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Study on trend and growth rate of ginger production in different agro-climatic zones of Chhattisgarh

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Abstract

This research investigates the growth trajectory and production trends of ginger across different agro-climatic zones of Chhattisgarh, India. As an important cash crop, ginger contributes substantially to the region's agricultural economy, yet its yield is highly dependent on factors such as rainfall, temperature, soil characteristics, and irrigation practices. Drawing upon secondary data from government agricultural reports, field surveys, and historical yield records, the study evaluates production patterns over the past decade. Analytical methods, including trend analysis and the Compound Annual Growth Rate (CAGR), were employed to measure fluctuations and regional variations in output. The results highlight notable disparities among zones, with certain regions recording consistent improvements in production, while others exhibit stagnation or decline. Key determinants of productivity were identified, and recommendations were proposed, including the adoption of improved crop management techniques, efficient irrigation methods, and region-specific policy interventions. The findings provide valuable insights to enhance ginger cultivation and promote sustainable growth within the state's agricultural sector.

Keywords: Ginger production, agro-climatic zones, Chhattisgarh, trend analysis, CAGR

Introduction

Ginger (*Zingiber officinale*), commonly known as ginger root, is the rhizome of a perennial plant that has been valued for centuries as a spice, medicinal ingredient, and culinary delicacy. The crop lends its name to the genus Zingiber and the family Zingiberaceae, which also includes other significant species such as turmeric, cardamom, and galangal. Interestingly, some distantly related plants of the genus Asarum are referred to as "wild ginger" because of their similar flavour.

India is often described as the "spice bowl of the world" owing to its diversity and superior quality of spices. Spices are cultivated across the country under a wide range of climatic conditions, from tropical to temperate zones, making India home to the highest number of spice varieties worldwide. For more than 5,000 years, ginger has been regarded as a "universal medicine" in ancient Chinese and Indian traditions, valued for its therapeutic role in alleviating nausea, indigestion, fever, and infections, while also enhancing vitality and longevity. Even today, ginger constitutes a major ingredient in over half of the world's traditional herbal formulations. Although the crop is grown across India, Kerala is especially renowned for producing premium-quality ginger due to its fertile soils and favourable climate. Major ginger-producing states include Karnataka, Odisha, Assam, Meghalaya, Arunachal Pradesh, and Gujarat, which together contribute nearly 65% of India's total output.

India's spice sector plays a vital role in the global market. With 107 spices traded internationally, about 20 countries are involved in their production and export, of which India alone contributes around 50. During 2013-14, the country produced approximately 5,908.29 thousand metric tonnes of spices from 3,163.24 thousand hectares, with an average productivity of 18.7 quintals per hectare (Indian Horticulture Database, 2013-14). Spices from India are exported to more than 134 countries, and exports during the same period were valued at Rs. 11,800 million. India is the world's leading producer of ginger, contributing nearly 86% of global spice production, followed by China (4%), Bangladesh (3%), Pakistan (2%), Turkey (2%), and Nepal (1%) (Spices Board of India, 2013-14). While ginger is cultivated in most Indian states, Kerala, Karnataka, Odisha, Assam, Meghalaya, Arunachal Pradesh, Rajasthan, and Gujarat together account for about two-thirds of the country's production (Indian Institute of Spices Research, 2014).

The Indian spice industry is valued at approximately Rs. 40,000 crore annually and continues to expand steadily. Key spices produced include pepper, cardamom, chilli, ginger, turmeric, coriander, cumin, celery, fennel, fenugreek, ajwain, dill seed, garlic, tamarind, clove, and nutmeg, among others. At present, India exports about 52 spices out of the 109 recognised by the Indian Standards Institute. The nation's diverse climatic conditions—ranging from tropical to subtropical and temperate—support the cultivation of

nearly all types of spices. India accounts for nearly 45% of global spice exports, and the industry serves as an important driver of rural employment and income generation, with almost all states contributing to spice production.

Materials and Methods

The present chapter provides a concise account of the data collection procedures and analytical techniques employed to achieve the stated objectives. The methodology specifically focuses on examining the trends and growth rates of area, production, and productivity of ginger cultivation across different agro-climatic zones of Chhattisgarh.

Selection of Area

The study is confined to all the agro-climatic zones of Chhattisgarh. The state is broadly classified into three distinct zones: the Chhattisgarh Plains, the Bastar Plateau, and the Northern Hills, collectively encompassing 27 districts.

