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A trend analysis of rice cultivation in 27 districts of Chhattisgarh state

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Abstract
The trend analysis of rice cultivation with respect to area, production and productivity was carried out and result indicates that the rice area in 06 districts was reported significantly decreasing trend and 15 districts observed significantly increasing trend. Out of 27 districts only 06 districts observed significantly increasing trend in rice production and one district observed significantly decreasing trend. Out of 27 districts the rice productivity trend indicates that only one district showed significantly decreasing trend and rest of 8 districts were showed significantly increasing trend.

Keywords: Area, production, productivity, rice, trend

Introduction
The Chhattisgarh state climate is tropical hot and humid. The dry sub-humid climate of Chhattisgarh is characterized by yearly potential evapotranspiration that is slightly higher than annual rainfall. The region's average annual rainfall is around 1400 mm, with 85% of that having fallen during the south-west monsoon season (June-October). The stable 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.
Rainfall analysis is important in view of crop planning for any region. In order to stabilized 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.

Material and Methods
Data on rice crop area, production, and productivity has been collected from many districts in Chhattisgarh https://aps.dac.gov.in/APY/Public_Report1.aspx Special Data Dissemination Standard Division, Directorate of Economics & Statistics, Ministry of Agriculture and Farmers Welfare, Govt. of India, New Delhi. Form the 2000 to 2019, the statistics ministry of agriculture will gather annual agricultural data such as area and production. This was utilized to investigate the impact of stable rainfall period on rice production. Because district level agricultural data is available, we estimated the suitable district for rice cultivation on the basis of monthly categorization rainfall.

Linear regression or trend analysis
The trend equations were calculated using monthly weather data. The regression equation was used to perform the trend analysis. This is also known as a linear regression mathematical model. Trend analysis was also performed on the basis of regression analysis. The equation is as follows:
$Y = a + bx$

Where,
Y = Yield (kg/ha).
b = Slope.
a = Intercept.
x = Independent variable like time or rainfall.

Result and Discussion

Trend analysis for area, production, productivity of rice crop in 27 districts of Chhattisgarh

It was observed from the table no.1 trend of Rice in Chhattisgarh. The trend analysis calculated for 27 districts of Chhattisgarh or area, production, productivity of rice crop. The result was found in table 1 trend of area of rice out of 27 districts 17 districts area found increasing trend and 10 districts area decreasing. This all districts 20 districts they are Balrampur, Bastar, Bemetara, Bilaspur, Dantewada, Dhamtari, Durg, Gariyaband, Jashpur, Kawardha, Kanker, Kondagaon, Mahasamund, Mungeli, Raigarh, Raipur, Rajnandgaon, Sukama, Surajpur and Surguja found significant at 1% and 5% of level in this 20 districts 19 districts are significant at 5% of level. Only one districts found significant at 1% of level with decreasing trend out of 18 districts 12 districts they are Bilaspur, Bemetara, Gariyaband, Jashpur, Kawardha, Kanker, Kondagaon, Mahasamund, Mungeli, Rajnandgaon, Surajpur, Surguja found significantly increasing trend and rest 6 districts were found significantly decreasing trend.

The result of production trend of rice indicates that some districts were increasing and the some were decreasing. Out of 27 districts only 7 districts showed significantly increasing or decreasing trend. In these 7 significant districts 6 districts were significant at 5% level and only 1district was 1% level. Two districts namely Sarguja and Dantewada showed significantly decreasing trend at 5% of level & 4 districts Dhamtari, Janjgir-Champa, Mahasamund and Raigarh showed significantly increasing trend.

The table, 1 showed the trend of productivity of rice crop amongst out of 27 districts only 9 districts Bemetara, Bilaspur, Durg, Janjgir-Champa, Korba, Mahasamund, Raigarh Raipur, Surguja found significant at 1% and 5% level. These 9 districts and 4 districts found significant at 1% of level Bemetara district showed significantly decreasing trend 1% of level and 3 districts they are Bilaspur, Durg and Korba show increasing trend at 5% of level. 5 districts they are Mahasamund, Janjgir-Champa, Raigarh, Raipur and Surguja found significant at 5% of level. All are increasing trend showed. Out of 27 districts, 20 districts showed increasing trend (Bastar, Bijapur, Bilaspur, Dantewada, Dhamtari, Durg, Gariyaband, Janjgir-Champa, Jashpur, Kawadha, Kanker, Koriya, Surajpur and Surguja) rest 7 (Balod, Balodabazar, Balrampur, Kondagaon, Mungeli, Narayanpur, Sukma) were showed decreasing trend.

