

International Journal of Agriculture Extension and Social Development

Volume 9; Issue 8; August 2026; Page No. 1147-1155

Received: 10-06-2026
Accepted: 14-07-2026

Indexed Journal
Peer Reviewed Journal

To analyse the growth rate of area, production and productivity of rhizomatous spice crops in northern hills zone and Chhattisgarh

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DOI: <https://www.doi.org/10.33545/26180723.2026.v9.i8o.4146>

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Abstract

The study analyzed the growth performance of turmeric and ginger in Chhattisgarh State and the Northern Hills Zone during 2005-06 to 2024-25. Turmeric showed higher growth, with area and production increasing by 6.59 and 6.56 per cent per annum in Chhattisgarh and 6.40 and 5.13 per cent in the Northern Hills Zone, respectively. However, productivity showed marginal negative growth in both regions. Ginger recorded comparatively slower growth, with area and production increasing by 2.56 per cent each at the state level and 1.07 and 0.77 per cent in the Northern Hills Zone, while productivity remained almost stagnant. Overall, production growth was mainly areadriven rather than productivity-driven. The findings highlight the need for improved planting material, irrigation, nutrient management, disease control, scientific cultivation practices and better marketing infrastructure to enhance productivity and sustain growth

Keywords: Compound growth rate, Area, Production, Productivity

Introduction

Almost all the states in India are producing spices. Andhra Pradesh is the largest spice producer of Chilli and Turmeric, Rajasthan emerges as the largest producer of Coriander, Cumin and Fenugreek, Kerala tops in Pepper, Cardamom and Ginger production. India export market share accounts for 38% of Chilli, 29% of Ginger, 78% of Turmeric, 10% of Pepper, 31% of Cardamom.

Spices are most profitable venture at all farming activities as it provides sample employment opportunities and slope to raise income of the farming community. They blend food to extract the nutrients and bind them in a palatable form. India is considered as kingdom of spices. India contributes 75% of global spice production. There are 107 spices with 20 countries being involved in the production and Export (Spices Board India, 2023).

The total area under spices in Chhattisgarh year 2024-25 was 67,325 hectares, with a total production of 4,66,482 metric tonnes. Among the rhizomatous spice crops, turmeric occupied 11,868 hectares (17.62%), while ginger covered 7,056 hectares (10.48%). Turmeric recorded the production of 1,06,959 metric tonnes (22.92%), followed by ginger with

68,304 metric tonnes (14.64%) (agriportal.cg.nic.in, 2024). In the Northern Hills Zone, among the rhizomatous spice crops, turmeric occupied 5,456 hectares (45.97%) with a production of 47,453 metric tonnes (44.36%), while ginger covered

1,893 hectares (26.82%) with a production of 21,105 metric tonnes (30.89%) (agriportal.cg.nic.in 2024).

2. Material and Methods

2.1. Selection of area

The present study was conducted in the Northern Hills Zone of Chhattisgarh, which has considerable potential for the cultivation of rhizomatous spice crops, particularly turmeric and ginger. The study area was selected considering the importance and potential of these crops in the region.

2.2. Selection of district

Out of 3 Agro climatic zones & 33 district of Chhattisgarh, four districts of Northern Hills Zone, namely Balrampur, Korea, Surguja and Raigarh districts, were purposively selected for the study based on their relatively highest area covered turmeric and ginger cultivation. These districts were

selected considering their potential for the production of rhizomatous spice crops and their importance in the study area.

2.3. Secondary Data Collection

The secondary data will be collected through different Government offices such as Government of Chhattisgarh Agriculture Development and Farmer Welfare and Bio - Technology Department (agriportal.cg.nic.in), Directorate of Statistics Government of Chhattisgarh.

2.4. Crops covered under the study

Major rhizomatous spice crops (Area) northern hills of Chhattisgarh Turmeric and Ginger.

2.5. Study period

The data required will be collected for the period of 20 years from 2005-06 to 2024-25.

2.6. Analytical tools

Compound Growth Rate (CGR)

The compound growth rate per annum over the period for all the variables was calculated from the following formula- The compound growth rates (CGR) used to examine the growth rate in area, production and productivity of rhizomatous spice crops in northern hills Chhattisgarh state as a whole, using the exponential growth function of the following form.

$$Y = ab^t$$

Where,

- Y= Dependent variable to be estimated (area, production, productivity)
- A= Intercept
- B= Regression Coefficient t = Time variable

The equation will be estimated after transforming as follows

$$\log Y = a + b^t$$

Where,

- = Log A
- = Log B

Then, the % compound growth rate (G) was calculated using the relationship

$$CGR = [(Antilog \text{ of } b) - 1] \times 100$$

3. Results and Discussion

3.1. Compound growth rate of area, production and productivity of rhizomatous spice crops

3.1.1. Compound Growth Rate of Turmeric

Table 1 presents the compound growth rate (CGR) of area, production and productivity of turmeric in Chhattisgarh State and the Northern Hills Zone (NHZ) during 2005-06 to 2024-25. The analysis indicates a strong expansion of turmeric cultivation during the study period, particularly in terms of area and production.

3.1.1.1. Turmeric in Chhattisgarh State

At the state level, the area under turmeric recorded a positive

growth rate of 6.59 per cent per annum. The growth was statistically significant, indicating a consistent increase in the area devoted to turmeric cultivation during the study period. The expansion in turmeric area suggests increasing farmer interest in the crop and its growing importance within the horticultural and spice-crop sector of Chhattisgarh.

