

International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
 ISSN Online: 2617-4707
 NAAS Rating (2026): 5.29
 IJABR 2026; 10(1): 1027-1030
www.biochemjournal.com
 Received: 06-11-2025
 Accepted: 10-12-2025

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Rice suitability categorization for different district of Chhattisgarh for the period of 15 years pre rainfall scenario

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DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i1m.7172>

Abstract

The 3 districts (Sukama, Jashpur and Sarguja) come under highly suitable for rainfed cultivation of rice under traditional biasi system with improved techniques available. In this analysis 08 districts (Narayanpur, Mahasamund, Koriya, Korba, Sarguja, Gariyaband, Dantewada and Bijapur) found for the condition under normally suitable for rainfed rice cultivation with good management and improved techniques. Similarly, 08 districts (Rajnandgaon, Raipur, Raigarh, Mungeli, Kanker, Durg, Dhamtari, Bilaspur and Balod) indicated that not economically suitable for rice rainfed cultivation. Crop diversification is necessary in near future. 02 districts (Baloda Bazar and Kabirdham) come under category which indicated that not economically suitable for rainfed rice cultivation immediate diversification is necessary.

Keywords: Rice, diversity, nutrition, climate and rainfall

Introduction

Rice (*Oryza Sativa*) is the world's second most widely grown grain, after corn (maize). It is the most significant grain in terms of human nutrition and calorific consumption, accounting for more than a fifth of all calories taken by humans globally. Rice is India's most important cereal crop. Because that is a heat-loving, semi-aquatic plant, the crop's water requirement is extremely high. When shallow flooding is allowed, tiller production is promoted, despite huge diurnal fluctuations in soil and water temperatures (Robertson, 1976). Rice is the staple crop of Asia. Although the production of rice has increased over time in the wake of the Green Revolution, major shortfalls caused by climatic aberrations such as drought and flood are frequent. Drought is one of the major constraints to rice production in Asia. At least 23 million ha of rice area (20% of total rice area) are drought-prone. India accounts for the largest share (59%) of the total drought-prone rice area in Asia. Most of these drought-prone areas are rainfed. (Gupta, *et al.* 2000) [4].

The state of Chhattisgarh, also known as the "Rice Bowl of India," has a rice crop area of 3610.47 thousand hectares, with a production of 5.48 million tonnes and a productivity of 1517 kg per hectare (Anonymous, 2010) [5]. Rice is the principal crop of Chhattisgarh, where it is grown on roughly 3.6 m ha, or 77 percent of the net sown area. Only around 20% of the land is irrigated, with the rest being rainfed. About 73 percent of the territory in the Chhattisgarh plains, 97 percent in the Bastar plateau, and 95 percent in the Northern hills is rainfed. The state's cropping intensity is 121, however during the rabi season, a large portion of the land is under utera (relay cropping), and largely lathyrus is cultivated under utera, therefore the amount of irrigated double cropped land is extremely little. Following rice, kodo-kutki is a prominent crop on the plains of Chhattisgarh and the Bastar plateau. During the kharif season, a large area in the Northern hills (45000 ha.) and roughly 25000 hectares in the Bastar plateau is planted with maize. Soybean and sunflower crops have been introduced and now cover more than 1.0 lakh ha in the plains of Chhattisgarh, but they need to be expanded. Lathyrus, gram, wheat, and linseed are grown during the rabi season. During the rabi season, Lathyrus is the most important crop, spanning around 5.8 lakh acres and used mostly as a relay (utera) crop. Chhattisgarh is a new state that was founded on November 1st, 2000, by separating Madhya Pradesh's south-eastern districts into 16 Chhattisgarhi-speaking

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districts. The state is located between the latitudes of 17°46' and 24°06' north and the longitudes of 80°15' and 84°20' east. Chhattisgarh is the tenth largest state in India, with 28 administrative districts. The total geographical area is around 137 lakh hectares.

There are three primary agroclimatic zones in the state of Chhattisgarh. Northern hill zone (NHZ), Chhattisgarh plain zone (CPZ), and Bastar plateau zone (BPZ) are the three zones. The Chhattisgarh lowlands zone, which encompasses 51 percent of the geographical area, the Bastar plateau zone, and the northern hill's zone, which cover 28 and 21 percent of the total geographical area, respectively. The shift in rainfall will be one of the major variables in determining global climate change consequences. Systematic and immediate attention needs to be paid to rainfall fluctuation since it impacts food production and fresh water availability (Dore, 2005) [3]. Cruz *et al.*, (2007) [2] reports that the rainfall pattern changes have a significant influence on Asia-Pacific water and agriculture. Extreme occurrences such as floods and draughts are often caused by population expansion, increasing urban development and rising rainfall levels. Therefore, several research have been carried out worldwide in order to assess the effects of climate change on the analysis of regional and temporal rainfall variations. In general, the year may be divided into four seasons. Winter season from Jan-Feb followed by premonsoon or summer season from March-May there after south west monsoon season starts from June-Sep and last to September month followed from Oct-Dec by post monsoon season till November-December.

