Table 1: Crop wise absolute change, relative change and coefficient of variation of major spices crops Northern Hills Zone of Chhattisgarh

Crop	Area			Production			Productivity		
	Absolute Change (000 Ha)	Relative change (%)	C.V (%)	Absolute change (000 Metric tonne)	Relative change (%)	C.V. (%)	Absolute change (Metric tonnes/h)	Relative change (%)	C.V. (%)
1.Turmeric	3.31	325.95	40.2	18.16	124.11	38.89	-6.9	-47.63	38.21
2.Ginger	1.72	166.38	33.33	14.88	93.4	35.57	-4.04	-25.98	26.61
3.Coriander	1.18	151.52	31.76	3.00	65.89	45.25	-1.97	-33.73	48.95
4.Garlic	0.28	24.79	26.28	0.19	1.96	25.69	-1.6	-18.38	37.64
5.Chilli	-0.08	-3.22	46.68	3.02	22.05	59.75	1.48	27.22	23.01
6. Other spices	0.6	32.54	19.91	9.53	186.53	37.62	3.4	128.74	29.86
7. Total spices crop	7.18	84.49	16.39	51.58	81.86	27.04	-0.14	-1.84	18.12

Ginger
Ginger is another spice crops of the region and area of (*i.e.* 166.38%), from increased by 1.72 thousand hectares from 1.04 thousand hectares in base year to 2.76 thousand hectares in current year. With a fluctuation of 33.33 percent. During the same period, production also increased by 14.88 thousand metric tonnes by 93.40 percent from 15.93 thousand metric tonnes in the base year to 30.82 thousand metric tonnes in the current year, with a 35.57 percent coefficient of variation. Here again the productivity of ginger crop decreased by 4.04 metric tonnes per hectare (25.98%), from 15.54 metric tonnes per hectare in base year to 11.50 metric tonnes per hectare in current year. The annual fluctuation was reported at 26.61 percent per year.

Coriander
Area of coriander by 1.18 thousand hectares or 151.52 percent, from 0.78 a thousand hectares in base year to 1.16 a thousand hectares in current year.With a fluctuation of 31.76 percent. During the same period, production also increased by 3.00 thousand metric tonnes by 65.89 percent from 4.56 thousand metric tonnes in the base year to 7.56 thousand metric tonnes in the current year, with a 45.25 percent coefficient of variation. The productivity of coriander decreased by 1.97 metric tonnes per hectare (33.73%), from 5.85 metric tonnes per hectare in base year to 3.88 metric tonnes per hectare in current year during the study period, with a yearly fluctuation of 48.95 percent.

Garlic
Area of garlic increased by 0.28 thousand hectares or 24.79 percent, from 1.12 thousand hectares in base year to 1.40 thousand hectares in current year. With a annual fluctuation of 26.28 percent. During the same period, production also increased by 0.19 thousand metric tonnes or by 1.96 percent from 9.75 thousand metric tonnes in the base year to 9.94 thousand metric tonnes in the current year, with a 25.69 percent coefficient of variation. It may be seen from the table that through the production and area of garlic crop resisterd are increased over the period of study the productivity whenever, registerd a decline by 1.60 metric tonnes per hectare (18.38%), from 8.69 metric tonnes per hectare in base year to 7.10 metric tonnes per hectare in current year during the study period, with a yearly fluctuation of 37.64 percent.

Chilli
Area of chilli decreased by 0.08 thousand hectares 3.22 percent, from 2.50 thousand hectares in base year to 2.42 thousand hectares in current year. With a annual fluctuation of 46.68 percent. During the same peiod, production also increased by 3.02 thousand metric tonnes by 22.05 percent from 13.71 thousand metric tonnes in the base year to 16.73 thousand metric tonnes in the current year, with a 59.75 percent coefficient of variation. The productivity of chilli increased by 1.48 metric tonnes per hectare or (27.22%), from 5.43 metric tonnes per hectare in base year to 6.91 metric tonnes per hectare in current year during the study period, with a yearly fluctuation of 23.01 percent.

Other spices Crops
Area of "other spices" increased by 0.60 thousand hectares (32.54%), from 1.84 a thousand hectares in base year to 2.44 a thousand hectares in current year. With a annual fluctuation of 19.91 percent. During the same period production also increased by 9.53 thousand metric tonnes by 186.53 percent from 5.11 thousand metric tonnes in the base year to 14.63 thousand metric tonnes in the current year, with a 37.62 percent coefficient of variation. The productivity of "other spices" reported an increased in the yield by 3.40 metric tonnes per hectare (128.74%), from 2.64 metric tonnes per hectare in base year to 6.04 metric tonnes per hectare in current year during the study period, with a yearly fluctuation of 29.86 percent.

Total spices crop
Over all the area of total spices increased by 7.18 thousand hectares or 84.49 percent, from 8.50 a thousand hectares in base year to 15.68 a thousand hectares in current year. With a fluctuation of 16.39 percent. During the same period production also increased by 51.58 thousand metric tonnes or by 81.86 percent from 63.01 thousand metric tonnes in the base year to 114.59 thousand metric tonnes in the current year, with a 27.04 percent coefficient of variation. The productivity of total spices decreased by 0.14 metric tonnes per hectare (1.84%), from 7.45 metric tonnes per hectare in base year to 7.31 metric tonnes per hectare in current year during the study period, with a yearly fluctuation of 18.12 percent in northern hills zone of Chhattisgarh.

Conclusion
Other spices show low coefficient of variation due to aggregation effect turmeric, coriander and other spices production coefficient of variation reflects coefficient variation of respective productivity coefficient variation while ginger, garlic and chilli production coefficient variation reflects respective area coefficient variation.

So accordingly for minimizing production coefficient of variation of turmeric, coriander and other spices, coefficient of variation are needs to be stabilized while for minimizing production coefficient variation of ginger, garlic and chilli respective productivity coefficient variation needs to be minimize.

The result shows that turmeric, ginger and coriander productivity decline needs to be reversed with strong policy intervention.

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