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An economic analysis of growth trends in area, production and productivity of coconut in Kondagaon district of Chhattisgarh

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Abstract

The study examines the growth trends in coconut area, production, and productivity in Kondagaon district and Chhattisgarh state between 2014-15 and 2023-24. Coconut is a significant plantation crop that supports the region's livelihood security and farm revenue. The Directorate of Horticulture and Farm Forestry in Chhattisgarh provided secondary data. Growth performance and stability were evaluated using the Coefficient of Variation (CV) and Compound Annual Growth Rate (CAGR). According to the findings, production and productivity in Chhattisgarh fell by -3.51% and -3.04%, respectively, while the area under coconut cultivation reduced somewhat at a CAGR of -0.49% annually. Low CV values show considerable stability in coconut agriculture at the state level notwithstanding these losses. Kondagaon district, on the other hand, showed good growth tendencies, with annual increases in area and production of 1.68% and 1.93%, respectively. With a marginal growth rate of 0.25 percent, productivity stayed nearly constant. The district's consistent performance is shown in the minimal variability across all parameters. According to the comparison analysis, Kondagaon's coconut farming is doing better than the state average and is comparatively stable. The results show that in order to increase coconut productivity throughout Chhattisgarh, specific governmental support and better management techniques are required.

Keywords: Coconut, growth trends, CAGR, productivity, Chhattisgarh, Kondagaon

Introduction

Coconut has been grown in India for thousands of years and holds a significant place in the country's culture, traditions, religious rituals, social customs, and cuisine. Every part of the coconut tree has multiple uses, making it highly versatile. Among its many products, coconut oil is especially valued for its rich content of essential nutrients and vitamins. In addition to oil, other coconut-based products such as packaged tender coconut water, coconut milk, virgin coconut oil, and fiber/coir goods are gaining commercial importance. India ranks among the top five coconut-producing nations globally. Within India, Kerala leads in coconut production, followed by Tamil Nadu and Karnataka. In Karnataka, coconut is cultivated in nearly all districts and is the second most significant horticultural crop (Lokesh and Sharif, 2021) [2]. In India, states such as Kerala, Tamil Nadu, and Karnataka account for more than two thirds of the country's total coconut cultivation area and production is placing them at the forefront of coconut farming. The Indian government has taken significant steps to boost coconut production and stabilize its wholesale prices. The Coconut Development Board (CDB) has introduced various initiatives to build farmer confidence and promote coconut cultivation. These include policy measures offering training programs, capacity-building workshops, technological support, and financial aid aimed at enhancing nut aggregation, processing, and value addition. Coconut Producer Companies (CPCs) in key states have been established to address the challenges faced by coconut farmers. Government efforts have played a vital role in expanding coconut farming in Tamil Nadu, Karnataka, Andhra Pradesh, and several other smaller coconut-producing states. These initiatives have led to noticeable improvements in both production and productivity in the targeted regions (Kappil *et al*., 2021) [1].

Materials and Methods

Trends in area, production and productivity

Compound annual growth rate (CAGR)

In the present research problem, compound growth rates in area, production and productivity quantities of coconut were appraised by utilizing the exponential function of growth of the form,

$$Y = ABt$$

Where,
Y = dependent variable to be estimated (area, production, productivity, export)
A = intercept
B = regression coefficient
t = time variable

The equation was estimated after transforming as follows

$$\text{Log } Y = a + bt$$

Where,

a = Log A
b = Log B

Finally, CAGR can be obtained with the use of relationship:

CAGR = [(antilog of b)-1] x 100

Result

1 Growth trends in area, production and productivity of coconut in Kondagaon district and Chhattisgarh state.

Any variable's growth reveals patterns and historical performance. It makes the performance of the variable in question more evident. An analysis of the growth trajectory of coconut area, production and productivity from 2014-15 to 2023-2024 is attempted. Compound growth equations are used to calculate the growth rates.

