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Statistical evaluation of agricultural development in Raipur district based on agricultural indicators

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Abstract

This study focuses on assessing the agricultural development of Raipur district in Chhattisgarh by constructing composite indices derived from a range of developmental indicators. The analysis was carried out for four blocks—Aarang, Abhanpur, Raipur, and Tilda covering the year 2024-25. To ensure a comprehensive evaluation, three different methods were applied: Principal Component Analysis (PCA), the Narain *et al.* (1991) ^[16] method, and the Michela method (2005) ^[17]. The findings of the study revealed notable disparities in the level of agricultural development across the blocks. Among them, Aarang emerged as the most advanced, reflecting higher performance across the selected indicators. In contrast, Raipur and Tilda were identified as significantly lagging behind, showing weaker agricultural development. Abhanpur, while not at the top, was positioned in an intermediate stage, indicating progress and potential for further development. These results highlight the uneven nature of agricultural growth within the district and underline the need for targeted interventions to reduce block-level disparities.

Keywords: Agricultural development, composite index, principal component analysis

Introduction

Agriculture is one of the dominant sectors of developing countries in terms of food security, poverty reduction and employment generation (Barik, 2017) ^[14]. It has a crucial role to national development through the economic and social contribution. The term agricultural development refers to the growth and overall changes of agriculture resulting in vertical expansion. In present time, when the agriculture is one of the important sources of income, the commercialization of agriculture is an important element of agricultural development. The area under cash crop to the total cropped area may be used for the measure of commercialization of agriculture. The level of agricultural development considered the degree of agrarian structure gets strengthened leading thereby to increased production and reflects the income level of cultivators. The crop productivity is one of vital aspects of agricultural development (Jadhav, 1997) ^[15].

Block-level analysis provides actionable insights for identifying disparities and guiding targeted interventions. Since single indicators cannot capture the multidimensional nature of development, composite indices offer a more comprehensive assessment. Raipur district in Chhattisgarh presents significant variation in agricultural outcomes across blocks. Understanding these disparities is essential for

designing localized strategies. This study aims to evaluate block-wise agricultural development.

Materials and Methods

Study Area

The present study pertains to four blocks in Raipur district of Chhattisgarh state and four blocks of Raipur districts are Aarang, Abhanpur, Raipur and Tilda. The secondary data on block level agricultural indicators has been collected from various sources, including the Directorate of Economics & Statistics, the Census Report (2011), and the Government of Chhattisgarh, for the year 2024-25.

Indicators

Agricultural Indicators: cropping intensity, irrigation coverage, fertilizer consumption, proportion of agricultural workers, cropping patterns, etc.

Statistical tools and techniques

- **Principal Component Analysis (PCA):** Used to reduce dimensions and identify key contributing indicators.
- **Narain *et al.* (1991) ^[16] method:** Constructed composite development indices after standardization.
- **Michela method (2005) ^[17]:** It also constructed

composite indices after normalization and Validated rankings through alternative aggregation.

Result and Discussion

The study titled Statistical Evaluation of Agricultural Development in Raipur District Based on Developmental Indicators was undertaken to assess the level of agricultural progress across different blocks of the district. For this purpose, four blocks Aarang, Abhanpur, Raipur, and Tilda were selected and analyzed in detail for the agricultural sector during the year 2024-25. The evaluation focused on examining variations in development by using a set of carefully chosen indicators that reflect different dimensions of agriculture, such as land use, irrigation, cropping patterns, and resource utilization. By comparing these blocks, the study aimed to highlight both the strengths and weaknesses in their agricultural performance, thereby providing insights into the disparities that exist within the district and pointing towards areas where targeted interventions may be needed to ensure balanced

development.

Develop adoption index for selected Agricultural technologies

The adoption indices for different blocks were computed using the agricultural and infrastructural indicators of Raipur district. For agricultural sector we had taken nine indicators viz., percentage area sown more than once, fertilizer consumption per hectare, percentage of net area irrigated, percentage of gross area irrigated, percentage of agricultural workers, percentage area under Kharif season crop, percentage area under Rabi season crop, Percentage area sown under food crops and Percentage of net sown area.

Composite Index of adoption for agricultural technologies

The Eigen value and proportion of adoption of recommended in agricultural technologies are worked out and presented in Table 1.

Table 1: Eigen value and proportion of agricultural development indicators

	PC I	PC II	PC III	PC IV	PC V	PC VI	PC VII	PC VIII	PC IX
Eigen Value	8.24	0.51	0.24	0.00	0.00	0.00	0.00	0.00	0.00
Proportion	0.91	0.05	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Cumulative	0.91	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00

The results of the Principal Component Analysis (PCA) highlighted that out of the nine agricultural technologies considered in the study, only two indicators percentage area sown more than once and percentage of net area irrigated were found to be the most significant in explaining variation across the blocks. Together, these two factors accounted for 0.91 percent of the total variation, underscoring their strong role in influencing the adoption of agricultural technologies. This suggests that practices related to multiple cropping and irrigation availability are central to determining the pace of

agricultural development in the region. Their prominence indicates that improvements in these areas could directly enhance technology adoption and contribute to narrowing developmental gaps among the blocks.

