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STATISTICAL ANALYSIS OF RAINFALL IN SAGAR DIVISION



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NATIONAL INSTITUTE OF HYDROLOGY
JALVIGYAN BHAWAN
ROORKEE - 247 667

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PREFACE

Rainfall is the main linking component in hydrologic cycle, rainfall amount generally varies from place to place and one month to another. A comprehensive knowledge of the trend or persistence of rainfall in the area is of great importance because of economic implications of rain sensitive operations. In the Sagar division, economy of the region mainly depends on agriculture which, in turn, relies on rainfall. Hence the study of rainfall pattern is very important for its agricultural planning.

Keeping in view the above facts, the statistical analysis of the rainfall pattern, particularly for identification of any trend or persistence in the rainfall series, statistical analysis of rainfall is carried out in Sagar division, Madhya Pradesh. The Sagar Division comprises of five districts namely, Sagar, Damoh, Panna, Tikamgarh and Chhattarpur.

This report has been prepared by Sh. Ravi Galkate, Sc.B and Sh. T Thomas, SRA posted at Regional Centre, Sagar. Sh. Laxmi Narayan Thakural, SRA, R.C. Sagar also provided assistance in data collection and its analysis for this study.


(S M SETH)

DIRECTOR

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ABSTRACT

Sagar division comprises of five districts namely Sagar, Damoh, Panna, Tikamgarh and Chhattarpur. The Sagar division has its economy mainly dependent on agriculture which in turn, relies on rainfall. Hence to understand the problem of rainfall particularly for identification of any trend or persistence in the rainfall series, a climatological study of rainfall in the Sagar division is carried out. Beside studying the statistical parameters and cross correlation, other techniques like linear regression and polynomial regression have been applied to identify the presence of any trend.

The study indicated that the serial correlation was very poor; indicating absence of any persistence in the rainfall series of the region. The distribution of rainfall in the region is nearly normal. All the raingauge stations show very good correlation with their neighbouring raingauge stations. Linear regression of monthly rainfall data shows falling trend at some places in Panna and Tikamgarh districts and shows rising trend at some places of Sagar, Damoh and Chhattarpur districts. Polynomial regression of rainfall data has indicated non-linear trend in the seasonal and annual rainfall series at Raheli, Jatara, Ajaygarh and Panna. The polynomial regression of non-monsoon rainfall series do not indicate any trend.

From the decadal mean of annual rainfall series, it was seen that rainfall during the 1961-70 was low and it was high during 1971-80 and 1981-90 except at some places in Panna and Tikamgarh districts.

1.0 INTRODUCTION

Sagar division comprises of five districts namely Sagar, Damoh, Panna, Tikamgarh and Chhattarpur. Sagar division falls under hilly plateau of Vindhyaachal region and low laying plains of North-Central Madhya Pradesh. Sagar division receives an average rainfall of around 1080 mm, which is near to the national average. In spite of having good rainfall average, region experiences acute problem of water shortage during rabbi and summer season. The major portion of the economy in the division is due to agriculture which involves nearly 80% of its population. Sagar division is however much below the national average of 27.5% (as in 1983-84) in the field of irrigation. The life style and socio-economic condition of the people of the region are governed by rainfall. Since the economy of the region mainly depends on agriculture which, in turn, relies on rainfall, the study of rainfall pattern is very important for its agricultural planning.

To understand the problem of rainfall and particularly for identification of any trend or persistence in the rainfall series, a climatological study of rainfall in the Sagar division is undertaken. The study is also aimed at presentation of hydrological information in condensed form for decision making in water resources planning of the region.

Rainfall is the main linking component in hydrologic cycle, rainfall amount generally varies from place to place

and from one month to another. Climatic fluctuation is a complex and vaguely comprehended phenomenon. A comprehensive knowledge of the trend and persistence in rainfall of the area is of great importance because of economic implications of rain sensitive operations. There is tremendous increasing need for fresh water use in all type of man's economic activities. For this region statistical analysis of rainfall have wide application in agriculture and Hydrology.

2.0 REVIEW

Studies for identifying the trend and periodicity in the rainfall series have been carried out by several authors for more than 30 years. Reynolds(1953) and Gregory(1956) had studied the regional variation of rainfall in Britain. Around the same time Pramanik and Jagannathan (1953) found systematic variation in the annual rainfall over certain parts of India.

Namias (1968) had studied the trend in rainfall of Central Park Observatory, New York and related them to general circulation aberration. Mitchel (1968) had also studied the trend in rainfall of Central Park Observatory using power spectrum analysis.

Koteswaram and Alvi (1969), Bhargava and Bansal (1973) had studied the secular trend and periodicities in the monsoon and annual rainfall of selected stations in India and had noted the presence of quasi-biennial oscillations. Winstanley (1973), while dealing with the aridity in the Sahel zone has established a 200 and 700 year harmonic cycle in behavior of rainfall and has included Bikaner and Jodhpur also in the cycle. Jagannathan and Bhalme (1973) showed that rainfall in India during the monsoon season has oscillations corresponding to the sunspot cycle.

Parthasarathy and Dhar (1974 and 1975), have examined the trends and periodicities in the sub-divisional rainfall of India extending over 60 years by using techniques like Mann-Kendal rank statistic, low pass filter and power spectrum analysis. Pareek et al. (1976), and Ramsastri

(1979), have used similar techniques for studying the trends of seasonal and annual rainfall in Sutlaj catchment and West Rajasthan respectively. Parthasarathi and Dhar (1974), have noticed the presence of persistence in the rainfall series of south interior Karnataka sub-division.

Ramasastri and Nirupama (1986), carried out statistical analysis of monthly and annual rainfall data of Belgaum district to identify the presence of any trend and to study the phenomenon of low rainfall

Ramamurthy et al (1987) studied the long term variation in the rainfall over upper Narmada catchment. Monthly, seasonal and annual rainfall of 38 stations in the upper Narmada catchment for the period of 1901 to 1980 were analysed. To test the presence of increasing or decreasing trend, Mann-Kendall rank statistics, Crammer test and low pass filter were used. The analysis indicated an increasing trend from the beginning of the century up to 1945 and thereafter stabilised around mean.

3.0 PROBLEM DEFINITION

Climatic fluctuation is a complex and vaguely comprehended phenomenon. In general, prediction of climate is possible if :

- (1) a climatic variable is statistically auto-predictable from knowledge of its own past history.
- (2) a climatic variable is statistically correlated with one or more variables that in turn are statistically and physically auto-predictable.

One of the methods to examine climatic shifts is the statistical analysis of the past behavior of the sample. In statistical analysis, the time series is assumed to be of two components; the deterministic components like trend, cycle, persistence and non-deterministic components namely randomness. Though it was recognized that auto-prediction of rainfall from its own time series was not possible because of the randomness associated with the process, efforts were made by various investigators to make long range forecasts of seasonal and annual precipitation through lag correlation in time series and space. Yevjevich (1964), has shown the time series of the past century to fit a stochastic model of a stationary, normally distributed random variable at variety of locations.

As indicated in the review at 2.0, further studies by several authors in India and other countries on seasonal and annual rainfall have indicated immense potential of statistical analysis in the identification of trend and persistence. WMO (1969), has recommended a number of

statistical techniques for climatological analysis. Using some of these methods, the monthly, seasonal and annual rainfall of rain gauge stations located in the five districts of Sagar division has been analysed to study presence of any trend and persistence in the rainfall series of the area.

3.1 DESCRIPTION OF STUDY AREA

Sagar division comprises of five districts namely Sagar, Damoh, Panna, Tikamgarh and Chhattarpur. The three districts Sagar, Damoh and Panna falls under hilly plateau of Vindhyaachal region whereas Tikamgarh and Chhattarpur districts of the division falls under low laying plains of North-Central Madhya Pradesh. The Sagar division lies between North latitudes $23^{\circ} 17'$ and $25^{\circ} 58'$ and East longitude $78^{\circ} 7'$ and $80^{\circ} 67'$ (fig. 2). The Sagar division has total geographical area of 38.22 lakh ha, out of which , 9.93 lakh ha is under forest and 17.16 lakh ha which is nearly 45% of the geographical area is under crops. The area under study is more or less undulating one. The elevation extended from lowest 125 m at Bihai of Panna district to highest 752 m at Chorai of Damoh district.

The Sagar division receives an average annual rainfall of around 1080 mm. Nearly 90 percent of the rainfall is received during the period of June to October , because of South-West monsoon. The locations of the rain gauge stations is shown in the Index map at Fig. 2. The soil in the

region is mainly of medium black-cotton type. Major crops of the region are paddy, wheat and gram.

The division has two major river systems Dhasan and Ken. Dhasan is the major tributary of river Betwa. River Bina and Jamni are the other tributaries of river Betwa. Ken is the tributary of river Ganga. The other rivers Bewas, Dehar, Kopra and Bearma are the tributaries of river Ken. The river network system in the division is shown in Fig. 3.

