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# Study of Inter Zonal Rainfall in the context of climate change in Odisha

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**ABSTRACT**
*The knowledge and information on the rainfall dynamics and its distribution over the cropping season are important for timely seed bed preparation, selection of crop varieties and choice of cropping pattern. Historical rainfall data of Sundergarh, Keonjhar and Ranital revealed that the total mean annual rainfall is 1668.19 mm, 1522.02mm, 1677.88 mm respectively. The trend analysis show that there is decrease trend in rainfall in Kirei and Ranital station and increase trend in Keonjhar over the last thirty years. it is found that the rainfall is uneven in distribution and the seasonal variation is also more and the monsoon rain contributes to the tune of 80-89% of total annual rainfall. that there is increase in extreme events like drought, flood, high rainfall intensity, seasonal variation, uneven distribution and spatio-temporal variation in rainfall . is received Due to climate change.*
*Key Words: Rainfall Climatology, Trend Analysis,*

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## INTRODUCTION

The growth and yield of any crop mainly depends upon the major climatic factors like solar radiation, temperature, and rainfall. Among this rainfall is particularly important in rainfed rice culture. Yield levels are determined . In a recent work by Pal and Tabbaa (2011), they showed that seasonal rainfall totals for the period 1954-2003 show significant trends in various regions in India. Some studies like those of Sinha Ray and Srivastava (2000), Sen Roy and Balling (2004) have shown that the trends in the number of extreme precipitation events are increasing in major parts of the country. They also concluded that the annual precipitation is decreasing in the northeastern states, some parts of the eastern Gangetic Plain and Uttaranchal .For entire India, the mean value of summer monsoon rainfall is 852.4 mm (Parthasarthy et al.1995) with a standard deviation of 84.7 mm and Coefficient of variation 9.9%. As calculated by Das et al. (2002), the values of mean rainfall, standard deviation, and coefficient of variation differ from region to region. Temporal variations in the summer monsoon rainfall are also of great concern. For example, in the recent past, southwest monsoon of 2002 was a case of severe drought all over India whereas monsoon of 2003 was marked by near normal rainfall over the entire country. In addition to interannual variations, monsoon also experiences intraseasonal variations in the form of active and break phases. In this paper emphasis has been given to highlight some of the importance of rain dynamics in the context of agriculture.

## MATERIAL AND METHODS

Numerical analyses are performed on historical rainfall data set which are used for the DSSAT Crop modeling in respective regions of Odisha. The point data is collected from the observatories of the stations located in Sundergarh, Bhubaneswar, Ranital and Keonjhar stations of Orissa University of Agriculture & Technology and India Meteorology Department. Both statistical as well SAS (Statistical Application Software) were used to analyse the historical data of minimum 30 years. Here the rainfall is classified into dry, Trace, light , Low, Moderate, Rather Heavy, Heavy and very heavy category of rain of quantum <1mm, 1-2mm , 2-2.5mm .2.5-30mm, 30-60 mm, 60-120mm, 120-250mm, and >250mm. The dependability of rainfall is also calculated as suggested by Reddi and Reddy.

## RESULT AND DISCUSSION

The mean annual rainfall of Kirei, Keonjhar, and Ranital are found to be 1668.19 mm, 1522.02 mm and 1677.88 mm respectively. The Standard deviation is found to be 360.41, 289.76 and 400.13 respectively. The Coefficient of variation of Kirei, Keonjhar and Ranital is found to be 21.6, 23.85 and 19.04 respectively. It shows that there is no much variability in rainfall in this regions. Also the there is no wide variation in rainfall in the last 30 years.