Description of Agro-Climatic zones of Chhattisgarh

There are 3 Agro climatic zones in Chhattisgarh

Zone-1 (Chhattisgarh Plains): Raipur, Gariyaband, Balodabazar, Mahasamund, Dhamtari, Durg, Balod, Bemetara, Rajnandgaon, Kabirdham, Bilaspur, Mungeli, Korba, Janjgir-Champa, Raigarh & a part of Kanker Districts (Narharpur &Kanker Block)

Zone-2 (Bastar Plateau): Jagdalpur, Narayanpur, Bijapur, Kondagaon, Dantewada, Sukma and the remaining part of Kanker Districts

Zone-3 (Northern Hills): Surguja, Surajpur, Balrampur, Koria, Jashpur &Dharamjaigarh Tehsil of Raigarh Districts

Selection of Crop

In Chhattisgarh, ginger is one of the most important spice crops, cultivated over an area of approximately 12,715 hectares, which represents about 13.58% of the total area under spice cultivation in the state. For the present study, ginger was chosen as the focal crop to assess its trends in production and productivity across the different agro-climatic zones of Chhattisgarh.

Period of Study

The analysis data from 2005-06 to 2019-20 would be used to analyze the Trend and growth rate policy related to Ginger production for the overall period.

Period- (2005-06 to 2019-20)

Base year- TE-2007-08
Current Year- TE-2017-18

Source of Data

The present study is based on secondary data, which will be collected from authentic and reliable sources:

Directorate of Horticulture and farm Forestry Chhattisgarh.
Spices Board of India and other Published records.
Period of Study

The data is collected for the period of 15 years from 2005-06 to 2019-20.

Analytical tools

Trend

To assess the growth rates of ginger cultivation in Chhattisgarh, trend analysis was conducted using the linear trend method.
Linear trend, Y = a + b x

Where,
Y= Dependent variables (Area, Production and Yield)
a = Intercept
b = Regression co-efficient
x = Period
N=Sample size

Simple Growth Rate (SGR)

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

Compound Growth Rate (CGR)

To know the actual growth rate for each year the compound growth rate is worked out as;

$Y = ab^2t$

CGR (%) = (Antilog b - 1) x 100

Results

Trend and Growth Performance of ginger in different Agro-climatic zones of Chhattisgarh

Trend and growth rate

Over the study period, the area under ginger cultivation exhibited a relatively low but significant growth rate of 8.13% in the Bastar Plateau, followed by 6.68% in the Chhattisgarh Plains and 4.95% in the Northern Hills. Similarly, production also recorded a low yet significant growth rate, highest in the Bastar Plateau (9.62%), followed by the Chhattisgarh Plains (8.38%) and the Northern Hills (4.53%). With respect to productivity, ginger yield showed a marginal increase in the Bastar Plateau (2.90%) and the Chhattisgarh Plains (1.45%), whereas a negative growth of -1.02% was observed in the Northern Hills. Overall, the study revealed that ginger in Chhattisgarh registered growth rates of 6.42% in area, 7.43% in production, and 0.65% in productivity.

Trend and Growth Performance of ginger in different Agro-climatic zones of Chhattisgarh

Trend and growth rate of Ginger crop in Different Agro-climatic Zones of Chhattisgarh State.

The simple growth rate of area of Ginger was found to be increased in Chhattisgarh plains 6.68 percent per annum, while production and productivity were found to be increased by 8.38 (percent) and 1.45 (percent) per annum and significant.

Bastar plateaus the area was increased by 8.13 percent per annum, in significant but the production and productivity were increased by (9.62 and 2.90) percent, and Northern Hills Zones of Chhattisgarh area of Ginger were found to be Decreased 4.95 Percent per annum in significant while

production and productivity were found to be Decreased by 4.53 percent and -1.02 Percent.

Compound growth rate of area of Ginger were found to be Decreased in Chhattisgarh plains 8.62 percent per annum, while production and productivity were found to be increased by 10.28 (percent) and 1.52 (percent) per annum and significant. in Bastar plateau the area was highly increased in 14.03 percent per annum, in significant but the production and productivity were increased by (17.83 and 3.34) percent, and Northern Hills Zones of Chhattisgarh area of Ginger were found to be Decreased 6.09 Percent per annum in non significant while production and productivity were found to be Decreased by 5.39 percent and -0.65 Percent.