In the three agro-climatic zones of Chhattisgarh, the soils differ significantly. Despite the differences in nomenclature, the types of soils and their physical qualities remain the same. Chhattisgarh plains bhata (lateritic), matasi (sandy loam), dorsa (clay loam), kanhar (clay), bastar plateau marhan (coarse sandy), tikra (sandy), mal (sandy loam), gabhar (clay & clay loam) and northern hills hilly soils, tikra, godachawar and bahara soils. The Chhattisgarh state climate is tropical hot and humid. The dry sub-humid climate of Chhattisgarh is characterised by yearly potential evapotranspiration that is slightly higher than annual rainfall. The region's average annual rainfall is around 1400 mm, with 90 to 95 percent of that having fallen during the south-west monsoon season (June-October). The state is mostly dependent on monsoon for rain. The monsoon arrives in the Bastar area around the 10th of June and covers the entire region by the 25th. Between the 15th and the 25th of September, the monsoon departs from various parts of the state. July and August are the wettest months of the year. Rainfall occurs in October as a result of cyclonic activity in the Bay of Bengal, and October rainfall is particularly important for rice productivity in the state. The average minimum temperature begins to dip below 15 °C in mid-November, signaling the start of winter. Winter in the northern districts, particularly in the Bilaspur division, is harsher and lasts longer than in the southern districts, particularly in the Bastar division. During the monsoon months, atmospheric humidity is quite high (>90%), although it begins to decline from October onwards, reaching as low as 15-20% during peak summer months. Morning relative humidity is between 68 percent and 87 percent, and afternoon relative humidity ranges between 54

percent and 80 percent during the south west monsoon and post monsoon seasons. The relative humidity during the winter season is modest, ranging between 61 and 69 percent. Between 39 percent and 51 percent in the morning and afternoon, respectively. Summer is the hottest time of year, with relative humidity ranging from 26% to 31% in the afternoon and 44% to 49% in the morning. The period when weekly rainfall is >50mm and the accompanying coefficient of variance is less than 100 percent is considered as a stable rainfall period for rainfed rice crops. Because the daily ET rate of rice crop is roughly 4mm and percolation rate is 3mm, 50 mm per week is estimated. As a result, the total daily water need is 7mm, or 50mm per week. Rainfall analysis is important in view of crop planning for any region. In order to stabilize crop yield at reasonable levels in rainfed situation. It is essential to plan rainfed crop and their management practices consonance with the rainfall pattern prevalent in the region. Rainfall studies, particularly its variability and probability analysis give more information for rainfed crop planning.

Materials and Methods

The present study is for different districts of Chhattisgarh state. Chhattisgarh, India's 26th state was carved from Madhya Pradesh in November 2000. It covers almost one-third of the geographical region of Madhya Pradesh. The daily data was converted on a monthly, seasonal, and annual basis for each district. The year was partitioned according to the meteorological calendar, beginning on January 1st and ending on December 31st of each year, for the computation of seasonal and monthly rainfall with the help of weather cock software. The CRIDA, Hyderabad-developed Weather Cock software was used to analyse several weather parameters, including yearly, seasonal, monthly, and weekly mean temperatures and rainfall etc.

Results and Discussion

The suitability categorization of rice for different 27 districts of Chhattisgarh worked for 15-year period. The Table 1 shows that the suitability conditions for rainfed rice cultivation. The rainfall categorized for rice suitability for the period of (1989-2004) pre rainfall scenario the result was found that out of 27 district 03 districts (Bemetara, Jashpur and Surajpur) come under A2+B2 criteria it indicated that their districts are highly suitable for rainfed rice cultivation even under transplanting condition. 3 districts (Sukama, Jashpur and Sarguja) come under highly suitable for rainfed cultivation of rice under traditional biasi system with improved techniques available. In this analysis 08 districts (Narayanpur, Mahasamund, Koriya, Korba, Sarguja, Gariyaband, Dantewada and Bijapur) found for the condition under normally suitable for rainfed rice cultivation with good management and improved techniques. Also 08 districts (Rajnandgaon, Raipur, Raigarh, Mungeli, Kanker, Durg, Dhamtari, Bilaspur and Balod) indicated that not economically suitable for rice rainfed cultivation. Crop diversification is necessary in near future. 02 districts (Baloda Bazar and Kabirdham) come under category which indicated that not economically suitable for rainfed rice cultivation immediate diversification is necessary. In this period 2 district data was not available due to new stabilised district.