Turmeric production registered a positive CGR of 6.56 per cent per annum, indicating substantial growth in total output. The simultaneous increase in area and production suggests that expansion of the cultivated area was an important contributor to the increase in turmeric production. In contrast, turmeric productivity recorded a marginal negative CGR of -0.03 per cent per annum. The corresponding p-value was 0.95, indicating that the change in productivity was statistically non-significant. Thus, despite substantial growth in area and production, there was practically no improvement in productivity during the study period.

The results therefore indicate that the growth in turmeric production at the state level was primarily area-driven rather than productivity-driven. The stagnation in productivity highlights the need to emphasize improved varieties, quality planting material, balanced nutrient management, irrigation, disease management and scientific crop-management practices.

Similar findings were reported by Sahu, Sushila and Limje (2021) ^[9], who studied turmeric in Bemetara district and Chhattisgarh. They reported compound growth rates of 2.69 per cent in area, 2.62 per cent in production and -0.06 per cent in productivity per annum in Chhattisgarh. The positive growth in area and production, accompanied by a marginal decline in productivity, is broadly consistent with the present findings.

3.1.1.2. Turmeric in Northern Hills Zone

The Northern Hills Zone recorded a positive CGR of 6.40 per cent per annum in turmeric area, indicating substantial expansion of cultivation during 2005-06 to 2024-25. The strong growth in area demonstrates the increasing importance of turmeric in the agricultural economy of the Northern Hills region.

Turmeric production in the Northern Hills Zone increased at a rate of 5.13 per cent per annum. The reported p-value of 0.0001 indicates a highly significant growth trend. Thus, turmeric production showed a strong and statistically meaningful upward trend in the region.

However, turmeric productivity registered a negative CGR of -1.20 per cent per annum. The p-value of 0.16 indicates that this decline was statistically non-significant. Hence, the increase in production was not supported by an improvement in yield per unit area. Instead, the expansion in production was largely associated with increased area under cultivation. The results indicate considerable potential for turmeric cultivation in the Northern Hills Zone. However, maintaining long-term production growth will require greater emphasis on productivity enhancement rather than further expansion of cultivated area alone. Adoption of improved planting material, integrated nutrient management, improved irrigation practices, disease and pest management and better extension support could contribute to productivity improvement.

Overall, turmeric performed strongly in both Chhattisgarh State and the Northern Hills Zone. The area under turmeric

increased at 6.59 per cent per annum at the state level and 6.40 per cent per annum in the Northern Hills Zone. Production increased by 6.56 per cent and 5.13 per cent per annum, respectively.

The relatively high growth in area and production indicates that turmeric is becoming an increasingly important rhizomatous spice crop in Chhattisgarh. However, productivity showed a marginal negative trend in both regions. Therefore, the future strategy for turmeric development should focus on raising productivity, reducing production constraints and improving post-harvest and marketing infrastructure.

Similar findings were reported by Sahu, Sushila and Limje (2021) ^[9], who studied turmeric in Bemetara district and Chhattisgarh. They reported compound growth rates of 2.69 per cent in area, 2.62 per cent in production and -0.06 per cent in productivity per annum in Chhattisgarh. The positive growth in area and production, accompanied by a marginal decline in productivity, is broadly consistent with the present findings.

Similarly, Ram *et al.* (2023) ^[11] analysed the growth performance of turmeric in Surguja district and Chhattisgarh and observed positive growth in area and production, whereas productivity recorded a negative and significant growth trend. Their findings support the present study, indicating that the increase in turmeric production was mainly associated with expansion in cultivated area rather than improvement in productivity.

3.1.1.3. Compound Growth Rate of Ginger

Table 1 also presents the compound growth rate of area, production and productivity of ginger in Chhattisgarh State and the Northern Hills Zone during 2005-06 to 2024-25. Compared with turmeric, ginger exhibited relatively slower growth during the study period.

3.1.1.4. Ginger in Chhattisgarh State

At the state level, the area under ginger recorded a positive CGR of 2.56 per cent per annum. The reported p-value of 0.07 indicates that the growth was significant at the 10 per cent level. This suggests a gradual but statistically meaningful expansion in ginger cultivation during the study period.

Production of ginger also recorded a positive growth rate of 2.56 per cent per annum. However, the reported p-value of 0.10 indicates that the growth was statistically non-significant at the conventional 10 per cent level. Although production followed an increasing trend, the rate of increase was not sufficiently consistent to establish statistically significant growth.

Ginger productivity recorded an almost negligible positive CGR of 0.0043 per cent per annum, with a p-value of 0.99. This indicates that productivity remained virtually unchanged during the study period. Therefore, the modest increase in ginger production was mainly associated with expansion in cultivated area rather than improvement in productivity.

The findings suggest that ginger production in Chhattisgarh has considerable scope for productivity improvement. The adoption of improved varieties, quality planting material, better disease management, irrigation facilities and scientific

crop-management practices may help increase output per unit area.

Similarly, Sharma *et al.* (2022) ^[12] reported positive growth rates of 4.85, 9.17 and 4.11 per cent per annum in area, production and productivity of ginger, respectively, during 2001-02 to 2016-17. The authors emphasized the importance of good-quality varieties and scientific cropmanagement practices for enhancing ginger productivity.

3.1.1.5. Ginger in Northern Hills Zone

In the Northern Hills Zone, ginger recorded a positive CGR of 1.07 per cent per annum in area. However, the corresponding p-value of 0.44 indicates that this growth was statistically non-significant. Thus, although the area under ginger showed an increasing tendency, the expansion was relatively slow and inconsistent.

Production of ginger in the Northern Hills Zone increased at 0.77 per cent per annum, with a p-value of 0.56. The growth was statistically non-significant, indicating that there was no strong evidence of a sustained increase in ginger production during the study period.