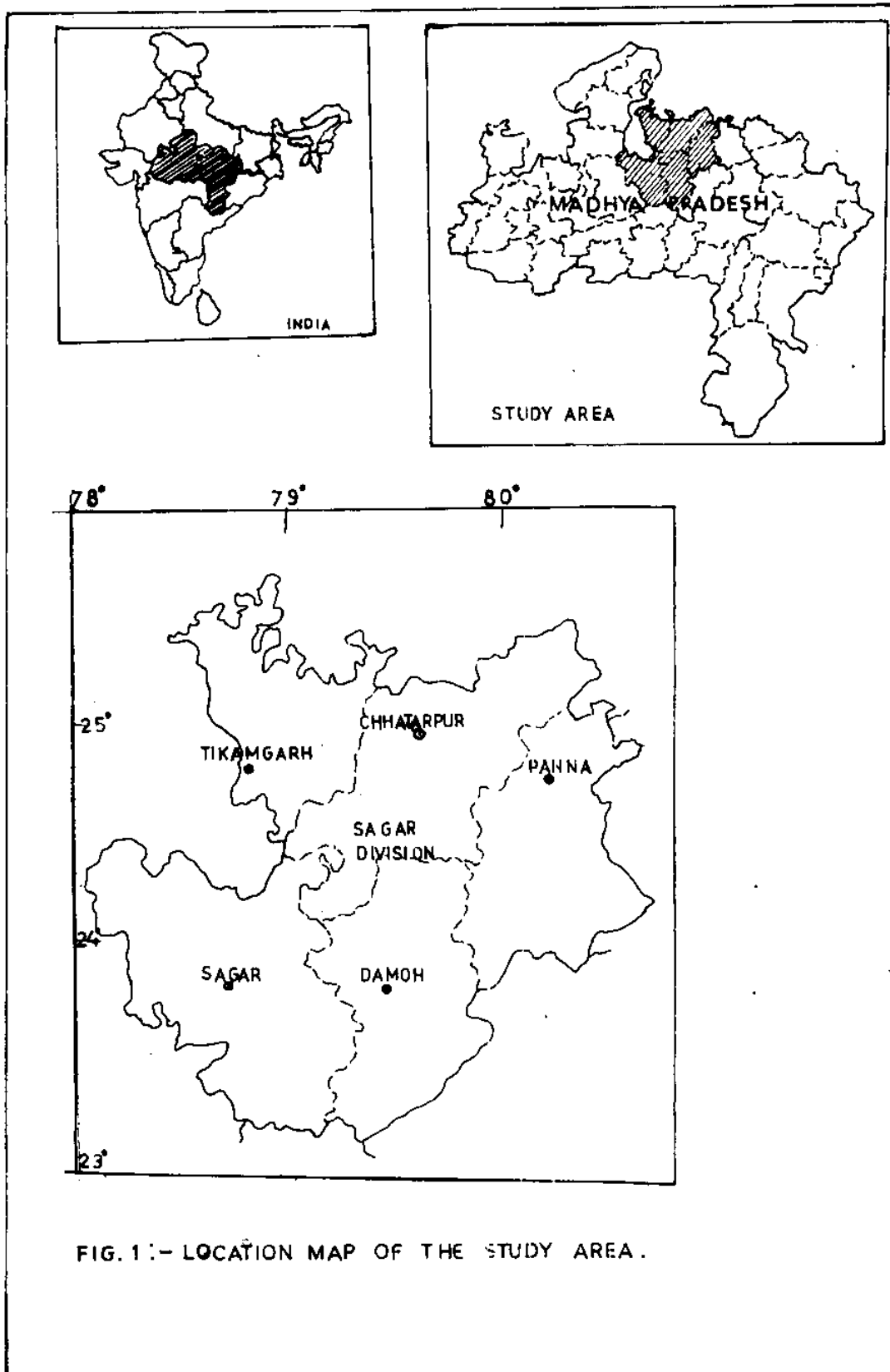


FIG. 1:- LOCATION MAP OF THE STUDY AREA.

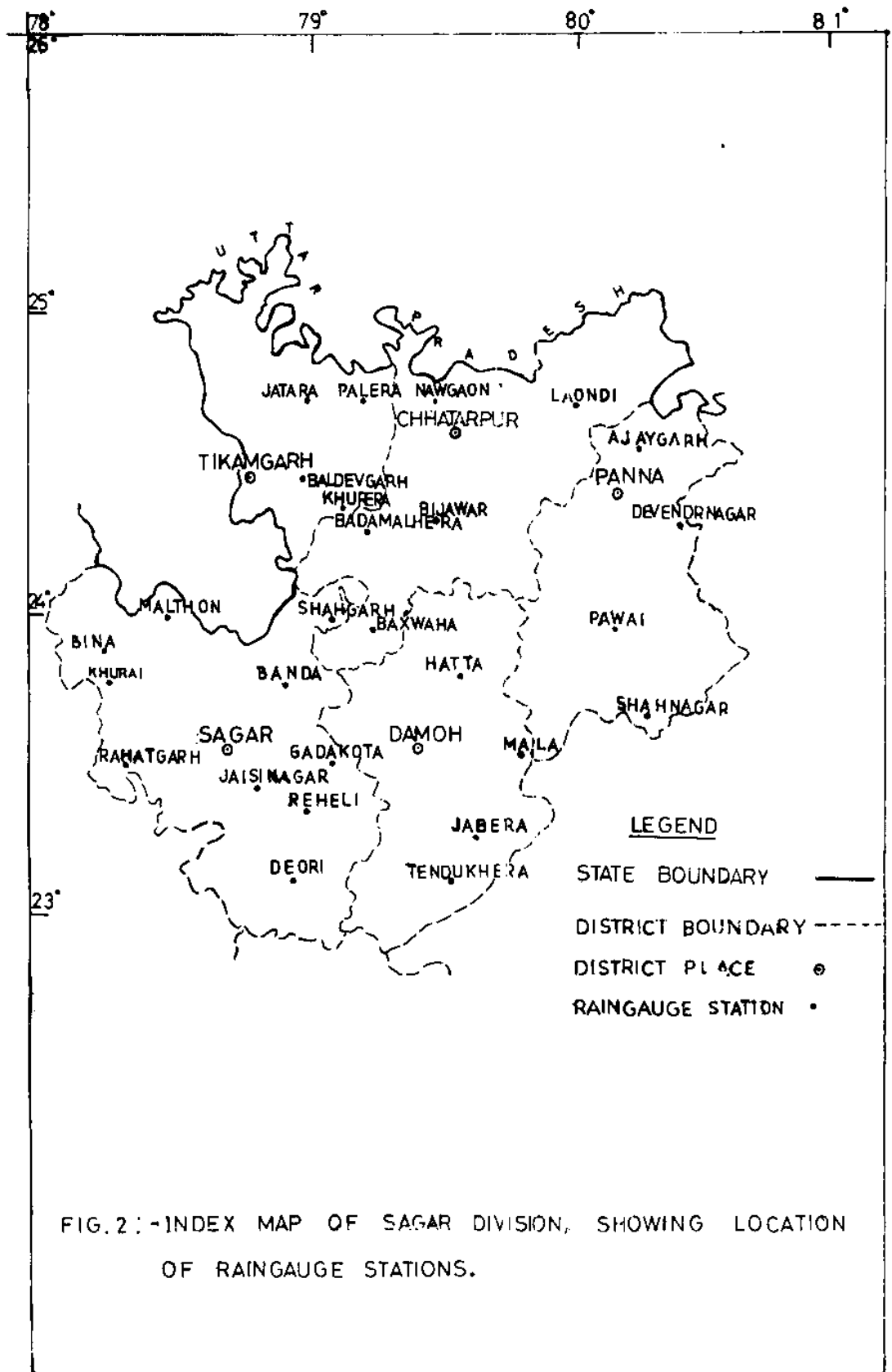


FIG.2 :-INDEX MAP OF SAGAR DIVISION, SHOWING LOCATION OF RAINGAUGE STATIONS.

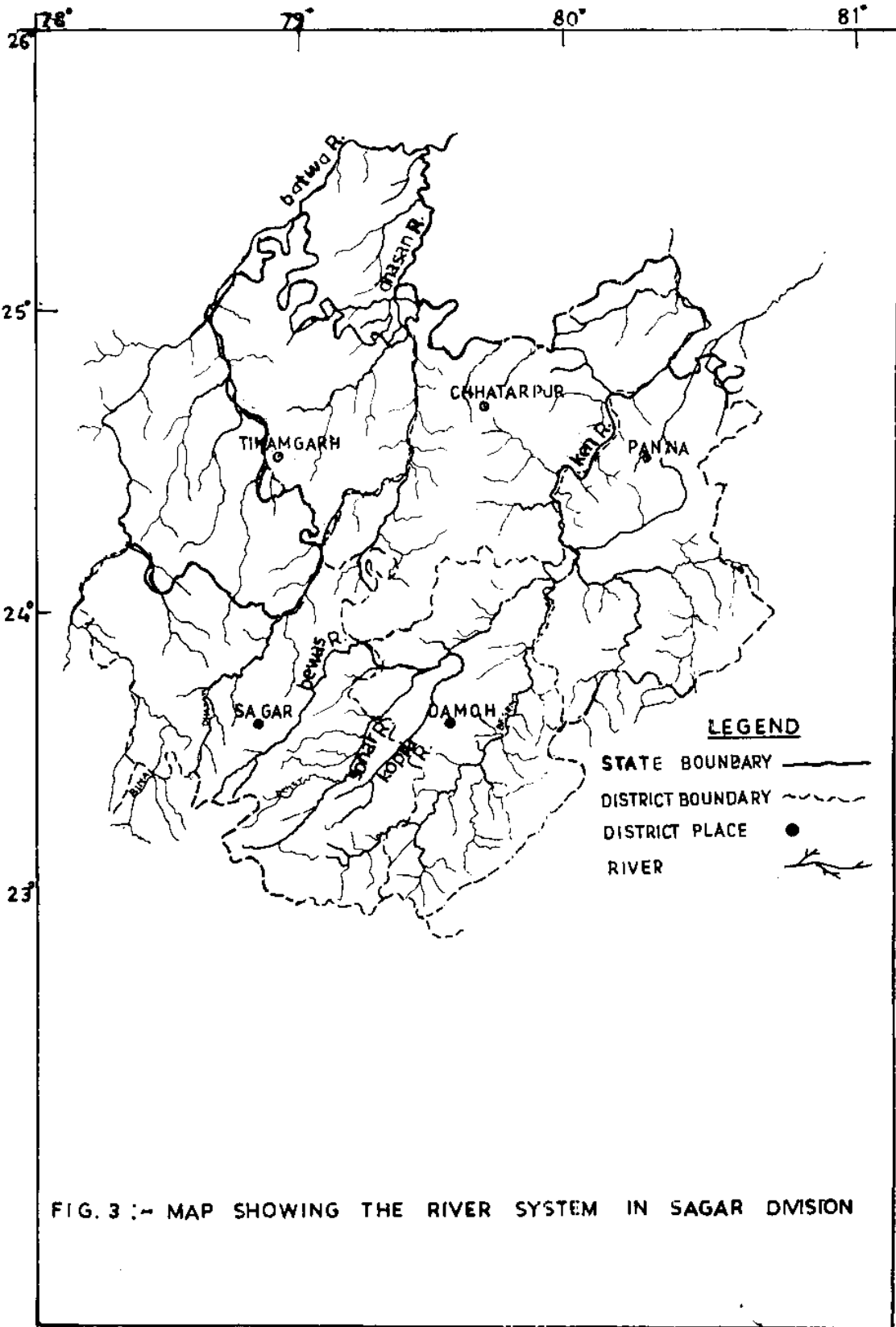


FIG. 3 :- MAP SHOWING THE RIVER SYSTEM IN SAGAR DIVISION

4.0 METHODOLOGY

The average monthly and annual rainfall for each district of the Sagar division has been computed by arithmetic mean method. The statistical parameters mean, standard deviation, coefficient of skewness and kurtosis for rainfall data have been computed for each of the twelve months and also for monsoon (June-October), non-monsoon (November-May), and annual (January-December) periods. Also, the decade means have been computed to identify the period of low or high rainfall epoch.

4.1 STUDY OF MONSOON PATTERN

To study the dependence of the total monsoon rainfall on the rainfall of each monsoon month and the relationship of the rainfall of each of the monsoon month with one another, cross correlation using equation (1) has been worked out

$$r = \frac{\left[\frac{1}{N} \sum_{i=1}^N x_i y_i - \frac{1}{N} \left(\sum_{i=1}^N x_i \right) \frac{1}{N} \left(\sum_{i=1}^N y_i \right) \right]}{\sqrt{\left[\frac{1}{N} \sum_{i=1}^N x_i^2 - \frac{1}{N} \left(\sum_{i=1}^N x_i \right)^2 \right] \left[\frac{1}{N} \sum_{i=1}^N y_i^2 - \frac{1}{N} \left(\sum_{i=1}^N y_i \right)^2 \right]}} \quad \dots (1)$$

where,

N is the length of the series and

x_i and y_i are two arrays of data.