Table 1: Rice Area production productivity trend of different districts of Chhattisgarh

S. No.	Districts	Area equation	Coefficient	Production equation	Coefficient	Productivity equation	Coefficient
1.	Balod	y = 840.6x + 17750	0.149	y = -5354.x + 33803	0.029	y = -0.04x + 1.906	0.062
2.	B. Bazar	y = 940.0x + 22482	0.111	y = 222.8x + 33606	0.000	y = -0.004x + 1.493	0.002
3.	Balrampur	y = 869.5x + 78081	0.464**	y = 94.33x + 13070	0.000	y = -0.016x + 1.674	0.021
4.	Bastar	y = -9623.x + 29773	0.817**	y = -7148.x + 34039	0.183	y = 0.03x + 1.073	0.181
5.	Bmetara	y = 3447x + 14840	0.905**	y = -5163.x + 27491	0.105	y = -0.063x + 1.825	0.346*
6.	Bijapur	y = 255.9x + 58838	0.217	y = 1487.x + 78609	0.043	y = 0.018x + 1.339	0.024
7.	Bilaspur	y = -7457.x + 35367	0.711**	y = 1499.x + 39352	0.006	y = 0.045x + 1.044	0.313*
8.	Dantewada	y = -9873.x + 22771	0.841**	y = -8352.x + 23789	0.445**	y = 0.023x + 1.052	0.069
9.	Dhamtari	y = 2344.x + 13901	0.461**	y = 18518x + 15272	0.584**	y = 0.085x + 1.172	0.619
10.	Durg	y = -24009x + 55606	0.693**	y = -18561x + 62031	0.210	y = 0.064x + 0.901	0.366 *
11.	Gariyaband	y = 1871x + 13008	0.788**	y = 8995.x + 16665	0.110	y = 0.045x + 1.290	0.055
12.	J. Champa	y = 200.6x + 25851	0.009	y = 30414x + 25846	0.743**	y = 0.117x + 0.986	0.765**
13.	Jashpur	y = 169.9x + 17915	0.478**	y = 3564.x + 17058	0.152	y = 0.018x + 0.952	0.138
14.	Kawardha	y = 999.8x + 87380	0.774**	y = 2940.x + 82641	0.358	y = 0.019x + 0.951	0.161
15.	Kanker	y = 1304.x + 15966	0.942**	y = 8930.x + 19990	0.229	y = 0.040x + 1.258	0.156
16.	Kondagaon	y = 1056x + 97287	0.751**	y = -790.8x + 15505	0.002	y = -0.022x + 1.585	0.022
17.	Korba	y = -29.01x + 10977	0.163	y = 2971.x + 96102	0.267	y = 0.027x + 0.873	0.273*
18.	Korea	y = -82.41x + 69946	0.053	y = 2056.x + 60970	0.162	y = 0.030x + 0.865	0.188
19.	Mahasamund	y = 2739.x + 23412	0.909**	y = 15367x + 20211	0.524**	y = 0.046x + 0.882	0.396**
20.	Mungeli	y = 1617.x + 10486	0.875**	y = -171.3x + 22561	0.000	y = -0.028x + 2.135	0.049
21.	Narayanpur	y = -74.88x + 25225	0.026	y = -992.8x + 39712	0.124	y = -0.035x + 1.564	0.126
22.	Raigarh	y = -456.6x + 24350	0.266*	y = 11592x + 19773	0.498**	y = 0.050x + 0.805	0.544 **
23.	Raipur	y = -26708x + 64494	0.712**	y = -13331x + 65989	0.119	y = 0.084x + 0.718	0.635 **
24.	Rajnandgaon	y = 2557.x + 24675	0.854**	y = 10120x + 24467	0.256*	y = 0.025x + 1.006	0.146
25.	Sukma	y = 1933.x + 69461	0.871**	y = -2222.x + 14419	0.029	y = -0.067x + 2.033	0.134
26.	Surajpur	y = 390.1x + 10661	0.454**	y = 2020.x + 15589	0.041	y = 0.013x + 1.463	0.020
27.	Surguja	y = -15079x + 38012	0.744**	y = -10281x + 36405	0.406**	y = 0.040x + 0.838	0.457 **

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