Productivity recorded a marginal negative CGR of -0.30 per cent per annum, with a p-value of 0.65. The decline was statistically non-significant, suggesting that productivity remained broadly stable during the period under consideration.

The slow growth of ginger in the Northern Hills Zone may indicate the presence of production and marketing constraints. Limited availability of quality planting material, disease incidence, inadequate irrigation, high production costs, price fluctuations and weak post-harvest management may restrict the expansion and profitability of ginger cultivation.

Ginger showed considerably lower growth than turmeric in both geographical areas. At the state level, ginger area and production increased at 2.56 per cent per annum, compared with the much higher growth recorded for turmeric. In the Northern Hills Zone, ginger area increased by 1.07 per cent and production by only 0.77 per cent per annum. Productivity growth was negligible for ginger at both levels. At the state level, productivity increased by only 0.0043 per cent per annum, while in the Northern Hills Zone it declined marginally by -0.30 per cent per annum. Both changes were statistically non-significant.

Therefore, the growth performance of ginger indicates that area expansion alone has not generated substantial production growth, while productivity improvement has remained largely stagnant. Greater emphasis should consequently be placed on technological interventions, improved planting material, irrigation, disease management, extension services and efficient marketing systems.

Similarly, Karthick *et al.* (2015) ^[13] examined the growth and export performance of ginger in India and reported an overall compound growth rate of 3.57 per cent in area, 5.48 per cent in production and 1.85 per cent in productivity. Their findings indicate that expansion in area and improvements in productivity contributed to ginger production growth, highlighting the importance of technological interventions for sustaining production.

Table 1: Compound Growth Rate (CGR) of Area, Production and Productivity of Turmeric & Ginger in the Chhattisgarh state & Northern hills zone (Year 2005-06 to 2024-25)

S. No.	Rhizomatous Spices Crops	Chhattisgarh state						Northern hills zone					
		Area		Production		Productivity		Area		Production		Productivity	
		CGR	P-Value	CGR	P-Value	CGR	P-Value	CGR	P-Value	CGR	P-Value	CGR	P-Value
1	Turmeric	6.59***	2.28	6.56***	2.18	-0.03 ^{NS}	0.95	6.40***	1.11	5.13***	0.0001	-1.20 ^{NS}	0.16
2	Ginger	2.56*	0.07	2.56 ^{NS}	0.10	0.0043 ^{NS}	0.99	1.07 ^{NS}	0.44	0.77 ^{NS}	0.56	-0.30 ^{NS}	0.65

Note: *** denote significant at 1 percent level of significance, ** denote significant at 5 percent level of significance, *denote significant at 10% level of significance, NS= Not Significant