Cross correlation has been worked out to see the dependence of non-monsoon rainfall on the previous monsoon rainfall. The inter-station correlation has also been worked out for the rainfall of the neighbouring raingauge stations to examine their relationship with each other.

4.2 TEST OF RANDOMNESS

In the present study, the series are examined in the first instance for randomness as it often happens that for nonrandom climatological series there is likelihood of presence of some form of trend. It is also interesting to know whether rainfall in a particular month is related to the rainfall which occurred in the previous month or years. This aspect has been studied by computing the serial correlation coefficient of the time series considering the monthly rainfall as sample data using the following equation.

$$r_k = \frac{\frac{1}{N-K} \sum_{i=1}^{N-K} x_i x_{i+k} - \frac{1}{(N-K)^2} \left(\sum_{i=1}^{N-K} x_i \right) \left(\sum_{i=1}^{N-K} x_{i+k} \right)}{\left[\frac{1}{N-K} \sum_{i=1}^{N-K} x_i^2 - \frac{1}{(N-K)^2} \left(\sum_{i=1}^{N-K} x_i \right)^2 \right] \left[\frac{1}{N-K} \sum_{i=1}^{N-K} x_{i+k}^2 - \frac{1}{(N-K)^2} \left(\sum_{i=1}^{N-K} x_{i+k} \right)^2 \right]} \quad \dots (2)$$

Where,

N is the length of series

x_i and x_{i+k} are two sets of data and

K is lag

This analysis has been carried out for K values of 3, 5, 15, and 20.

4.3 TEST FOR TREND

To identify the existence of any trend or persistence in the rainfall series, the following tests have been carried out.

- (1) Comparison of decade mean with mean of whole period.
- (2) Linear regression and
- (3) polynomial regression.

4.3.1 Comparison of decade mean with the mean of whole period

The decade means were compared with the mean of whole period of the respective rainfall series, to identify low or high rainfall trend in a particular decade. A test of 'null' hypothesis of randomness (WMO, 1966) has been applied to determine whether the difference of the means are no larger than would be compatible with the hypothesis.

$$T_k = \frac{\bar{X}_k - \bar{X}}{S} \quad \dots (3)$$

Where,

- \bar{X}_k is the mean of any k observations
- \bar{X} is the mean of whole period and
- S is the standard deviation of the whole period series

4.3.2 Linear regression

Linear regression of the form $y = mx + c$ has been attempted for the rainfall series. The regression coefficient m indicates the presence of a rising or falling trend. The coefficient was tested using the Student's t test.

4.3.3 Polynomial regression

Polynomial regression relationship of 2nd order has been also fitted to the rainfall series for examining the possibility of trend in the rainfall series. The regression coefficients were tested with the F value for the test of significance.

5.0 DATA

Monthly and annual rainfall data of thirty raingauge stations in the Sagar division of Madhya Pradesh for the period 1961-96 has been collected from the office of Sub-Divisional Officer , Department of Hydrometeorology, Chhattarpur . Also, rainfall data for Sagar district is collected from Department of Land Record & Settlement, Sagar.

6.0 APPLICATION

The statistical techniques described earlier have been applied to the monthly , seasonal and annual rainfall data of raingauge stations in all five district of Sagar division. To visualise graphically , the presence of any trend , plots of annual rainfall of all raingauge stations in the division have been made. These are shown in Figures 4 to 22. The 3 and 5 years moving averages of annual rainfall of the respective raingauge stations are also shown in the corresponding graphs.

The statistical parameters, mean , standard deviation, coefficient of skewness and kurtosis of the monthly, seasonal and annual rainfall are given in table 1.1 to 1.32 for all the raingauge stations of the division. The values of serial correlation are given in table 6.1 for lag values of 3, 5, 15, and 20 . The cross correlation matrices of seasonal rainfall are given in table 2.1 to 2.23

6.1 TREND ANALYSIS

The decade mean of each raingauge station have been compared with the mean of whole period of the respective rainfall series. Linear regression has been fitted to the monthly , monsoon and annual rainfall data series. The correlation coefficient and regression coefficient along with its t value are given in table 4.1 to 4.26 .

Polynomial regression of 2nd order has been fitted to data series of monthly, monsoon, non-monsoon and annual rainfall . The results are presented in table 5.1 to 5.4.

7.0 RESULTS AND DISCUSSION

The graphical analysis of annual rainfall series and their respective 3 and 5 year moving average series did not indicate the presence of any trend for any raingauge station except at Deori of Sagar district and Laundi of Chattarpur district, Ajaygarh of Panna district and Tikamgarh of Tikamgarh district. Deori and Laundi shows a rising trend whereas Ajaygarh and Tikamgarh shows falling trend.

7.1 RAINFALL CHARACTERISTICS

From tables 1.1 to 1.32 it may be seen that the monsoon season from June to October contributed nearly 85 to 90 % of the annual rainfall . It is also seen that July and August are the principal rainy months in the region. The coefficient of variation of rainfall during non-monsoon season is more than that of the monsoon season. Tendukera of Damoh district shows minimum coefficient of variation (55%) during non-monsoon season whereas Damoh of Damoh district shows minimum coefficient of variation (23%) during monsoon season. From the table it is also seen that coefficient of variation of monthly rainfall was found to decrease from June attaining the minimum value in August and then has an increasing trend in the subsequent months. Eight stations in the division namely Deori, Rahatgarh, Gadakota, Baxwaha, Jaisinagar, Rehli, Jabera and Laundi have minimum coefficient of variation in August i.e. below 36%. The coefficient of variation of rainfall is found maximum

in April or in November at most of the places in Sagar division.

The coefficient of skewness of monsoon season and annual rainfall is nearly zero indicating a near normal distribution of rainfall in the region. Rainfall during the non-monsoon season is seen more skewed as compared to the rainfall during monsoon season with the exception at Gadakota and Tendukhera.

The correlation of the rainfall series of monsoon months among themselves is very poor shows independent nature of rainfall occurrence.

All the raingauge stations in the division show very good correlation with their neighbouring raingauge stations. In most of the cases the correlation coefficient observed is above 0.80 and thus indicates the significant correlation. The highest correlation is observed between Damoh and Jabera of Damoh district (0.92), whereas lowest correlation is observed between Raheli of Sagar district and Jabera of Damoh district (0.66).

7.2 PERSISTENCE

From table 6.1 it is observed that the serial correlation coefficient is almost negative at all lag values for all the rainfall series and hence showing the absence of any significant persistence in the rainfall series of the region.

7.3 RAINFALL TREND IN TIME

From the decadal mean of annual rainfall given in table 3.1 , it may be seen that in the Sagar region, rainfall during the decade 1961-70 was low and it was high during the decades 1971-80 and 1981-90. It may also be observed that the decadal mean are close to the whole period mean. The Tk values given in table 3.1 are not found significant.

7.4 LINEAR TREND

The linear regression analysis of annual rainfall series has shown significant linear trend at some places in the Sagar division. Significant rising trend has been noticed in the annual rainfall series at Raheli, Deori, Malthon, Jaberā and Bijawar. Significant falling trend has been noticed in the annual rainfall series at Ajaygarh of Panna district and Tikamgarh. Other stations do not show any trend in the annual rainfall time series.

July and August are the principal rainy months in the Sagar region. The linear regression analysis of monthly rainfall series for July and August shows rising trend at some places in Sagar, Damoh and Chhattarpur districts and shows falling trend at some places in Panna, and Tikamgarh districts. Jatara of Panna district shows exceptionally significant rising trend. The presence of any trend in the monthly rainfall series is reflected in the annual rainfall series.

7.5 NON-LINEAR TREND

The polynomial regression of the rainfall series in the region indicates presence of trend at very few places in the region. The polynomial regression of annual rainfall series indicates rising trend at Raheli of Sagar district and Jatara of Tikamgarh district whereas falling trend is observed at Ajaygarh of Panna district and Tikamgarh of Tikamgarh district.

The polynomial regression of non-monsoon rainfall series do not indicate presence of any trend in the region. The polynomial regression of monsoon rainfall series shows same trend as annual rainfall series. The monthly rainfall series indicates non-linear trend at Raheli, Damoh, Pawai, Tikamgarh and Jatara.