1.1 Growth trends in area, production and productivity of coconut in Chhattisgarh state.

Area

The growth rate in area of Coconut over the study period (2014-2015 to 2023-24) in Chhattisgarh is presented in Table 1.1. This table presents data on Coconut, analyzing their average area, production and productivity along with their coefficient of variation (CV %) and compound annual growth rate (CAGR %) over time. The maximum area under coconut was 1706 thousand hectares during 2014-15 and minimum area obtained 1349 thousand hectares during 2023-24. The compound annual growth rate for coconut was -0.49 percent per annum. There is a slight decline in area over the years. Coefficient of variation (CV) is 0.61 percent that is not statistically significant, indicating relative stability in coconut cultivation trends across the state.

Production

Table 4.1 indicates that coconut production in Chhattisgarh reached its highest level of 19,169 thousand metric tons during the year 2014-15. Since then, production has steadily declined, reaching the lowest point of 10,569 thousand metric tons in 2022-23. This downward trend is further confirmed by a compound annual growth rate (CAGR) -3.51% per annum, highlighting a consistent decrease in production over the period. Despite this decline, the coefficient of variation (CV) for the data is only 0.13%, which is statistically insignificant. Fluctuations in coconut production were minor and did not vary greatly from the overall trend.

Productivity

It is observed from Table 1.1 that the productivity of coconut in Chhattisgarh was highest during the year 2014-15, reaching 1123.62 metric tons per hectare. Over the years, productivity has declined, reaching its lowest point of 634.01 metric tons per hectare in 2022-23. This decline is reflected in the compound annual growth rate (CAGR) of -3.04%, indicating a slight but consistent decrease in productivity over the period. Despite this downward trend, the coefficient of variation (CV) is only 0.15%, which is statistically insignificant. Year-to-year fluctuations in coconut productivity were minimal and had no significant impact on the overall trend.

Table 1: Growth trends in area, production and productivity of coconut in Chhattisgarh state

S. No.	Year	Area ('000 ha)	Production ('000 Mt)	Productivity (Mt/ha)
1	2014-15	1706	19169	1123
2	2015-16	1378	11045	801
3	2016-17	1561	12617	808
4	2017-18	1632	15697	961
5	2018-19	1669	16015	959
6	2019-20	1616	16377	1013
7	2020-21	1622	11064	682
8	2021-22	1569	10871	692
9	2022-23	1667	10569	634
10	2023-24	1349	12548	930
CAGR		-0.49	-3.51	-3.04

Source: Directorate of Horticulture and Farm Forestry Chhattisgarh (2014-2023)

Period: 2014-2024

*Indicate Significance level at 5%

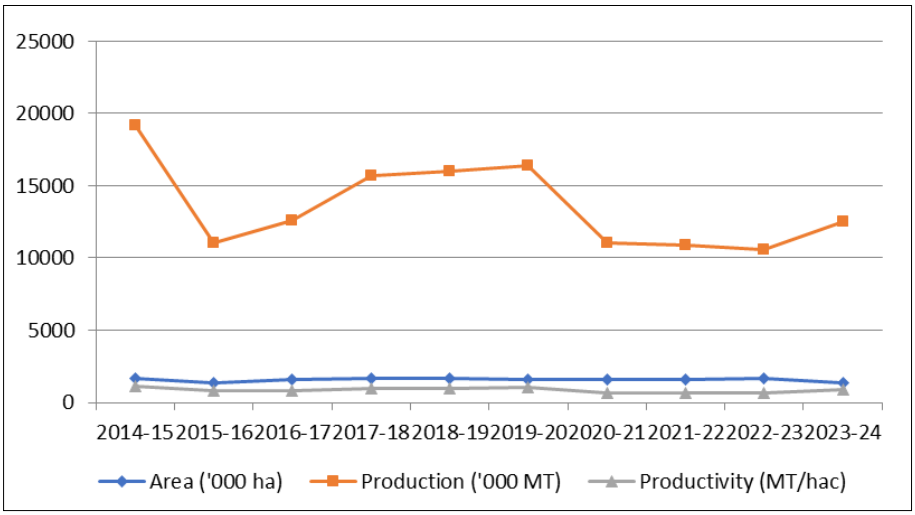

Fig 1: Graph showing the growth trend in area, production and productivity of coconut in Chhattisgarh (2014-15 to 2023-24)

The graph shows that the area under coconut cultivation remained almost stable, while production fluctuated moderately and productivity showed only minor variation over the years.