Table 1. Rainfall Quantum of Kirei, Keonjhar and Ranital of Odisha

| SL NO | NAME OF STATION | MEAN ANNUAL RAINFALL IN MM | STANDARD DEVIATION | CV% |
|---|---|---|---|---|
| 1 | Kirei | 1668.19 | 360.41 | 21.6 |
| 2 | Keonjhar | 1522.02 | 289.76 | 19.04 |
| 3 | Ranital | 1677.88 | 400.13 | 23.85 |
| | | | | |

Rainfall Category:

The historical rainfall is categorised into dry, trace, light, low, moderate, Rather heavy, heavy, very heavy and extremely very heavy. It is found that the number of dry days are maximum in Kirei followed by Keonjhar and minimum in Ranital. The trace days varied from 4 to 101 days and light category varied from 16-58, low varied from 12-36, moderate varied from 11-39, rather heavy 3-14, heavy varied 1-6 days and very heavy varied from 1-3 days and extremely very heavy is found only in Ranital station in the last 30 years.

Table 2. Rainfall Category Range in number of Days of Kirei, Keonjhar and Ranital of Odisha during last 30 years.

| SL NO | STATION NAME | Dry | Trace | Light | Low | Moderate | Rather heavy | Heavy | Very heavy | Extremely very heavy |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Kirei | 182-302 | 4-66 | 17-52 | 21-36 | 14-39 | 4-11 | 1-6 | 1 | - |
| 2 | Keonjhar | 153-258 | 38-101 | 19-58 | 12-32 | 13-30 | 3-13 | 1-5 | 1-3 | - |
| 3 | Ranital | 252-297 | 4-49 | 16-36 | 9-26 | 11-25 | 4-19 | 1-9 | 1-3 | 1 |

Seasonal Contribution of rainfall.

The analysis of seasonal contribution of kirei is monsoon rainfall contributes maximum and percentage contribution is from 74-95% , and of Keonjhar is from 62-91% and of Ranital is 43-91% of the total annual rainfall during the last 30 years.

Table 3. Seasonal Contribution of rainfall of Kirei, Keonjhar and Ranital of Odisha in the last 30 years.

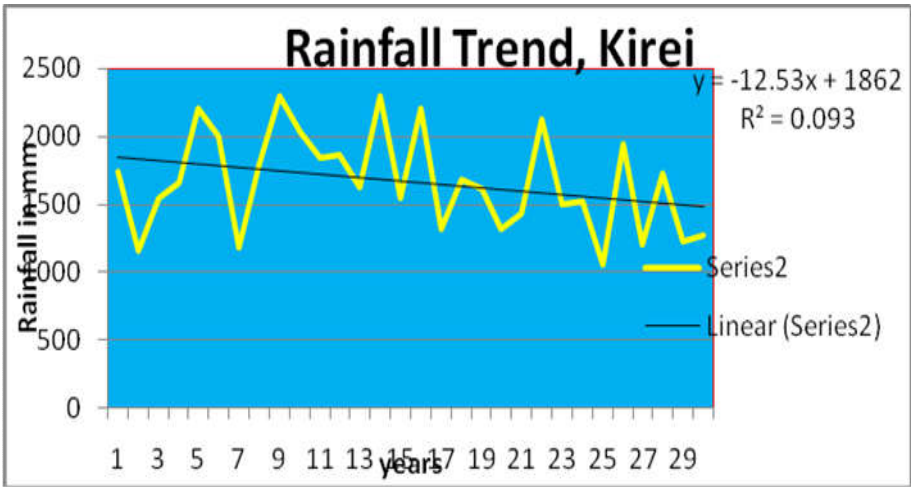
| Sl No | Name Of Station | Winter Rainfall % Contribution To Total | Winter Rainfall % Contribution To Total | Winter Rainfall % Contribution To Total | Winter Rainfall % Contribution To Total | Total Rainfall In Mm |
|---|---|---|---|---|---|---|
| 1 | Kirei | 5 | 8 | 85 | 2 | 1668.19 |
| 2 | Keonjhar | 4 | 4 | 88 | 4 | 1522.02 |
| 3 | Ranital | 2 | 5 | 85 | 8 | 1677.88 |