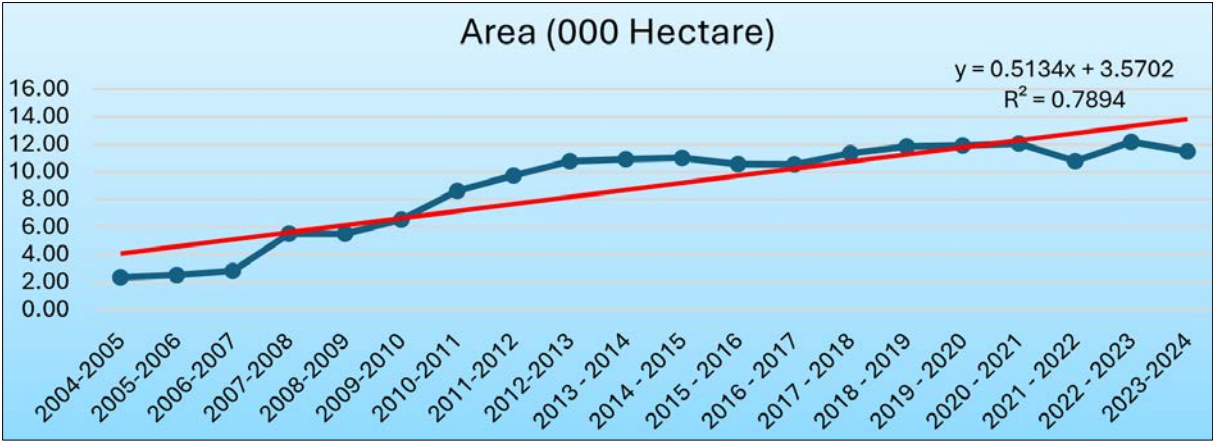


Fig 1: Trend of area under of turmeric in Chhattisgarh state

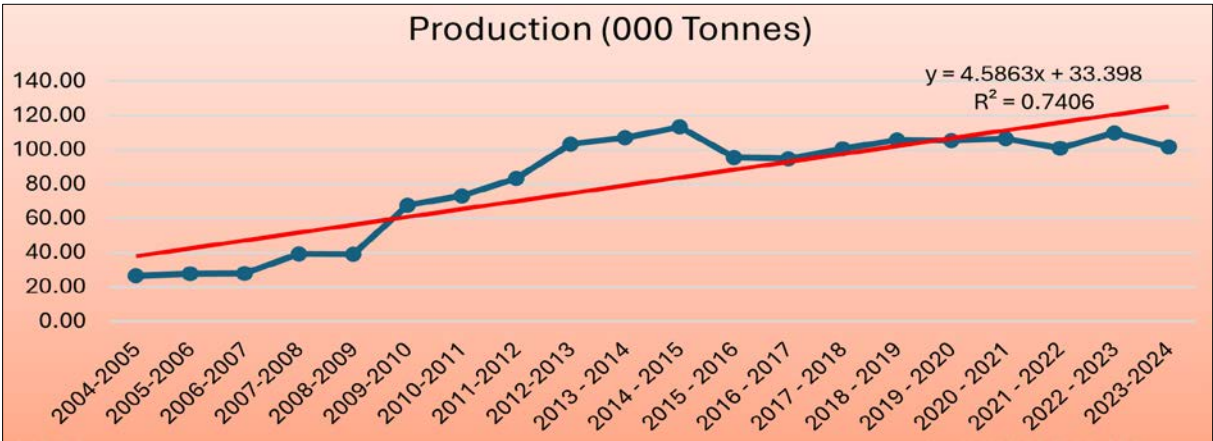


Fig 2: Trend of production under of turmeric in Chhattisgarh state

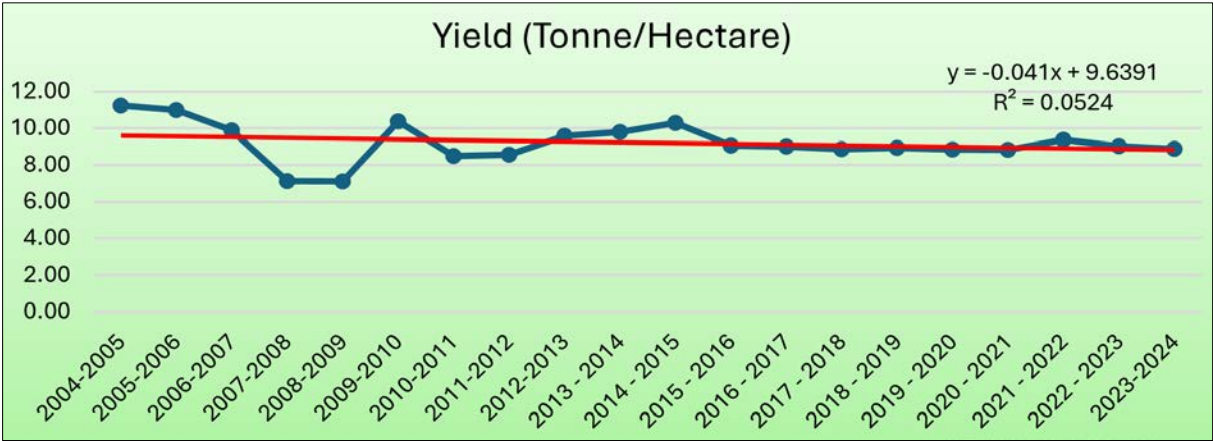


Fig 3: Trend of productivity under of turmeric in Chhattisgarh state

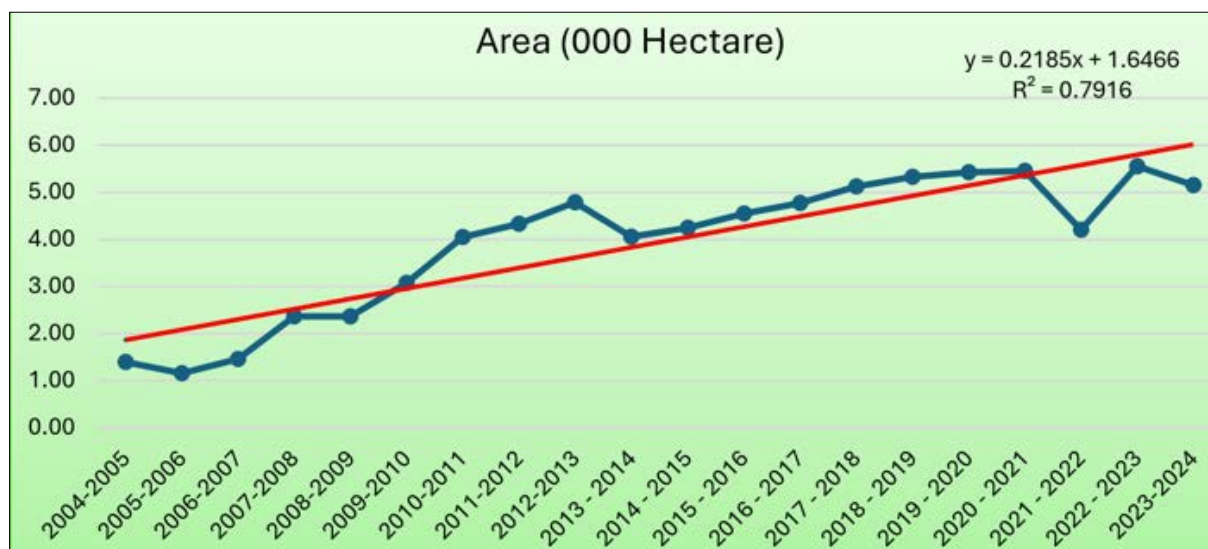


Fig 4: Trend of area under of turmeric in Northern Hill Zone of Chhattisgarh State