1.2 Growth trends in area, production and productivity of coconut in Kondagaon district.

Area

Table 1.2 presents the growth rate of coconut cultivation area in Kondagaon over the study period from 2014-15 to 2023-24. The data shows that the area under coconut cultivation increased from a low of 530 thousand hectares in 2014-15 to a maximum of 677 thousand hectares in 2021-22. This represents a compound annual growth rate (CAGR) of 1.68% per annum, indicating a slight but steady increase in the area devoted to coconut farming. Additionally, the coefficient of variation (CV) is 0.05%, suggesting minimal fluctuation in the cultivated area over the years. The CV value is significant, implying that the changes in area were relatively consistent throughout the period.

Production

Table 4.2 shows that coconut production in Kondagaon reached its highest level of 8,891 thousand metric tons in 2021-22, while the lowest production was recorded in 2015-16 at 6,517 thousand metric tons. Over the study period, the compound annual growth rate (CAGR) was 1.93% per annum, indicating a slight but consistent increase in production. The coefficient of variation (CV) is 0.12%, which is not statistically significant, suggesting that production fluctuations over the years were minimal and did not substantially impact the overall growth trend.

Productivity

Table 1.2 indicates that coconut productivity in Kondagaon reached its highest level of 1,350 metric tons per hectare in 2023-24, while the lowest productivity was recorded in 2015-16 at 1,128 metric tons per hectare. The compound annual growth rate (CAGR) of 0.25% per annum suggests that productivity has remained almost stable over the study period. Additionally, the coefficient of variation (CV) is 0.73%, which is not statistically significant, indicating minimal fluctuations in productivity from year to year.

Table 2: Growth trends in area, production and productivity of coconut in Kondagaon District

S. No.	Year	Area ('000 ha)	Production ('000 Mt)	Productivity (Mt/ha)
1	2014-15	530	6892	1300
2	2015-16	578	6517	1128
3	2016-17	636	8274	1301
4	2017-18	668	8691	1301
5	2018-19	671	8734	1302
6	2019-20	674	8778	1302
7	2020-21	666	8539	1282
8	2021-22	677	8831	1304
9	2022-23	654	7492	1146
10	2023-24	631	8517	1350
CAGR		1.68	1.93	0.25

Source: Directorate of Horticulture and Farm Forestry Chhattisgarh (2014-23)
* Indicate significant at 5% level