Table 1: Trend and Growth Rate of Area in Ginger in Different Agro-Climatic Zones of Chhattisgarh

S. No.	Agro-climatic Zones	Area (000'ha.)		
		Coefficient of b	Simple growth rate %	Compound growth rate %
1	Chhattisgarh Plains	0.41** (0.04)	6.68	8.62
2	Bastar Plateau	0.09** (0.01)	8.13	14.03
3	Northern Hills	0.13** (0.02)	4.95	6.09
4	Chhattisgarh State	0.62**	6.42	8.17

Table 2: Trend and Growth Rate of Production in Ginger in Different Agro-Climatic Zones of Chhattisgarh

S. No.	Agro-climatic Zones	Production (000'ton.)		
		Coefficient of b	Simple growth rate %	Compound growth rate %
1	Chhattisgarh Plains	5.93** (0.36)	8.38	10.28
2	Bastar Plateau	0.81** (0.39)	9.62	17.83
3	Northern Hills	1.34** (0.34)	4.53	5.39
4	Chhattisgarh State	8.08**	7.43	8.98

Table 3: Trend and Growth Rate of Productivity in Ginger in Different Agro-Climatic Zones of Chhattisgarh

S. No.	Agro-climatic Zones	Productivity (ton/ha)		
		Coefficient of b	Simple growth rate %	Compound growth rate %
1	Chhattisgarh Plains	0.17** (0.07)	1.45	1.52
2	Bastar Plateau	0.21** (0.05)	2.90	3.34
3	Northern Hills	-0.12* (0.13)	-1.02	-0.65
4	Chhattisgarh State	0.07**	0.65	0.74

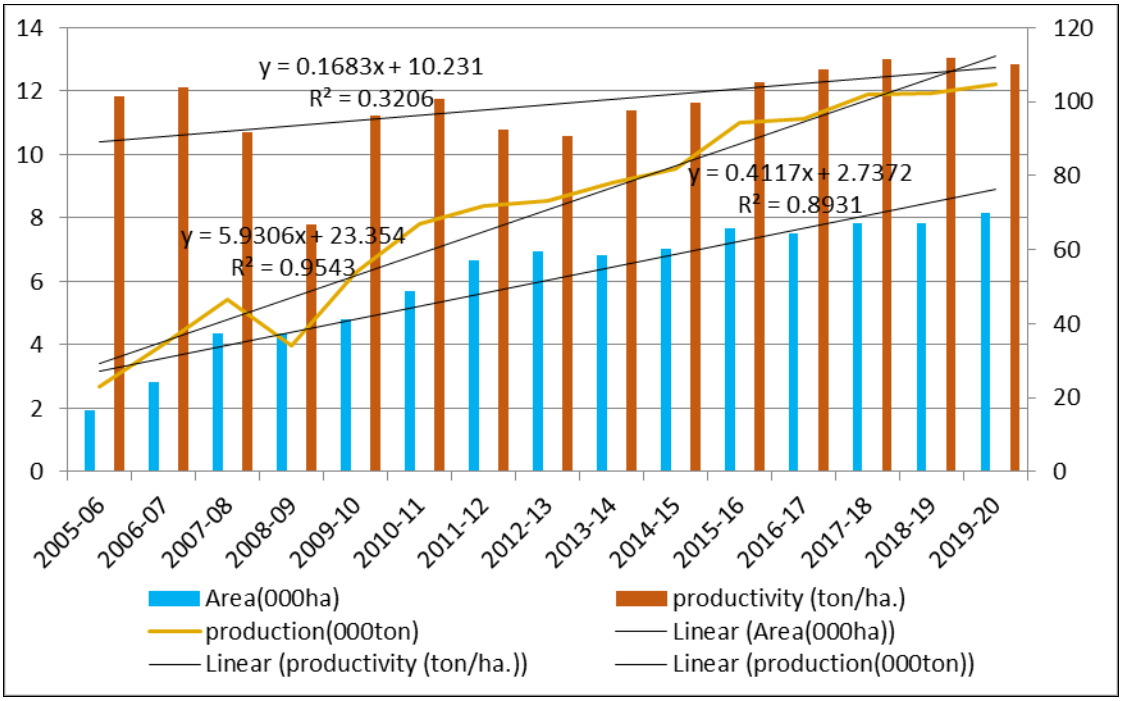

Fig 1: The trend on Area, Production and Productivity of ginger in Chhattisgarh Plains Zones of Chhattisgarh state