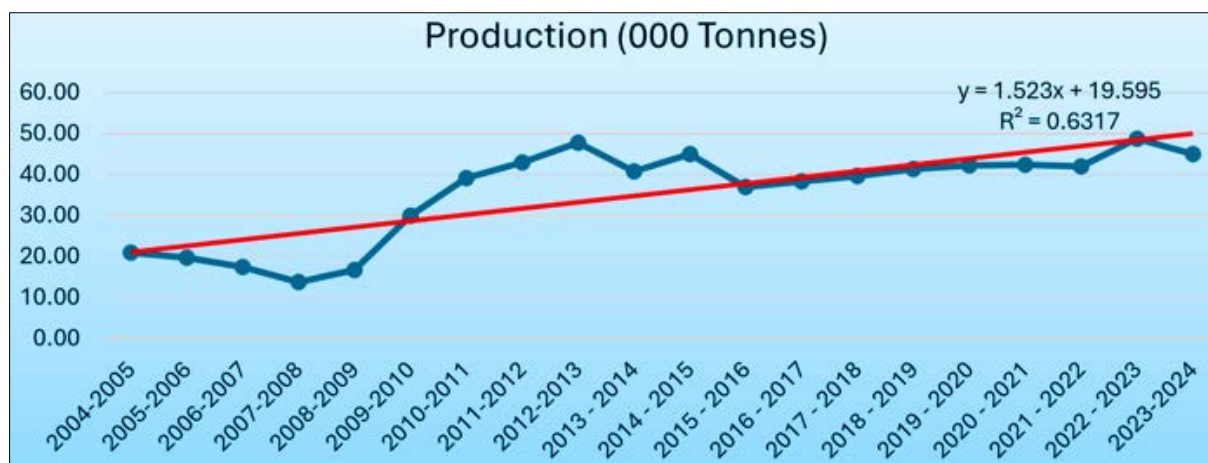


Fig 5; Trend of production under of turmeric in Northern Hill Zone of Chhattisgarh State

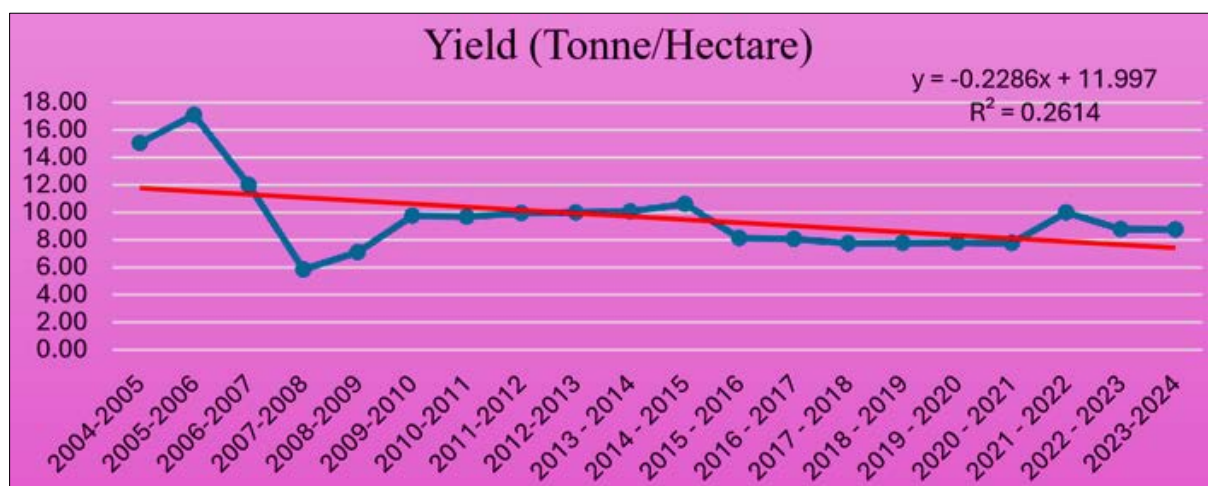


Fig 6: Trend of productivity under of turmeric in Northern Hill Zone of Chhattisgarh state