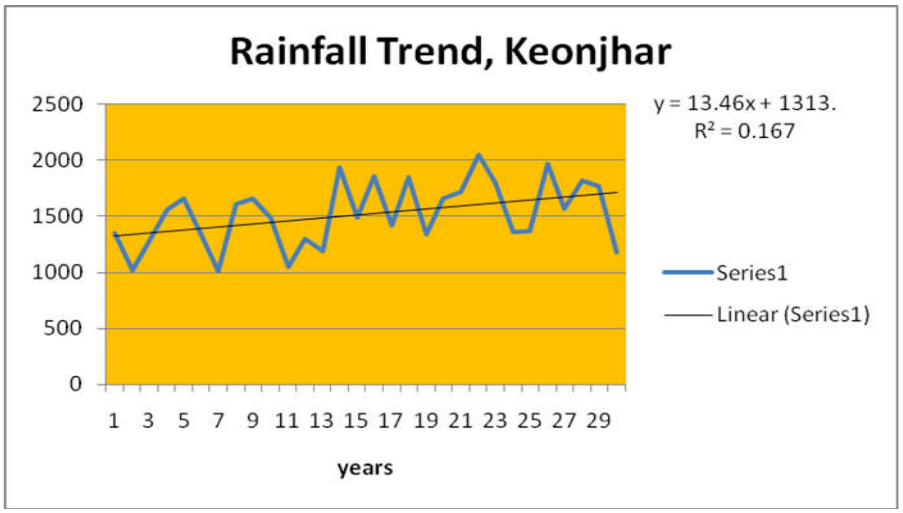
Forecasting of rainfall upon dependability of rainfall:

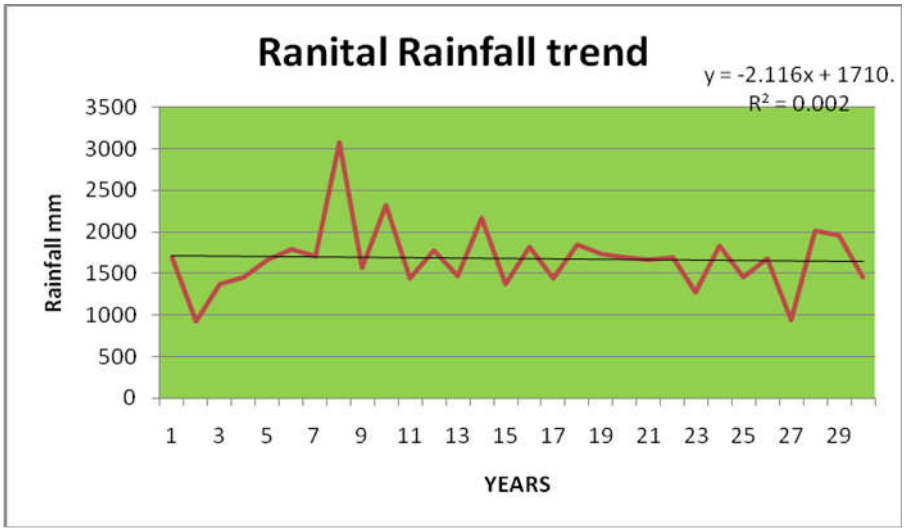
It is found by arranging the yearly rainfall in descending order. The amount of rainfall present at the three-fourth's place in descending order line is the 75% probability rainfall. It is found that the quantum of rainfall at 75% probability for kirei, Keonjhar and Ranital is found to be 1326 mm, 1345 and 1455 mm respectively.

Trend Analysis:

The trend analysis of Kirei and Ranital for the last thirty years show that there is decreasing trend in the rainfall pattern and increasing trend in the rainfall pattern of Keonjhar.




**CONCLUSION**

It is inferred that the total seasonal rain amount does not show much change in the last thirty years or so. However the different categories of rain events have undergone significant changes due to possible weakening of monsoon circulation as suggested in some studies in the recent past (e.g., Dash et al 2009). The trend analysis shows that there is negative trend in the rainfall pattern of Kirei and Ranital but there is positive trend in the rainfall pattern of Keonjhar Station. Also the rainfall probability forecasted based on dependability for Kirei, Keonjhar and Ranital is 1326 mm, 1345 mm and 1455 mm respectively. So this type of analysis will definitely help in finding suitable sowing window and cropping pattern which helps

increase in the agrarian economy. So it is pertinent to know about the rainfall climatology of a region in space and time scale.

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