(A) District : Sagar, Station : Sagar

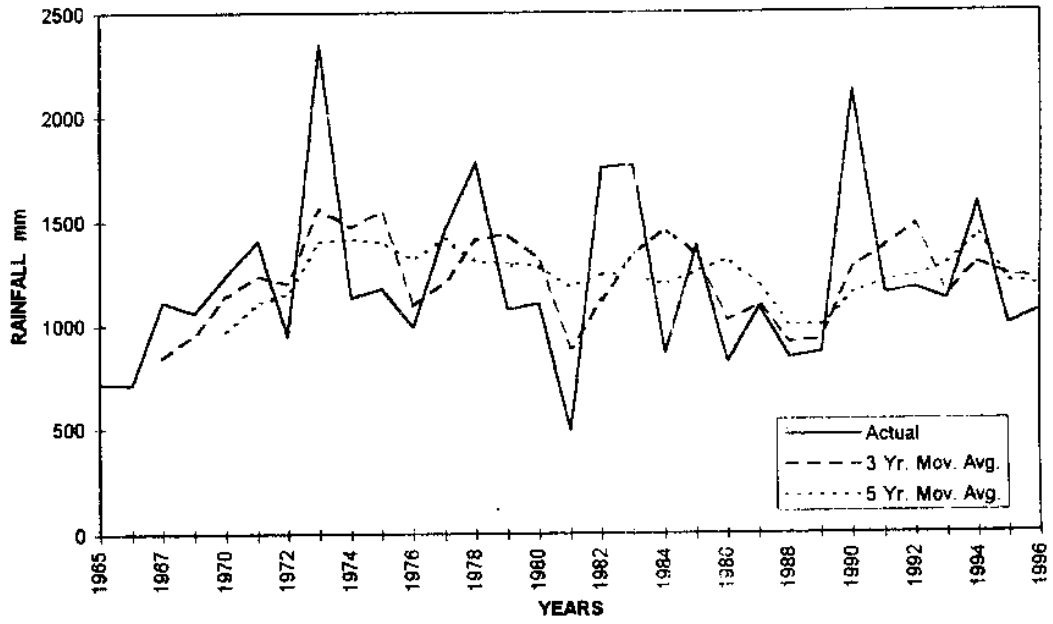


Figure 4 Annual rainfall time series and its 3 and 5 years moving averages

(B) District : Sagar, Station : Khurai

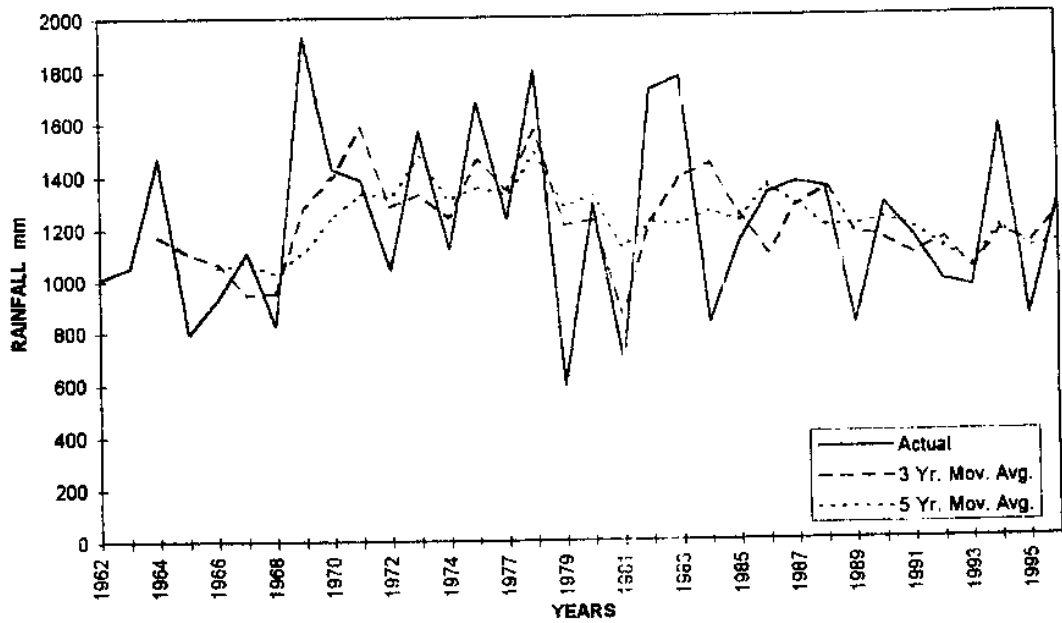


Figure 5 Annual rainfall time series and its 3 and 5 years moving averages.

(C) District : Sagar, Station : Banda

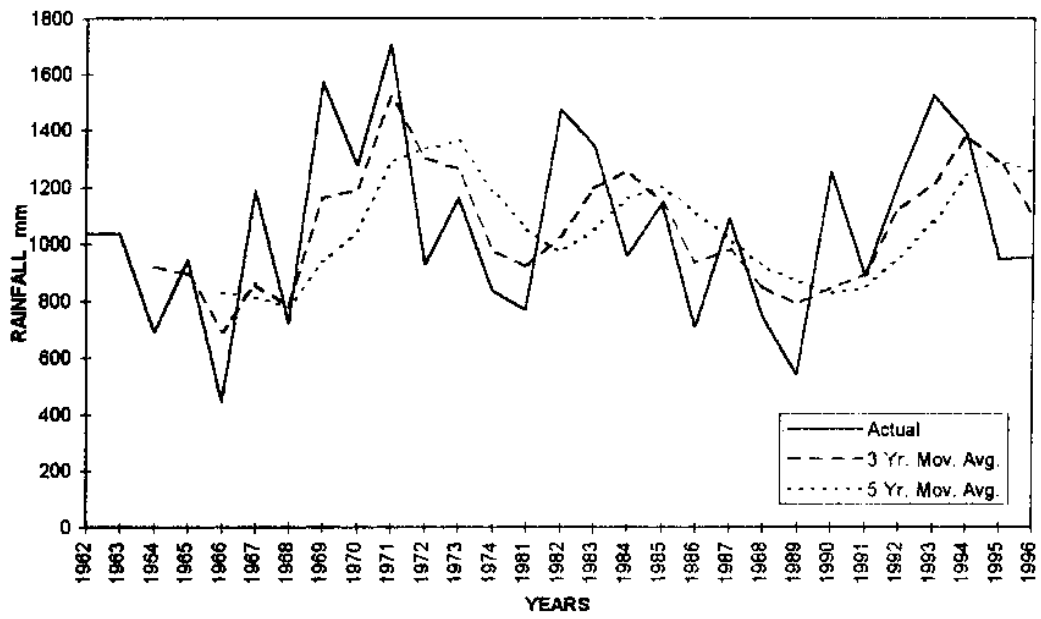


Figure 6 Annual rainfall time series and its 3 and 5 years moving averages.

(D) District : Sagar, Station : Raheli

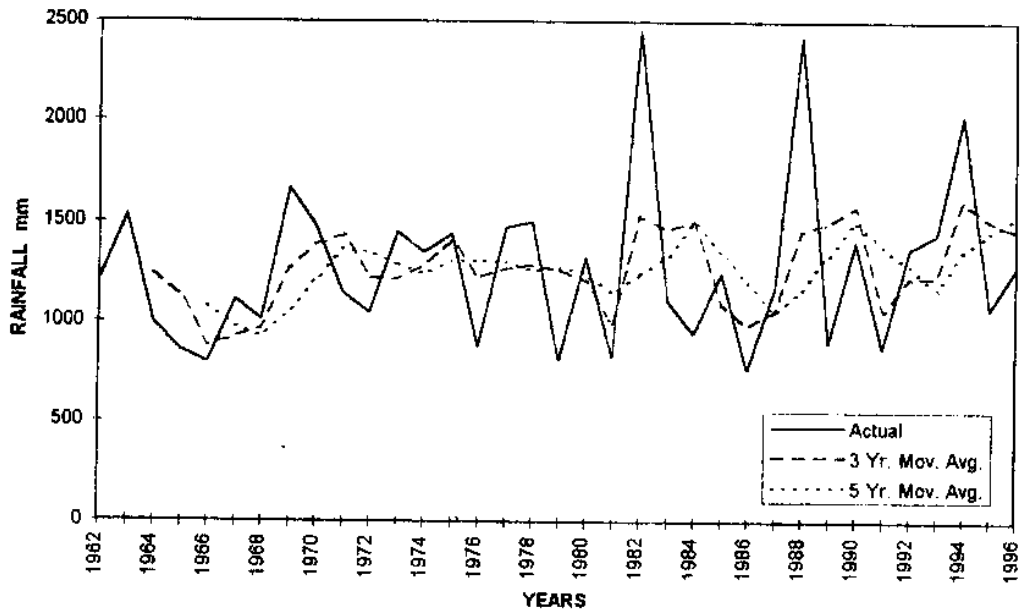


Figure 7 Annual rainfall time series and its 3 and 5 years moving averages.

(E) District : Sagar, Station : Deori

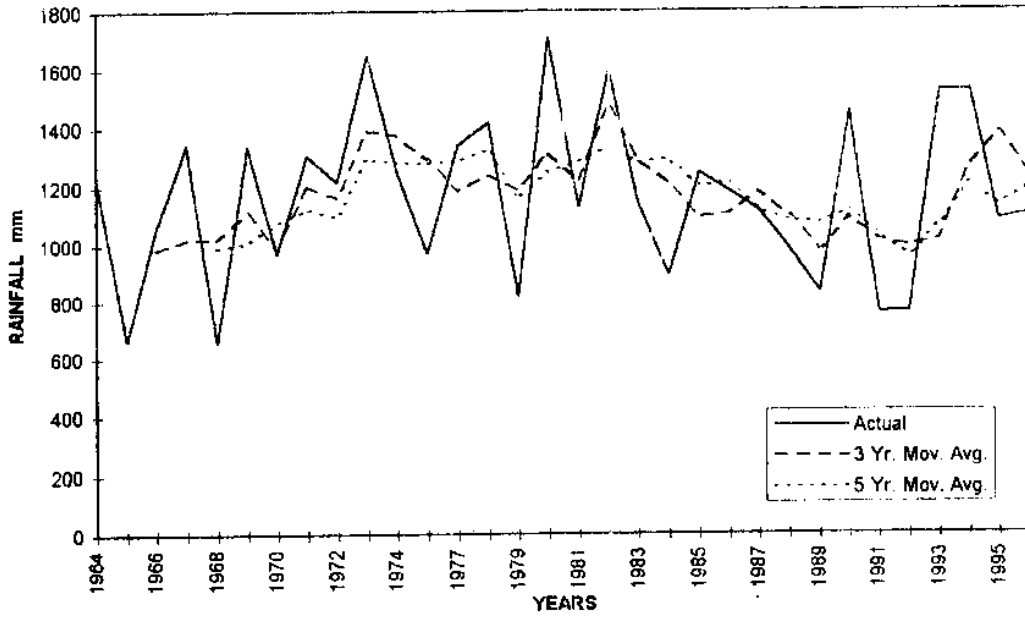


Figure 8 Annual rainfall time series and its 3 and 5 years moving averages.

(A) District : Damoh, Station : Damoh

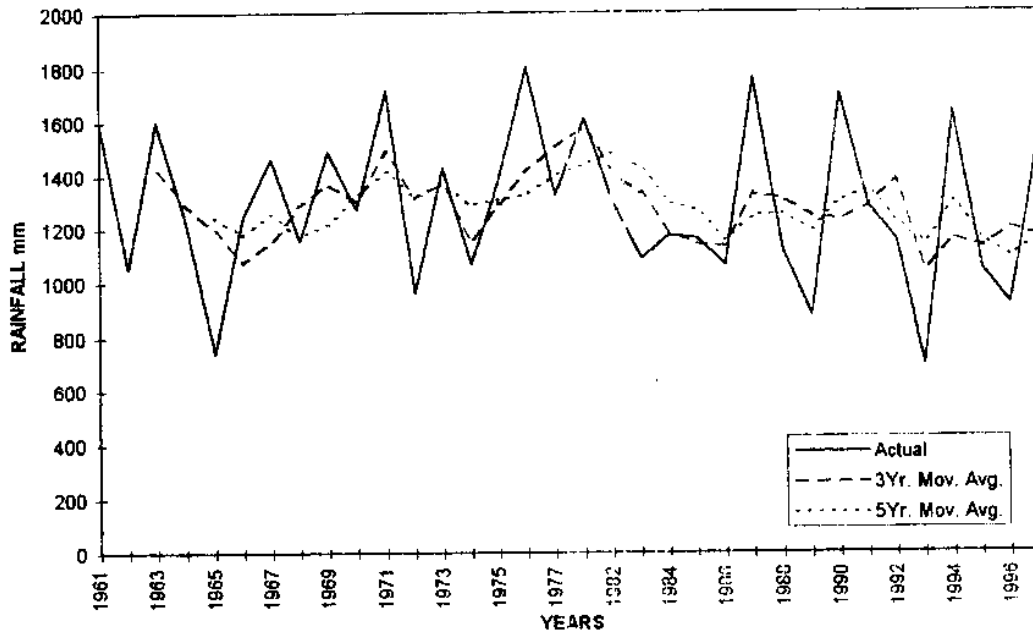


Figure 9 Annual rainfall time series and its 3 and 5 years moving averages.