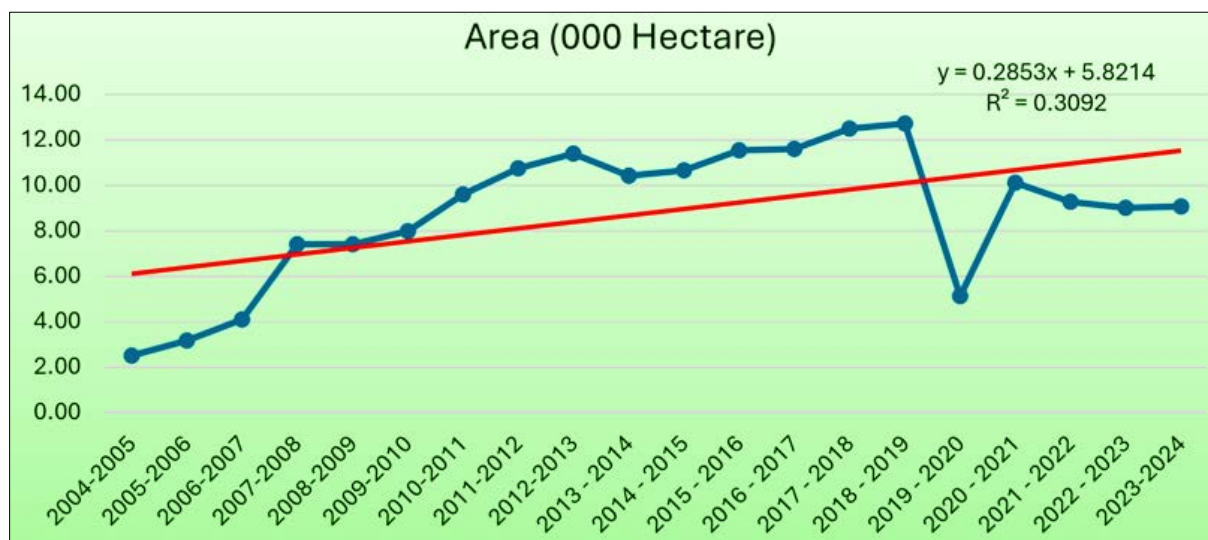


Fig 7: Trend of area under of Ginger in Chhattisgarh State

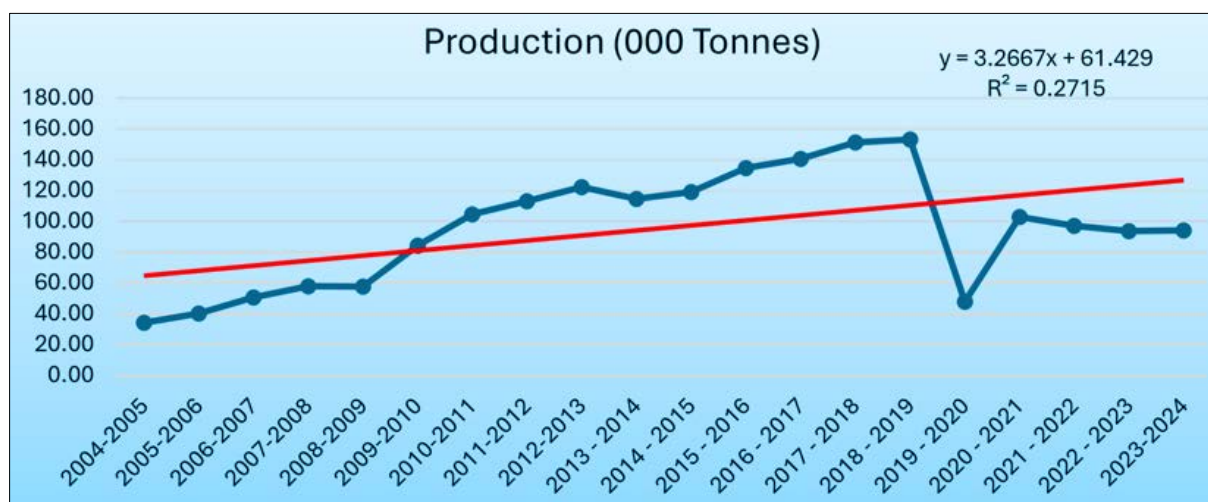


Fig 8: Trend of production of of Ginger in Chhattisgarh State

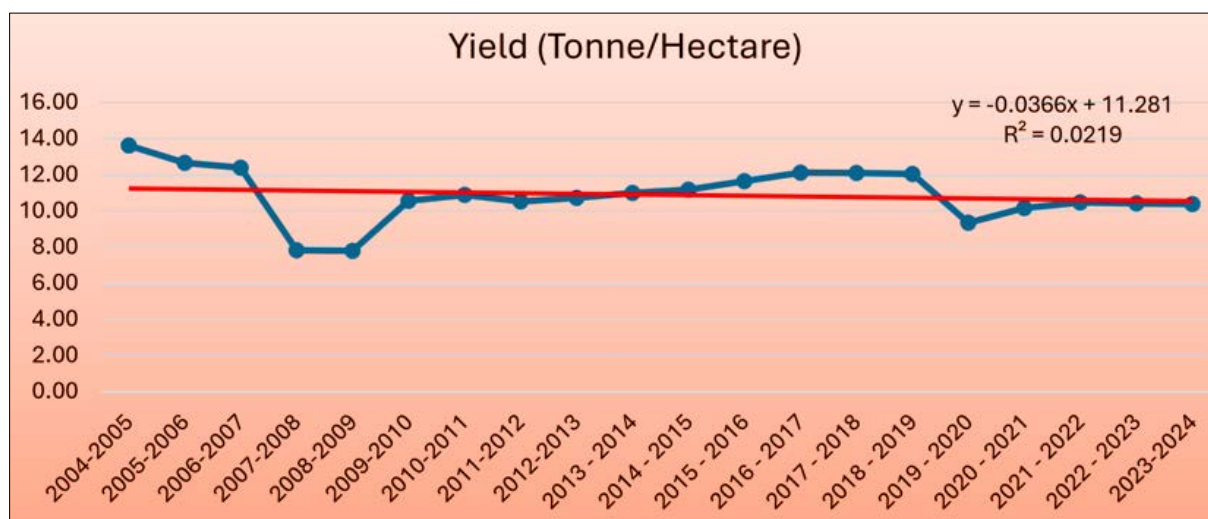


Fig 9: Trend of productivity under of Ginger in Chhattisgarh state

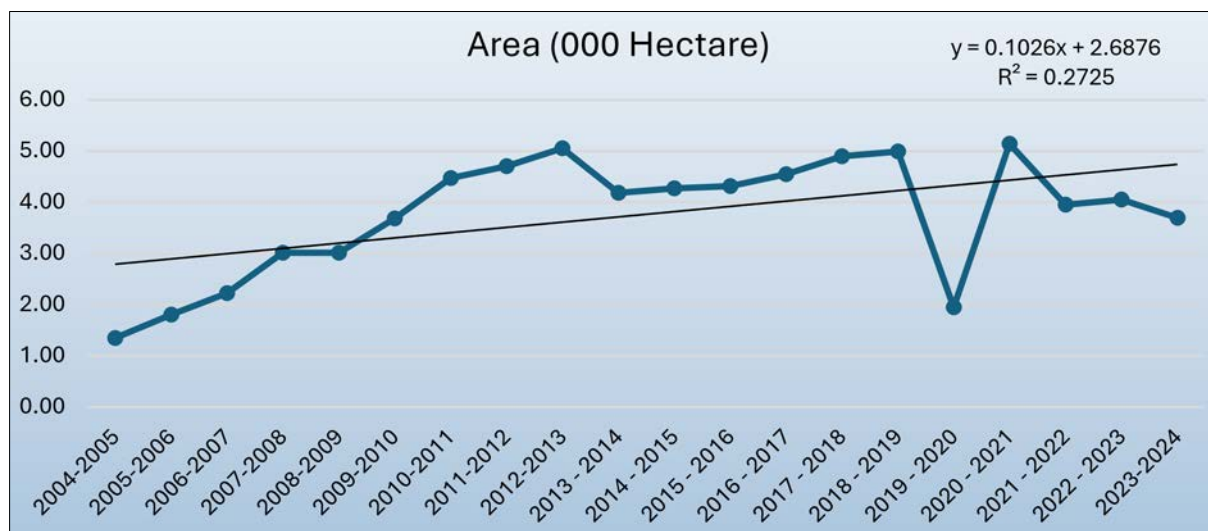


Fig 10: Trend of area under of ginger in Northern Hill Zone of Chhattisgarh state