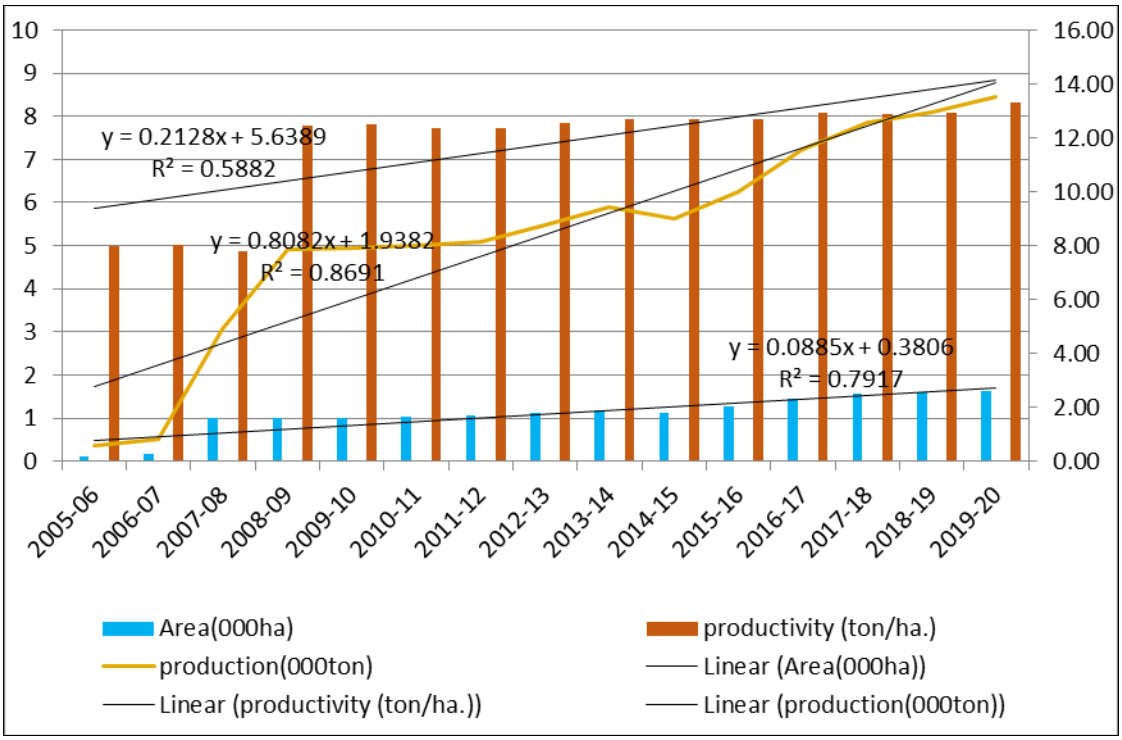

Fig 2: The trend on Area, Production and Productivity of ginger in Bastar plateau Zones of Chhattisgarh state