(B) District : damoh, Station : Hatta

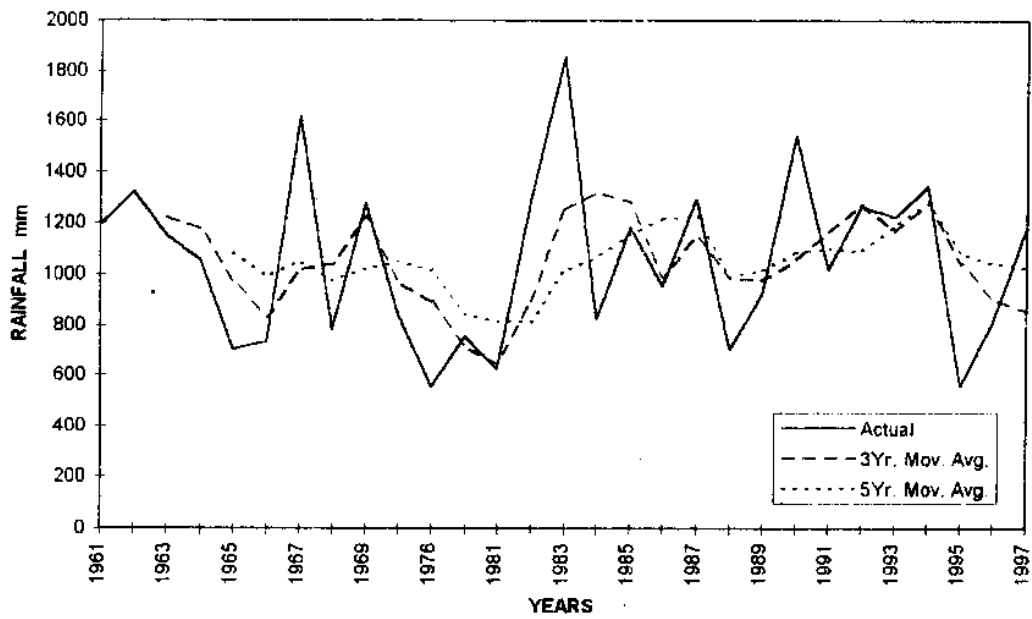


Figure 10 Annual rainfall time series and its 3 and 5 years moving averages.

(C) District : Damoh, Station : Jabera

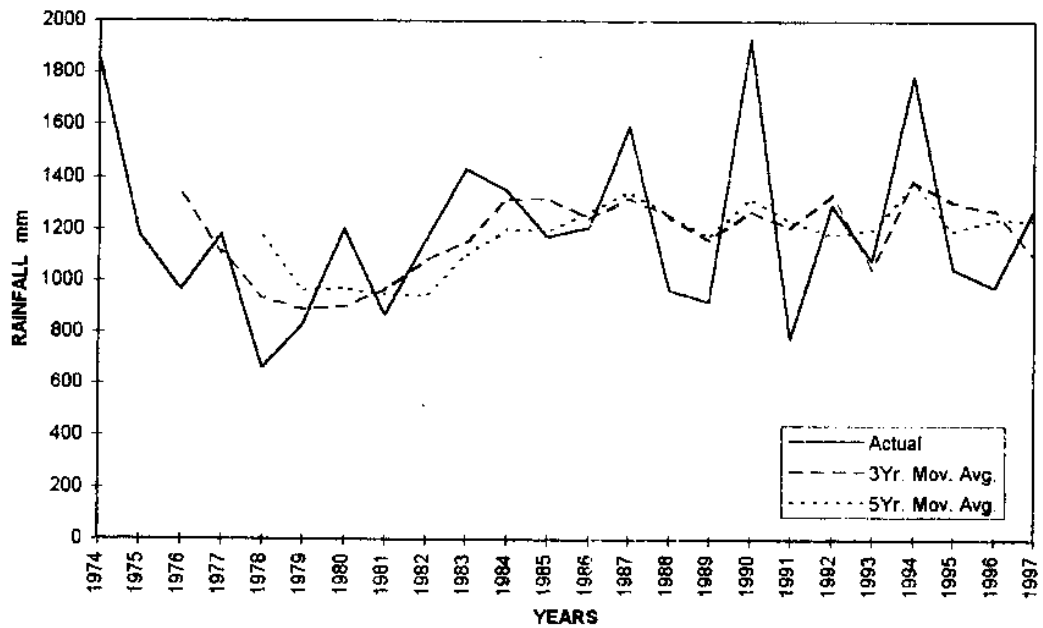


Figure 11 Annual rainfall time series and its 3 and 5 years moving averages.

(A) District : Panna, Station : Panna

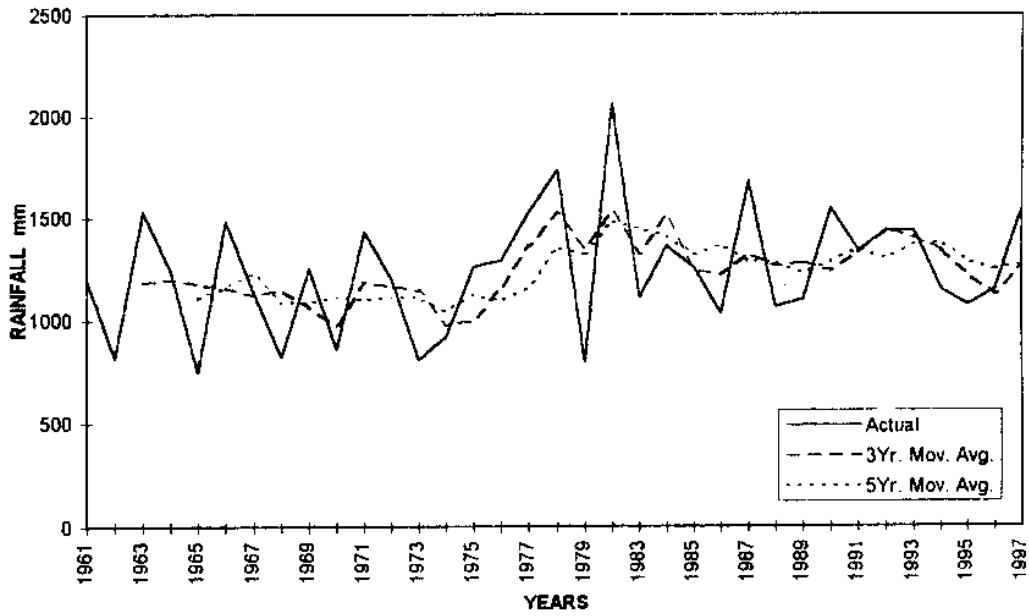


Figure 12 Annual rainfall time series and its 3 and 5 years moving averages.

(B) District : Panna, Station : Pawai

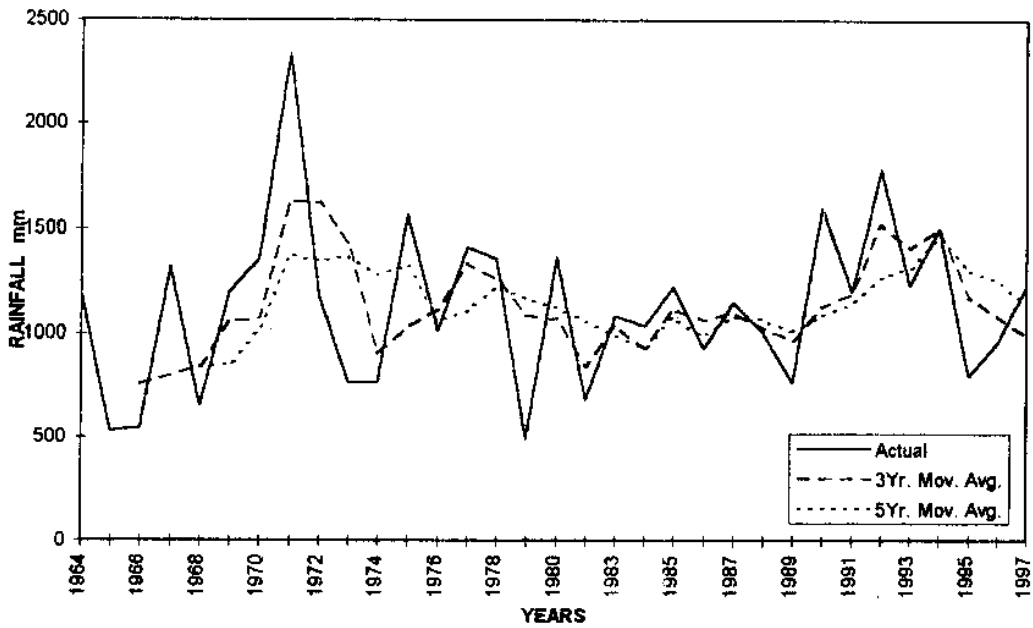


Figure 13 Annual rainfall time series and its 3 and 5 years moving averages.

(C) District : Panna, Station : Ajaygarh

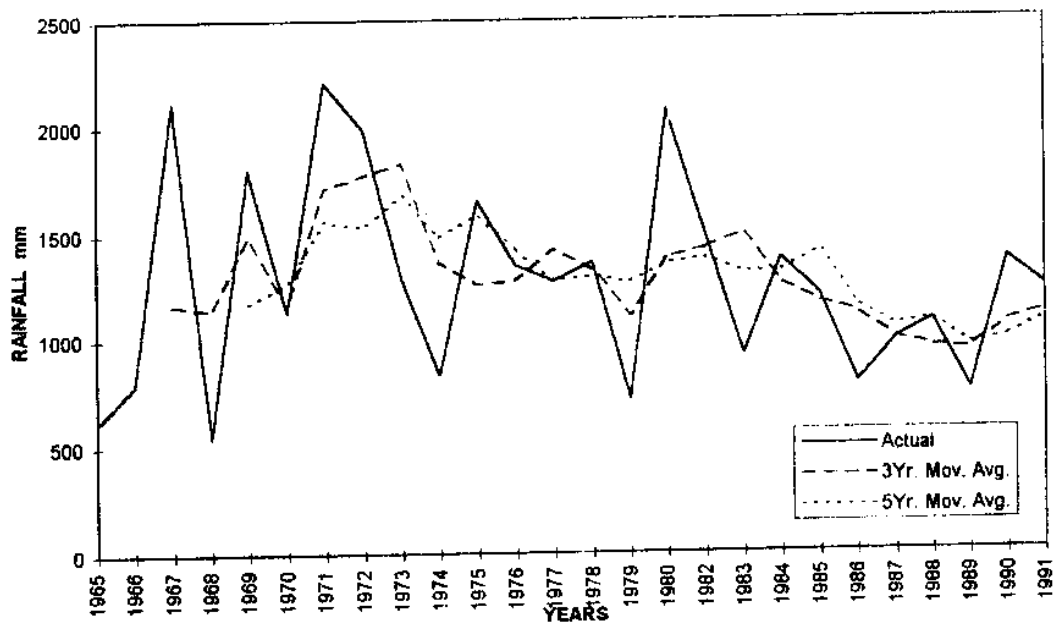


Figure 14 Annual rainfall time series and its 3 and 5 years moving averages.