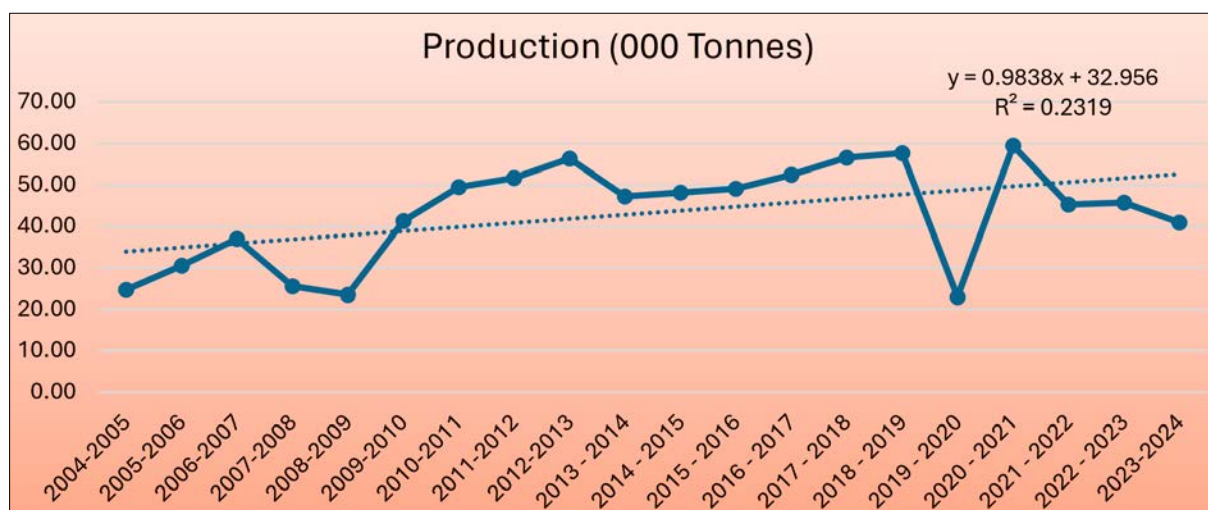


Fig 11: Trend of production under of ginger in Northern Hill Zone of Chhattisgarh state

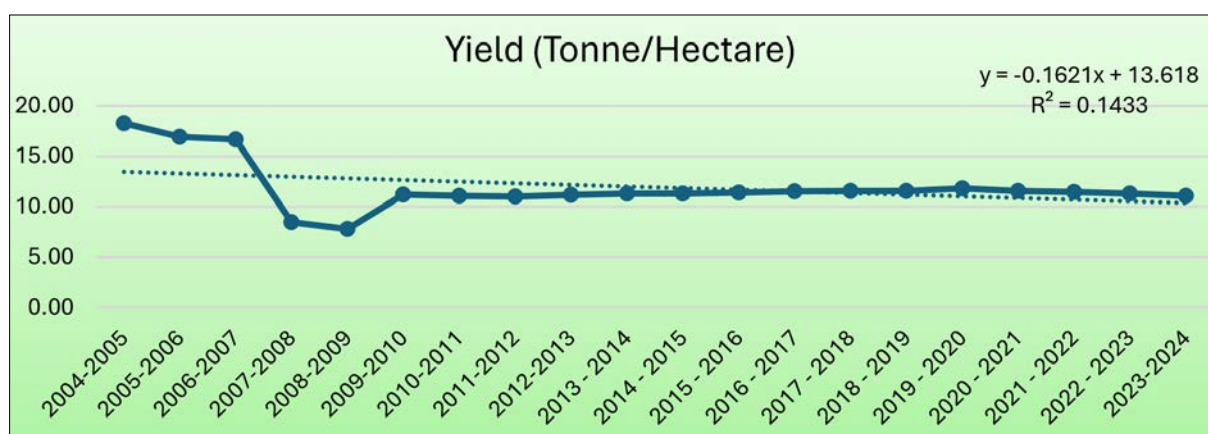


Fig 12: Trend of productivity under of ginger in Northern Hill Zone of Chhattisgarh state

4.1.1.6. Overall Crop-wise Conclusion

The crop-wise analysis clearly shows that turmeric exhibited stronger growth performance than ginger during 2005-06 to 2024-25. Turmeric recorded significant growth in area and production in both Chhattisgarh State and the Northern Hills Zone, whereas ginger showed relatively slow and mostly non-significant growth.

For turmeric, the major driver of production growth was expansion in cultivated area, as productivity remained stagnant or declined marginally. Similarly, ginger showed very limited productivity improvement. Hence, sustainable growth of both rhizomatous spice crops requires a shift from merely increasing cultivated area towards productivity enhancement, technological improvement, quality planting

material, irrigation development, disease management and better value-chain and marketing infrastructure.