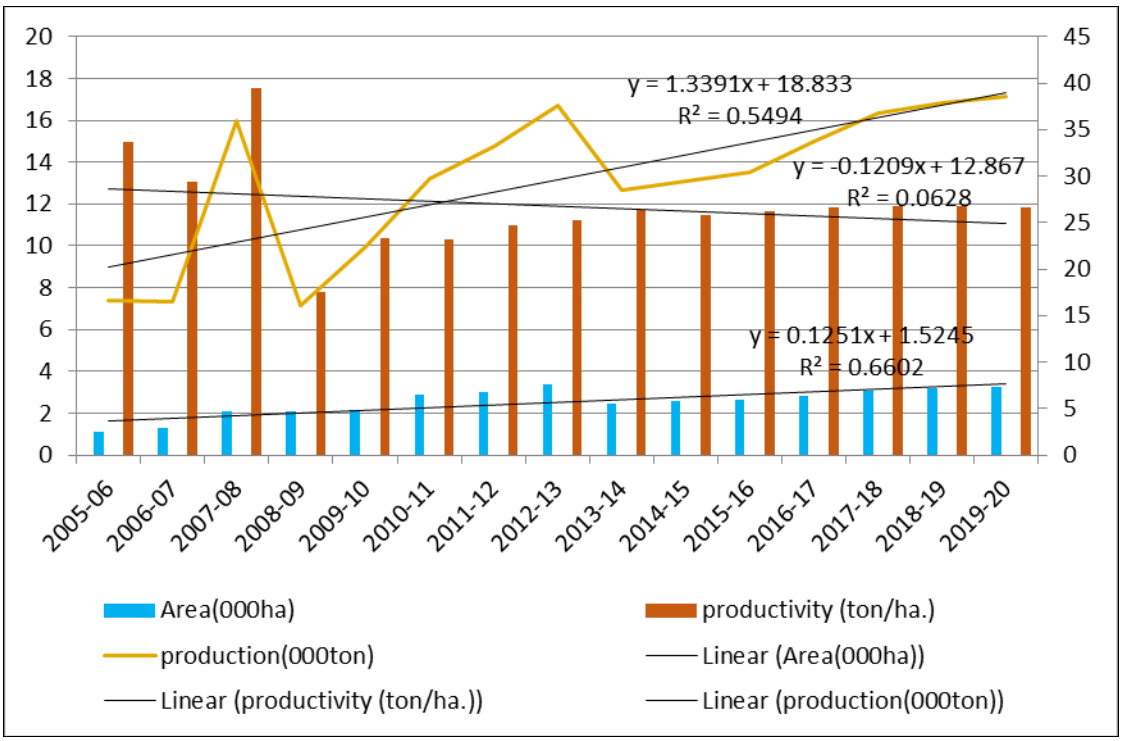

Fig 3: The trend on Area, Production and Productivity of ginger in Northern Hills Zones of Chhattisgarh state

Conclusion

Summary

Chhattisgarh, widely recognized as the "rice bowl" of India due to its substantial rice production, also holds considerable importance in the cultivation of spices. The state's diverse agro-climatic conditions provide favourable opportunities for growing a wide range of spice crops. During 2019-20, spices were cultivated on approximately 93,588 hectares in Chhattisgarh, with a total production of about 6.59 metric tonnes (Directorate of Horticulture and Farm Forestry, Chhattisgarh, 2019-20). Among the major spices cultivated, turmeric, coriander, chilli, and onion occupy a prominent position. The Chhattisgarh Plains alone account for nearly 62% of the total area under spice cultivation in the state. The prosperity of the region and the economic security of growers largely depend on achieving an optimum scale of spice production. However, the cultivation of spices is often associated with high risk due to their perishable nature, which makes efficient management and marketing crucial for sustaining farmers' income.

Ginger covers one third of total cultivated area of Spices Crops in Chhattisgarh state. It provides Spices to more than half of the Chhattisgarh population. Turmeric is the second most important spices crop of Chhattisgarh after Ginger. Ginger is the principal Spices crop extensively cultivated in all the zones of the Chhattisgarh state both in kharif and rabi seasons total cropped area 13.58 percent under the total area during 2019-20. The area under during 2018-19 was 12.73 hectare the production of ginger during 2018-19 was at 153.74 tone the productivity of ginger is 12.07 tone/hectare hence selected for the growth rate study.

Major Findings

In the Chhattisgarh Plains, the overall area, production, and productivity of ginger increased by 62% (7.95 thousand hectares), 67% (103.01 thousand tonnes), and 39% (12.96 tonnes/ha), respectively. In the Bastar Plateau, these parameters also recorded growth, with area increasing by 13% (1.60 thousand hectares), production by 8% (13.02 thousand tonnes), and productivity by 25% (8.15 tonnes/ha). Similarly, in the Northern Hills zone, the area under ginger cultivation rose by 25% (3.18 thousand hectares), production by 25% (37.71 thousand tonnes), and productivity by 36% (11.87 tonnes/ha).

The compound annual growth rate (CAGR) further highlights these trends. In the Chhattisgarh Plains, the CAGR of area, production, and productivity was 8.62%, 10.28%, and 1.52%, respectively, all showing an increasing pattern. In contrast, the Northern Hills registered a positive CAGR for area (6.09%) but a decline in productivity (-0.65%) and a lower production growth (5.39%). The Bastar Plateau showed the most notable gains, with the CAGR of area, production, and productivity recorded at 14.03%, 17.83%, and 3.34%, respectively.

The overall compound growth rate of area, production and productivity in Chhattisgarh state was (8.17%, 8.98% and 0.74%) increased. The highest area effect of Chhattisgarh State in Northern Hills (175.37%) followed by Chhattisgarh plain zone (83.39%) and Bastar Plateau (53.08%).

The yield effect of highest due to area contribution was Bastar Plateau (12.47%) followed by Chhattisgarh plain (6.04%), Northern Hills (-33.00%). The interaction effect highest was Bastar Plateau (34.03%) followed Chhattisgarh Plains (9.82%) and northern hills (-38.08%) of Chhattisgarh state.

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