(A) District : Tikamgarh, Station : Tikamgarh

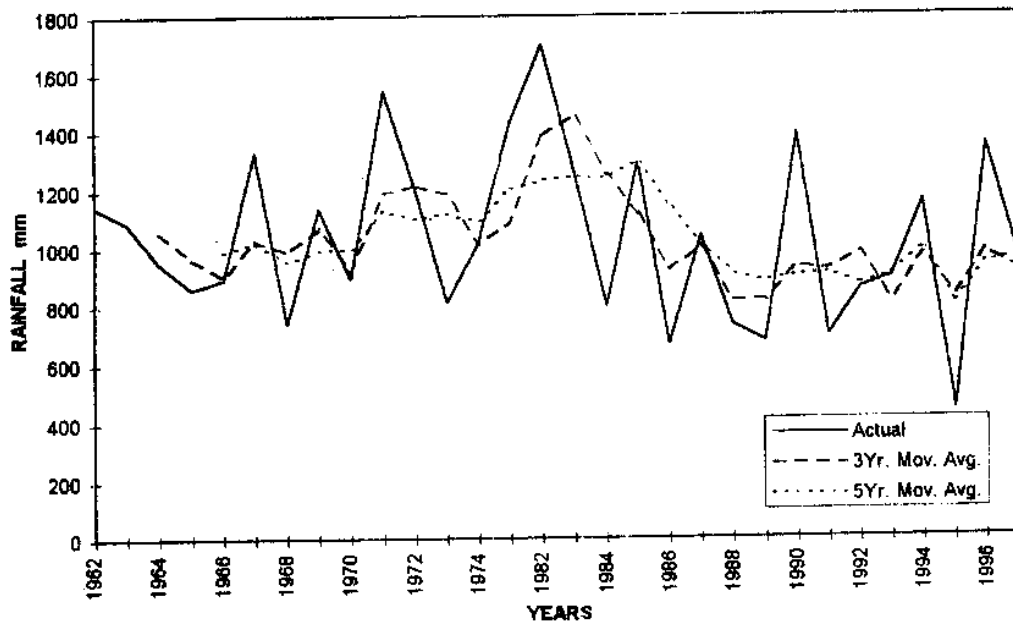


Figure 15 Annual rainfall time series and its 3 and 5 years moving averages.

(B) District : Tikamgarh, Station : Jatara

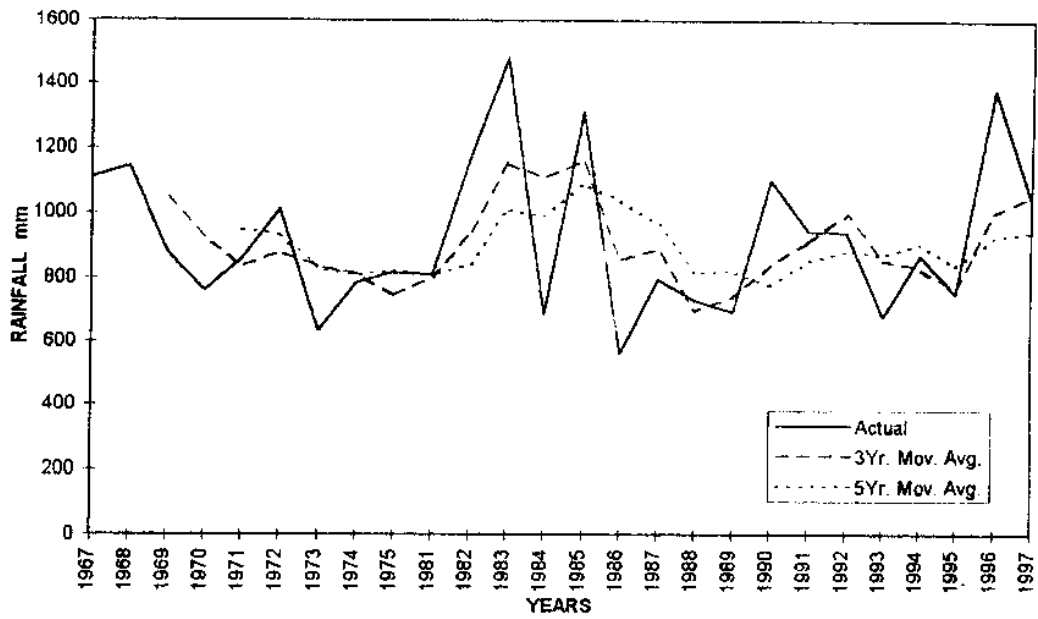


Figure 16 Annual rainfall time series and its 3 and 5 years moving averages.

(C) District : Tikamgarh, Station : Baldevgarh

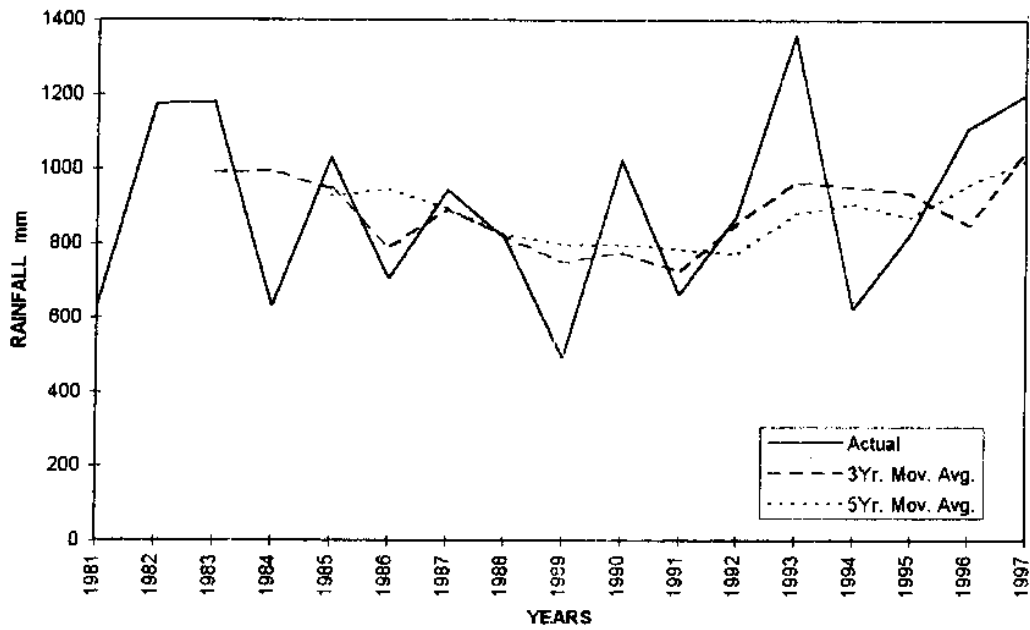


Figure 17 Annual rainfall time series and its 3 and 5 years moving averages

(A) District : Chattarpur, Station : Chattarpur

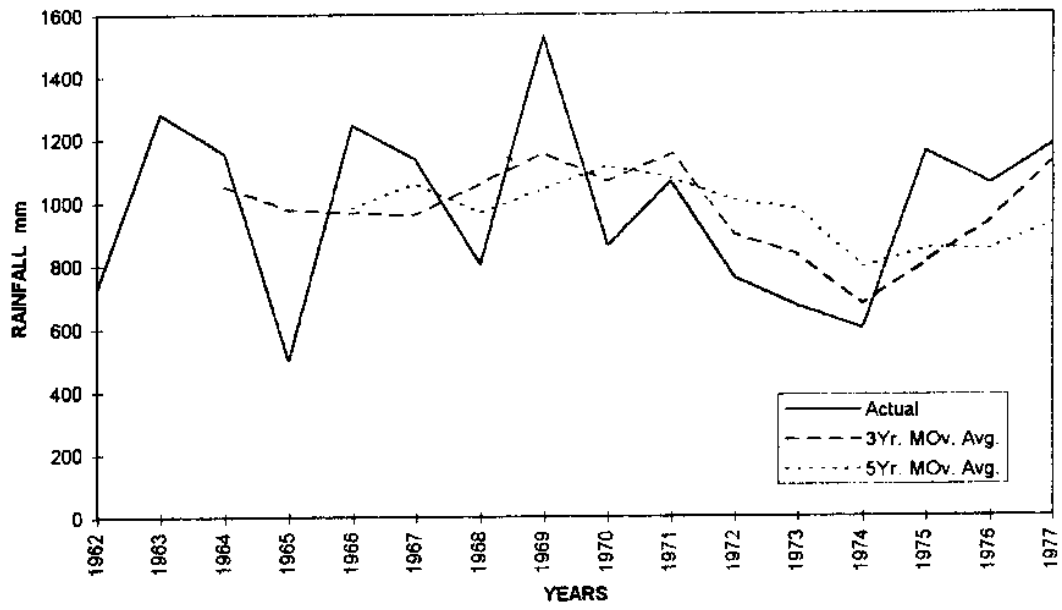


Figure 18 Annual rainfall time series and its 3 and 5 years moving averages.