The level of Development for agricultural indicators

The composite indices of development have been worked out for different blocks of agricultural sector. The blocks have been ranked on the basis of developmental indices.

Table 2: Composite indices of agricultural development for different blocks of Raipur district

S. No.	Blocks	Composite indices I		Composite indices II	
		Composite indices	Rank	Composite indices	Rank
01	Aarang	1.00	1	1.00	1
02	Abhanpur	0.40	2	0.43	2
03	Raipur	0.00	4	0.01	4
04	Tilda	0.36	3	0.37	3

The composite indices of agricultural development for the different blocks of Raipur district present a clear picture of regional disparities. The results show that Aarang stands at the top position, reflecting its stronger agricultural base, while Raipur occupies the lowest rank, indicating significant gaps in development. When measured through Narain *et al.*'s method, the indices varied within a range of 0.00 to 1.00, whereas Michela's method produced a slightly different scale, ranging from 0.01 to 1.00. Beyond ranking

the blocks, the analysis also helped in identifying key agricultural indicators that play a crucial role in shaping development outcomes. These indicators are particularly important because they can be targeted and influenced through policy and extension efforts to enhance the adoption of agricultural technologies. By addressing these factors, it becomes possible to bridge the developmental gaps among the blocks and create a more balanced pattern of agricultural growth across the district.

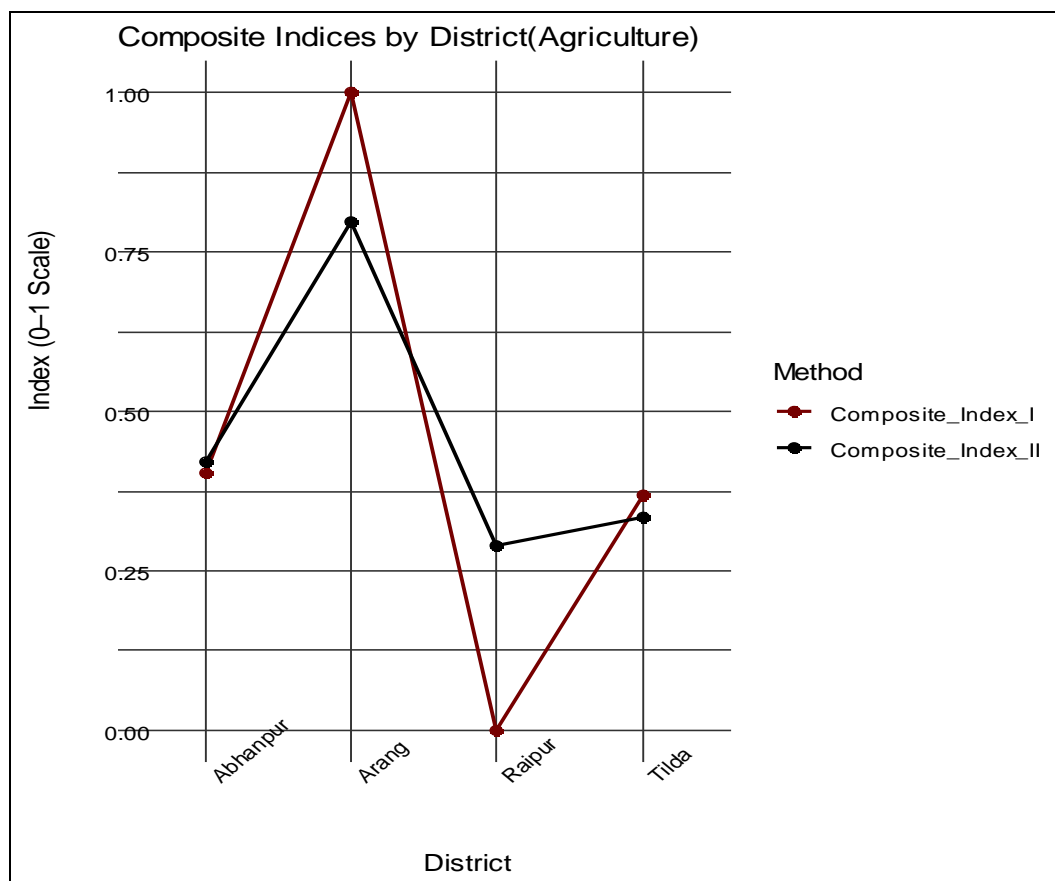


Fig 1: Composite indices of agricultural development for different blocks of Raipur district

Conclusion

The study highlights significant disparities in agricultural development across the four blocks of Raipur district. Aarang consistently emerged as the most developed block, while Raipur lagged behind agriculture sector. Abhanpur showed signs of progress but remained at an intermediate stage, and Tilda was positioned slightly above Raipur. Principal Component Analysis revealed that cropping intensity and irrigation coverage were the most influential factors for agricultural development. These findings suggest that targeted efforts to expand irrigation facilities, improve development, reduce poverty, and enhance access to basic services could accelerate balanced development and promote wider adoption of agricultural technologies across the district.

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