5. Conclusion

The compound growth analysis revealed that turmeric performed better than ginger in Chhattisgarh State and the Northern Hills Zone during 2005-06 to 2024-25. At the state level, turmeric area and production increased significantly at 6.59 and 6.56 per cent per annum, respectively, while productivity declined marginally by -0.03 per cent. In the Northern Hills Zone, area and production increased by 6.40 and 5.13 per cent, respectively, whereas productivity declined by -1.20 per cent. Thus, turmeric production growth was mainly area driven. Ginger showed comparatively slower growth, with state-level area and production increasing by 2.56 per cent each, while productivity remained almost stagnant (0.0043%). In the Northern Hills Zone, ginger area and production increased by only 1.07 and 0.77 per cent, while productivity declined by -0.30 per cent. Overall, productivity enhancement through improved varieties, quality planting material, irrigation, nutrient management, disease control and better extension and marketing support is essential for sustainable growth. The findings are broadly consistent with Sahu, Sushila and Limje (2021)^[9] and Ram *et al.* (2023)^[11].

6. Suggestions and Recommendations

- 1. Promotion of improved varieties:** Farmers should be encouraged to adopt highyielding, disease-resistant and regionally suitable varieties of turmeric and ginger. Availability of improved varieties through government agencies, Krishi Vigyan Kendras and agricultural universities should be strengthened.
- 2. Availability of quality planting material:** Production of certified and disease-free rhizomes should be promoted through nurseries, farmer producer organizations, cooperatives and public-sector agencies. Quality planting material is particularly important for improving the productivity of ginger and turmeric.
- 3. Productivity-oriented production strategy:** Since production growth has been largely area-driven, future policies should focus on increasing yield per hectare rather than simply expanding cultivated area. Demonstrations on improved production technologies should be organized at the farmer level.
- 4. Integrated nutrient management:** Balanced application of major and micronutrients, organic manures and bio-fertilizers should be promoted according to soil-test recommendations. Integrated nutrient management can improve soil fertility and support sustainable productivity growth.
- 5. Strengthening irrigation facilities:** Small-scale irrigation facilities, farm ponds, drip irrigation and other water-conservation technologies should be promoted in suitable areas. Improved water management can reduce production risk and enhance productivity, particularly during critical crop-growth stages.
- 6. Integrated pest and disease management:** Farmers should be provided technical guidance on identification and management of major pests and diseases. Integrated pest and disease management practices should be promoted to reduce crop losses and improve the quality

of harvested rhizomes.

- 7. Strengthening extension services:** Regular training programs, field demonstrations, farmer-scientist interactions and mobile-based advisory services should be strengthened. Extension agencies should focus on improved planting methods, seed treatment, nutrient management, disease control, harvesting and post-harvest practices.
- 8. Promotion of mechanization:** Appropriate small-scale farm machinery for planting, intercultural operations, harvesting, cleaning and processing of turmeric and ginger should be promoted. Custom Hiring Centers can help small and marginal farmers access such machinery at affordable rates.
- 9. Post-harvest infrastructure:** Greater emphasis should be placed on scientific curing, drying, grading, storage and packaging facilities. Establishment of local processing and value-addition units can reduce post-harvest losses and improve farmers' returns.
- 10. Value addition and processing:** Farmers and farmer groups should be encouraged to undertake value addition through turmeric powder, dried ginger, ginger powder, oleoresins and other processed products. Small-scale processing units can generate additional income and employment opportunities in rural areas.

References

1. Alagappan V, Manoharan M. Production of pepper in India: a global perspective. *Spice India*. 2001;1:4-5.
2. Angles S, Hosamani SB. Growth in area, production and productivity of turmeric in selected South Indian states. *Karnataka Journal of Agricultural Sciences*. 2022;5(4):1-6.
3. Choudhury K, Kalita DC. Trends of area, production and productivity of turmeric in Assam. *Journal of Hill Agriculture*. 2018;9(3):322-324.
4. Goudra VG, Havaldar VN, Megri SN, Hosamani SB, Banakar B. Growth rate scenario of chilli in North Karnataka. *Karnataka Journal of Agricultural Sciences*. 2011;24(3):412.
5. Immanuelraj TK, Dastagiri MB, Sajesh VK. Growth and instability of onion production in Maharashtra, India. *Journal of Global Economics*. 2014;2(1):1-4.
6. Lal C, Rohtas. The trends of area, production and productivity of selected spices and traditional crops in Haryana. *Economic Affairs*. 2022;67(1):19-24.
7. Malik DP, Dhaiya P, Singh IJ. Area, production and yield of vegetables in Haryana: trend and growth analysis. *Agricultural Marketing*. 2002;44(4):4-14.
8. Manu AC. Value chain analysis of turmeric in Chamarajanagar District of Karnataka [master's thesis]. Bangalore: University of Agricultural Sciences, GKVK; 2013.
9. Sahu S, Sushila, Limje S. Trend in growth rate in area, production and productivity of turmeric in Bemetara District and Chhattisgarh State. *The Pharma Innovation Journal*. 2021;10(8):1148-1151.
10. Soumya C, Burark SS, Sharma L, Jain HK. Growth and instability in production and export of selected spices of India. *International Journal*. 2014;4(2):1-10.
11. Ram O, Levine Y, Dalmedigos I, Muhlgay D, Shashua A, Leyton-Brown K, Shoham Y. In-context retrieval-

- augmented language models. Transactions of the Association for Computational Linguistics. 2023 Nov 13;11:1316-31.
12. Sharma M, Luthra S, Joshi S, Kumar A. Developing a framework for enhancing survivability of sustainable supply chains during and post-COVID-19 pandemic. International Journal of Logistics Research and Applications. 2022 May 4;25(4-5):433-53.
 13. Suganya KU, Govindaraju K, Kumar VG, Dhas TS, Karthick V, Singaravelu G, Elanchezhian M. Blue green alga mediated synthesis of gold nanoparticles and its antibacterial efficacy against Gram positive organisms. Materials Science and Engineering: C. 2015 Feb 1;47:351-6.