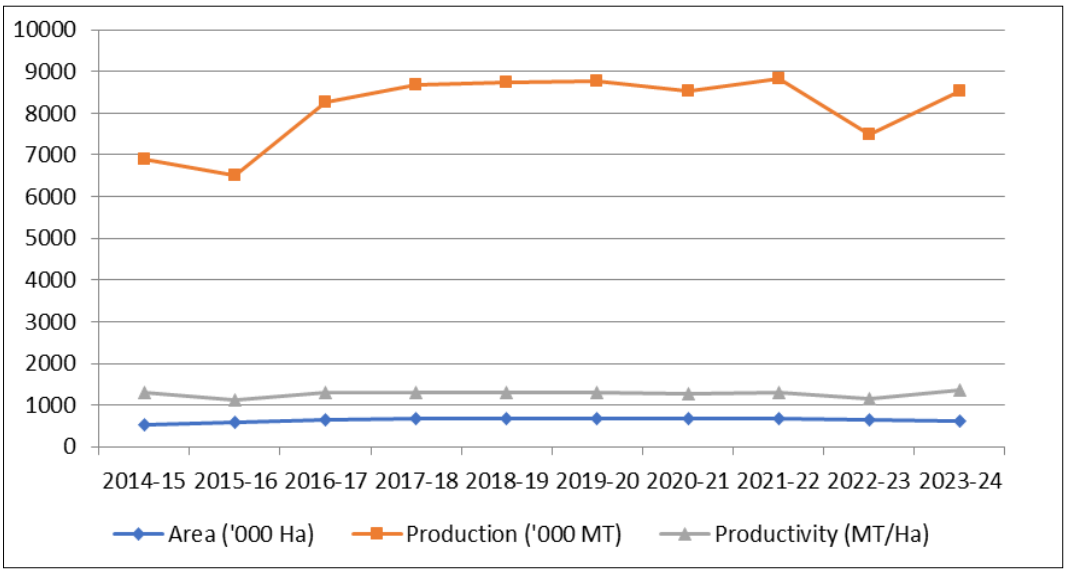

Fig 2: Kondagaon Coconut Area, Production and Productivity 2014-24

Graph suggests that coconut cultivation in Kondagaon is stable, with no significant changes in area, production, or productivity during the study period.

1.3 Comparison of Area, Production and Productivity Growth Trends (CAGR %) and Significance Levels in Chhattisgarh and Kondagaon

The Compound Annual Growth Rate (CAGR) analysis of area, production, and productivity of coconut in Chhattisgarh and Kondagaon district shows noticeable variation between the two regions table 1.3.

For the area, Chhattisgarh recorded a slight decline of -0.49%, which was not significant (p = 0.61), indicating that the total area under coconut cultivation remained almost constant during the study period. In contrast, Kondagaon district showed a small positive growth of 1.68% with a borderline significant p-value (0.05), reflecting a gradual increase in the area under coconut, likely due to farmers' growing interest and favorable conditions.

In the case of production, Chhattisgarh registered a decline of -3.51% (p = 0.13), which was not statistically significant, showing that overall production in the state slightly decreased over time. Conversely, Kondagaon exhibited a mild increase of 1.93% (p = 0.12), indicating that production remained relatively stable with slight improvement in recent years.

Regarding productivity, Chhattisgarh experienced a negative growth rate of -3.04% (p = 0.15), suggesting a small but consistent decline in yield per hectare. On the other hand, Kondagaon showed a marginal increase of 0.25% (p = 0.73), which was not significant, implying that productivity levels have remained nearly stable.

Table 3: Comparison of Area, Production and Productivity Growth Trends (CAGR %) and Significance Levels in Chhattisgarh and Kondagaon

Parameters	CAGR% Chhattisgarh	CAGR% Kondagaon	CV% Chhattisgarh	CV% Kondagaon
Area	-0.49	1.68	0.61	0.05
Production	-3.51	1.93	0.13	0.12
Productivity	-3.04	0.25	0.15	0.73

Discussion

The study identifies clear geographical variations in the growth performance of coconut cultivation between Kondagaon district and Chhattisgarh state between 2014-15 and 2023-24. Coconut cultivation is stagnating at the state level, as evidenced by the marginal area loss and the comparatively greater negative growth rates in production and productivity. A number of variables, including aging plantations, a lack of adoption of modern agricultural techniques, poor input management, and climate unpredictability, may be responsible for these developments. Low coefficients of variation across all metrics indicate that coconut cultivation in Chhattisgarh has remained structurally stable with little year-to-year variations despite the dropping growth rates. This highlights the necessity for technical interventions and productivity development measures since it shows the existence of long-term limits rather than short-term instability. Kondagaon district, on the other hand, showed a rather favourable growth trend. Growing farmer interest and improved resource utilization are shown in the consistent growth in both area and production. The district's productivity was almost constant, demonstrating effective management techniques and flexibility in response to regional agroclimatic circumstances. The district's coconut farming is consistent and resilient, as seen by the minimal fluctuation seen in all indices. The comparative study highlights Kondagaon's rise to prominence as a cutting-edge coconut-growing area in Chhattisgarh's unconventional coconut belt. Its better success has been attributed to favourable agroclimatic conditions, heightened farmer knowledge, and institutional support. The district's experience offers other appropriate areas of the state a model that can be replicated. In order to increase coconut productivity and maintain growth throughout Chhattisgarh, the results highlight the significance of region-specific policies, technological advancements, and targeted extension services.

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