Based on rainfall distribution the criteria are given below

1. A₂+ B₂: Highly suitable for rainfed rice cultivation even under transplanting condition.
2. A₂ B₂/A⁺ 1 A₁ B₂: Highly suitable for rainfed cultivation of rice under traditional *bias* system with improved techniques available.
3. A₂ B₁C₁/A₁⁺ A B₁ C₁: Normally suitable for rainfed

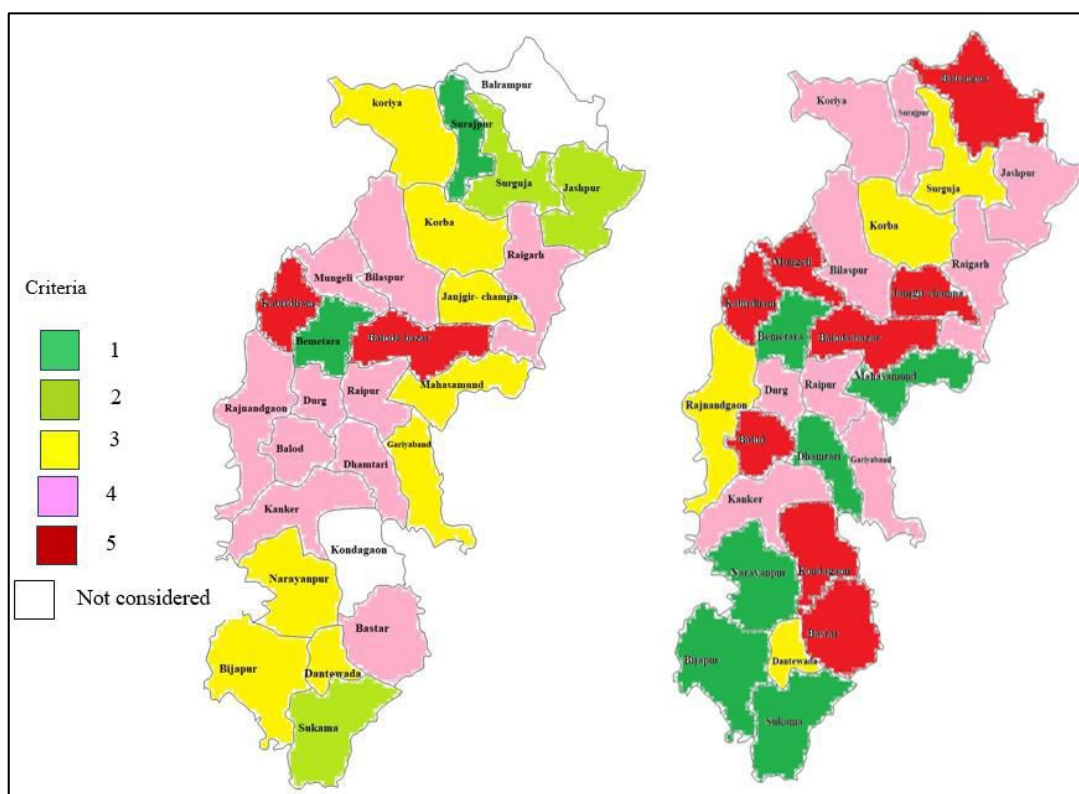
rice cultivation with good management and improved techniques.

4. A₂ C₂ or A₁B₁C₂: Not economically suitable for rainfed rice cultivation. Crop diversification is necessary in near future.

Other combination: Not economically suitable for rainfed rice cultivation. Immediate diversification is necessary.

Table 1: Rice suitability Categorization for different district of Chhattisgarh 1989-2004

S. No.	District	June	July	Aug	Sept	Criteria
1	B. Bazar	C	B	B	C	B2C2
2	Balod	C	B	A	C	A1B1C2
3	Balrampur*					
4	Bastar	C	A	A	C	A2C2
5	Bemetara	B	A+	A	B	A2+B2
6	Bijapur	C	A	B	C	A1BC2
7	Bilaspur	C	A	A	C	A2C2
8	Dantewada	C	A+	A+	B	A2+B1C1
9	Dhamtari	C	A	A	C	A2C2
10	Durg	C	A	B	C	A1B1C2
11	Gariyaband	B	A	A+	C	A2+B1C1
12	Janjgir	C	A	A	B	A2B1C1
13	Jashpur	B	A+	A	B	A2+B2
14	Kanker	C	A	A	C	A2C2
15	Kawardha	C	B	B	C	B2C2
16	Kondagaon*					
17	Korba	B	A+	A	C	A2+B1C1
18	Koriya	C	A	A	B	A2B1C1
19	Mahasamund	C	A	A	B	A2B1C1
20	Mungeli	C	A	B	C	A1B1C2
21	Narayanpur	B	A	A	C	A2B1C1
22	Raigarh	C	A	B	C	A1B1C2
23	Raipur	C	A	A	C	A2C2
24	Rajnandgaon	C	A	A	C	A2C2
25	Sarguja	B	A	A	B	A2B2
26	Sukma	B	A	A	B	A2B2
27	Surajpur	B	A+	A	B	A2+B2



Conclusion

As a result, the total daily water need is 7mm, or 50mm per week. Rainfall analysis is important in view of crop planning for any region. In order to stabilize crop yield at reasonable levels in rainfed situation. It is essential to plan rainfed crop and their management practices consonance with the rainfall pattern prevalent in the region. Rainfall studies, particularly its variability and probability analysis give more information for rainfed crop planning.

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