(B) District : chattarpur, Station : Laundi

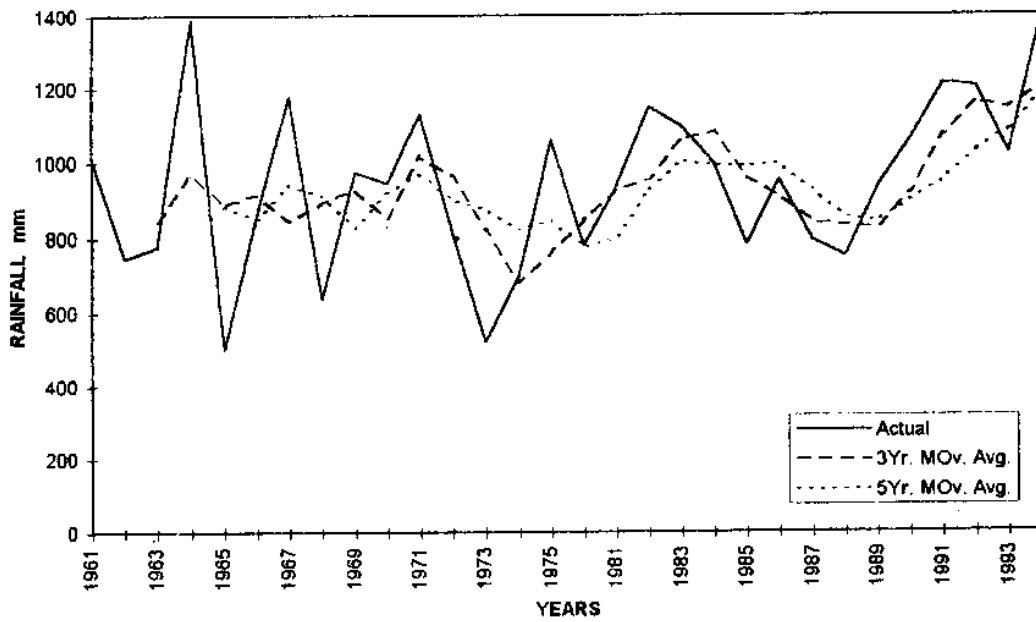


Figure 19 Annual rainfall time series and its 3 and 5 years moving averages.

(C) District : Chattarpur, Station : Nawgaon

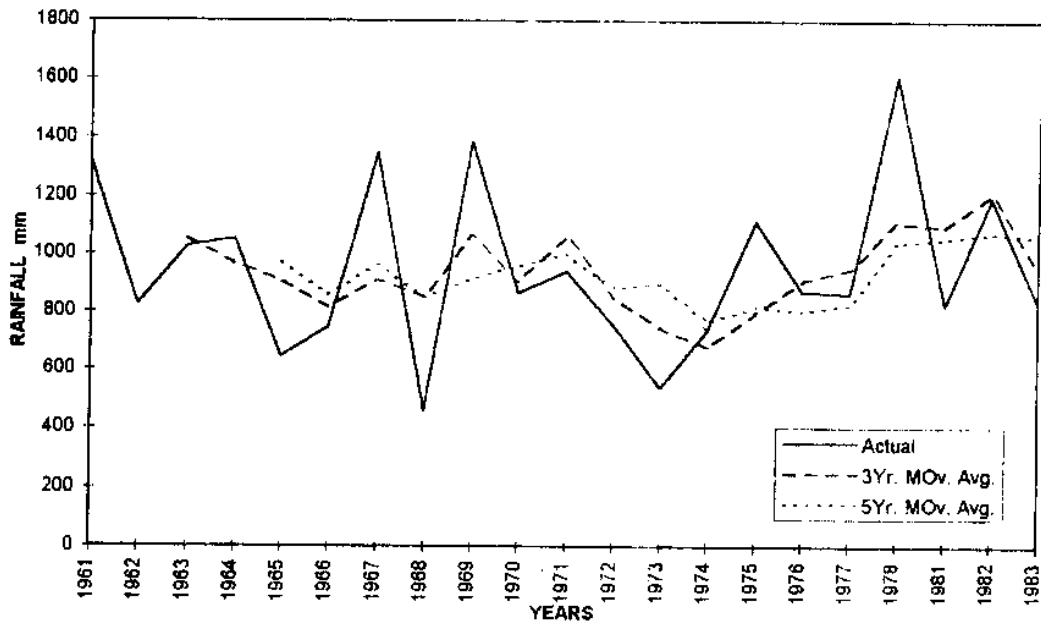


Figure 20 Annual rainfall time series and its 3 and 5 years moving averages.

(D) District : Chattarpur, Station : Baxwaha

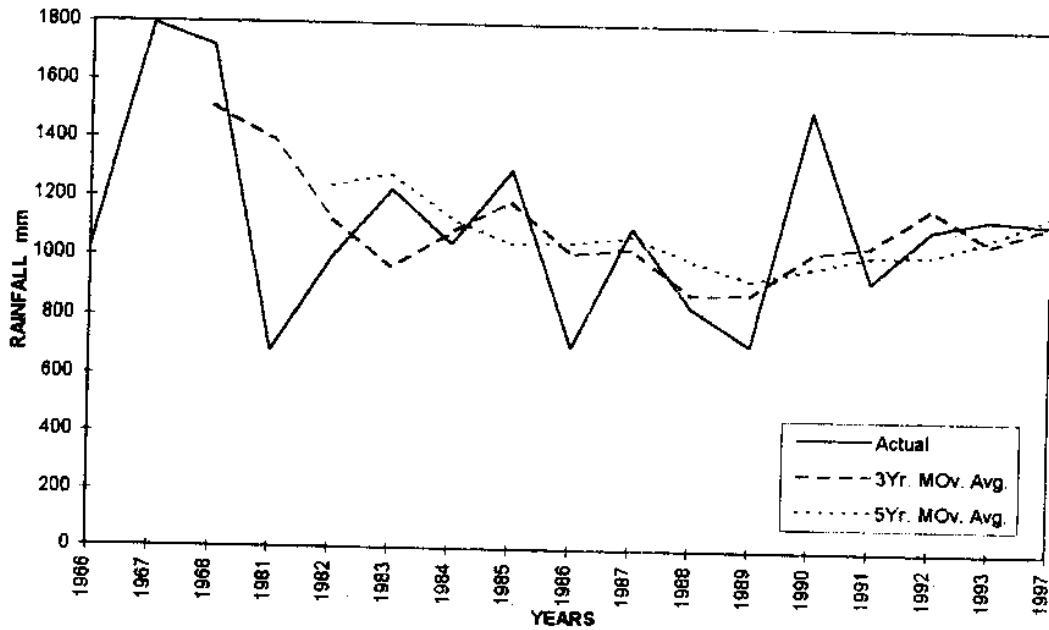


Figure 21 Annual rainfall time series and its 3 and 5 years moving averages.

(E) District : chattarpur, Station : Bijawar

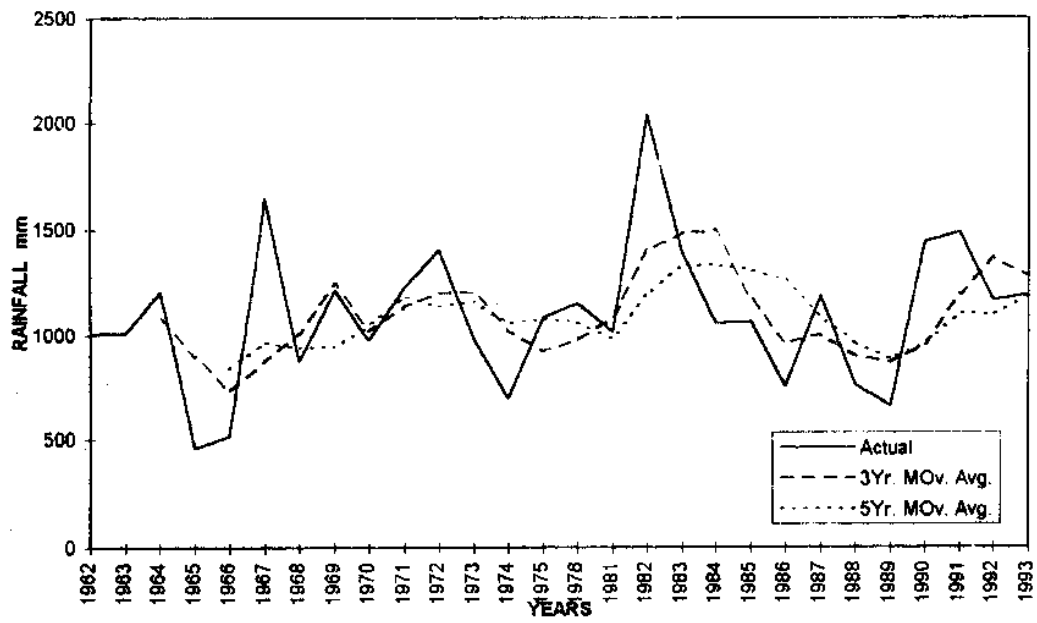


Figure 22 Annual rainfall time series and its 3 and 5 years moving averages.

Table 1.1 Statistical parameters of rainfall at Sagar, District Sagar.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	16.69	34.69	207.00	0.49	0.35
February	13.48	22.95	170.00	0.38	0.24
March	10.49	15.75	150.00	0.21	0.09
April	2.05	6.67	324.00	0.63	0.45
May	7.11	14.63	205.00	0.43	0.25
June	136.77	122.62	89.00	0.27	0.14
July	341.80	194.87	57.00	0.33	0.23
August	444.39	206.21	46.00	0.20	0.13
September	172.15	131.71	76.00	0.18	0.11
October	24.05	48.19	196.00	0.42	0.25
November	16.60	44.42	267.00	0.56	0.41
December	12.92	26.07	201.00	0.49	0.34
Monsoon	1126.05	414.09	37.00	0.19	0.13
Non-Monsoon	77.70	83.56	108.00	0.29	0.17
Annual	1203.75	415.09	34.00	0.17	0.12

Table 1.2 Statistical parameters of rainfall at Khurai,
District Sagar.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	16.24	25.85	159.00	0.26	0.12
February	7.91	14.03	177.00	0.28	0.12
March	7.45	13.36	179.00	0.42	0.27
April	2.22	6.18	278.00	0.53	0.34
May	3.24	6.06	186.00	0.27	0.11
June	125.04	98.47	78.00	0.12	0.06
July	369.11	189.07	51.00	0.13	0.06
August	472.95	209.04	44.00	0.15	0.12
September	165.47	131.42	79.00	0.25	0.18
October	21.34	45.78	214.00	0.46	0.30
November	12.53	25.70	205.00	0.39	0.22
December	8.26	18.23	220.00	0.53	0.39
Monsoon	1158.36	335.68	29.00	0.02	0.06
Non-Monsoon	56.39	50.27	89.00	0.13	0.07
Annual	1214.75	343.75	28.00	0.04	0.07

Table 1.3 Statistical parameters of rainfall at Deori, District Sagar.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	14.72	33.64	228.00	0.58	0.44
February	11.52	28.88	250.00	0.47	0.30
March	7.12	14.22	199.00	0.50	0.37
April	1.14	3.76	328.00	0.64	0.49
May	6.62	20.09	303.00	0.81	0.75
June	154.83	120.35	77.00	0.16	0.09
July	334.72	114.94	34.00	0.07	0.07
August	401.91	178.88	5.00	0.00	0.07
September	181.86	121.91	24.00	0.16	0.09
October	26.10	52.92	202.00	0.41	0.24
November	12.02	31.54	266.00	0.53	0.35
December	12.43	25.99	205.00	0.40	0.23
Monsoon	1097.95	283.28	26.00	0.02	0.07
Non-Monsoon	65.74	72.72	111.00	0.19	0.10
Annual	1163.69	285.79	25.00	0.01	0.07

Table 1.4 Statistical parameters of rainfall at Gadakota, District Sagar.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	11.16	17.61	157.00	0.52	0.46
February	5.58	10.50	188.00	0.48	0.34
March	6.33	11.80	186.00	0.46	0.34
April	5.66	11.72	206.00	0.51	0.35
May	4.00	7.47	186.00	0.58	0.52
June	136.54	98.64	72.00	0.40	0.36
July	274.36	190.92	69.00	0.40	0.45
August	298.63	107.52	36.00	0.16	0.20
September	162.09	71.99	44.00	-0.17	0.23
October	31.18	66.67	213.00	0.76	0.73
November	5.81	10.41	179.00	0.47	0.35
December	10.90	22.46	205.00	0.71	0.66
Monsoon	931.90	245.47	26.00	0.36	0.34
Non-Monsoon	48.80	41.08	84.00	0.10	0.17
Annual	980.70	251.29	26.00	0.37	0.37

Table 1.5 Statistical parameters of rainfall at Malthon, District Sagar.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	11.52	21.34	185.00	0.71	0.67
February	12.03	22.08	183.00	0.41	0.28
March	5.76	16.21	281.00	0.79	0.74
April	1.51	4.98	329.00	0.87	0.84
May	5.71	13.36	233.00	0.50	0.33
June	118.25	96.09	81.00	0.14	0.12
July	346.82	151.21	43.00	0.52	0.48
August	343.17	155.50	45.00	0.14	0.15
September	178.09	140.33	78.00	0.20	0.17
October	13.63	40.73	298.00	0.73	0.64
November	10.98	30.20	275.00	0.60	0.44
December	1.71	3.71	216.00	0.54	0.41
Monsoon	1022.81	313.93	31.00	0.13	0.22
Non-Monsoon	49.24	75.45	153.00	0.42	0.31
Annual	1072.06	292.16	27.00	0.22	0.20

Table 1.6 Statistical parameters of rainfall at Bina, District Sagar.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	3.00	10.23	341.00	0.87	0.84
February	4.33	7.79	179.00	0.46	0.34
March	0.54	1.66	305.00	0.83	0.80
April	5.66	11.72	206.00	0.51	0.35
May	4.00	7.47	186.00	0.58	0.52
June	102.27	63.88	62.00	0.24	0.25
July	369.21	168.81	45.00	0.27	0.27
August	439.94	166.17	37.00	0.47	0.40
September	161.49	130.70	80.00	0.22	0.17
October	25.69	78.47	305.00	0.86	0.83
November	9.05	34.28	360.00	0.88	0.85
December	2.44	6.79	278.00	0.78	0.73
Monsoon	1081.37	323.50	30.00	0.30	0.26
Non-Monsoon	11.62	16.54	142.00	0.51	0.45
Annual	1092.99	336.30	31.00	0.31	0.28

Table 1.7 Statistical parameters of rainfall at Rahatgarh, District Sagar.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	2.63	8.41	319.00	0.85	0.82
February	3.59	8.18	228.00	0.65	0.57
March	6.84	16.32	238.00	0.79	0.75
April	2.22	6.18	278.00	0.53	0.34
May	3.16	6.95	219.00	0.60	0.50
June	117.39	76.79	65.00	-0.01	0.11
July	314.31	122.30	38.00	0.12	0.19
August	544.56	100.00	18.00	-0.06	0.29
September	186.98	135.27	72.00	0.29	0.28
October	20.45	21.45	104.00	0.20	0.19
November	3.18	10.55	331.00	0.85	0.82
December	4.20	7.70	183.00	0.45	0.32
Monsoon	1146.09	290.96	25.00	0.07	0.17
Non-Monsoon	21.99	19.87	90.00	0.09	0.21
Annual	1168.08	294.91	25.00	0.05	0.16

Table 1.8 Statistical parameters of rainfall at Jaisinagar, District Sagar.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	1.24	3.81	305.00	0.85	0.81
February	2.30	7.02	304.00	0.84	0.81
March	4.15	12.97	312.00	0.85	0.82
April	0.18	0.60	331.00	0.86	0.83
May	1.93	4.31	222.00	0.50	0.34
June	162.71	146.48	90.00	0.34	0.27
July	381.69	149.94	39.00	0.26	0.23
August	417.45	153.85	36.00	0.09	0.17
September	156.53	153.08	97.00	0.34	0.26
October	16.58	30.31	182.00	0.65	0.59
November	11.49	38.11	331.00	0.85	0.82
December	0.45	1.50	330.00	0.84	0.81
Monsoon	1165.64	364.09	31.00	0.23	0.20
Non-Monsoon	10.60	18.73	177.00	0.60	0.55
Annual	1176.24	363.65	31.00	0.22	0.19

**Table 1.9 Statistical parameters of rainfall at Banda,
District Sagar.**

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	12.46	21.59	173.00	0.35	0.22
February	7.99	15.26	190.00	0.35	0.18
March	11.37	23.45	206.00	0.40	0.22
April	3.05	14.10	461.00	0.92	0.90
May	3.96	7.76	195.00	0.30	0.14
June	95.90	98.63	102.00	0.26	0.14
July	295.07	149.68	50.00	0.15	0.10
August	407.20	176.48	43.00	0.21	0.13
September	173.62	125.32	72.00	0.18	0.12
October	18.59	38.63	207.00	0.58	0.47
November	9.23	18.74	202.00	0.34	0.17
December	8.84	22.69	256.00	0.74	0.67
Monsoon	993.85	308.36	31.00	0.05	0.09
Non-Monsoon	57.73	50.81	88.00	0.16	0.10
Annual	1051.58	313.98	30.00	0.03	0.08

Table 1.10 Statistical parameters of rainfall at Raheli, District Sagar.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	13.46	30.37	225.00	0.55	0.42
February	7.79	15.13	194.00	0.33	0.17
March	6.06	10.26	169.00	0.27	0.13
April	2.74	7.07	257.00	0.40	0.20
May	2.03	6.54	320.00	0.57	0.40
June	193.24	293.22	151.00	0.76	0.70
July	332.09	152.12	46.00	0.27	0.18
August	448.34	170.60	38.00	0.03	0.06
September	180.36	126.69	70.00	0.11	0.07
October	27.85	49.85	178.00	0.36	0.20
November	12.83	27.13	211.00	0.36	0.19
December	9.76	21.67	222.00	0.48	0.34
Monsoon	1174.88	373.26	32.00	0.20	0.15
Non-Monsoon	94.12	270.34	287.00	0.91	0.88
Annual	1269.00	410.37	32.00	0.22	0.14

**Table 1.11 Statistical parameters of rainfall at Damoh,
District Damoh.**

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	15.22	23.37	153.00	0.39	0.24
February	20.55	48.40	235.00	0.69	0.59
March	8.50	13.33	156.00	0.22	0.09
April	3.57	12.35	345.00	0.81	0.75
May	3.58	7.12	198.00	0.48	0.35
June	136.22	117.82	86.00	0.23	0.12
July	364.86	164.81	45.00	0.18	0.17
August	464.05	186.37	40.00	0.07	0.06
September	223.20	181.93	50.00	0.42	0.34
October	28.90	45.78	158.00	0.26	0.12
November	7.07	20.13	284.00	0.58	0.42
December	7.16	14.97	208.00	0.56	0.44
Monsoon	1217.25	283.71	23.00	0.00	0.06
Non-Monsoon	65.67	65.03	99.00	0.38	0.28
Annual	1282.93	293.86	22.00	0.00	0.06

Table 1.12 Statistical parameters of rainfall at Hatta, District Damoh.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	13.01	24.88	191.00	0.46	0.32
February	11.80	20.31	172.00	0.35	0.21
March	7.29	16.93	232.00	0.48	0.31
April	4.43	11.07	249.00	0.47	0.29
May	7.65	23.11	301.00	0.82	0.77
June	111.59	107.43	96.00	0.26	0.16
July	307.32	159.21	51.00	0.10	0.10
August	366.82	112.29	30.00	0.03	0.07
September	184.30	157.03	85.00	0.18	0.10
October	27.86	51.50	184.00	0.39	0.25
November	5.45	16.04	294.00	0.63	0.51
December	7.96	14.17	178.00	0.34	0.18
Monsoon	997.91	313.56	31.00	0.11	0.09
Non-Monsoon	57.62	67.30	116.00	0.26	0.14
Annual	1055.53	328.93	31.00	0.06	0.08

Table 1.13 Statistical parameters of rainfall at Jabera, District Damoh.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	14.05	32.11	228.00	0.63	0.54
February	23.69	36.30	153.00	0.36	0.23
March	9.01	19.15	212.00	0.44	0.26
April	1.11	2.95	265.00	0.55	0.39
May	7.22	15.82	218.00	0.57	0.44
June	136.60	105.92	77.00	0.42	0.32
July	348.40	156.78	45.00	0.17	0.12
August	406.76	144.37	35.00	0.18	0.13
September	216.66	146.12	67.00	0.12	0.10
October	19.16	31.70	165.00	0.35	0.21
November	6.04	11.62	192.00	0.46	0.33
December	8.74	15.39	176.00	0.36	0.19
Monsoon	1127.60	332.02	29.00	0.14	0.12
Non-Monsoon	69.86	69.22	99.00	0.28	0.19
Annual	1197.47	333.35	27.00	0.14	0.12

Table 1.14 Statistical parameters of rainfall at Tendukhera, District Damoh.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	4.66	14.00	300.00	0.82	0.79
February	4.62	9.38	203.00	0.68	0.64
March	2.47	7.43	300.00	0.82	0.79
April	0.00	0.00	0.00	0.00	0.00
May	2.05	6.16	300.00	0.82	0.79
June	138.12	153.58	111.00	0.34	0.26
July	367.93	191.01	51.00	0.52	0.52
August	326.05	221.29	67.00	-0.06	0.27
September	175.57	135.75	77.00	0.36	0.33
October	20.22	46.15	228.00	0.75	0.71
November	9.22	24.14	261.00	0.79	0.76
December	0.60	1.80	300.00	0.82	0.79
Monsoon	1027.91	263.09	25.00	0.36	0.31
Non-Monsoon	23.64	13.14	55.00	0.25	0.30
Annual	1051.55	266.06	25.00	0.34	0.30

Table 1.15 Statistical parameters of rainfall at Mazgaon Hansraj, District Damoh.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	4.06	16.25	400.00	0.91	0.82
February	3.25	13.00	400.00	0.91	0.89
March	4.50	18.00	400.00	0.91	0.89
April	6.58	11.07	169.00	0.25	0.09
May	3.57	5.37	203.00	0.35	0.12
June	102.83	108.65	105.00	0.32	0.23
July	354.91	171.33	48.00	0.19	0.21
August	381.09	244.03	64.00	-0.05	0.10
September	190.65	152.94	80.00	0.04	0.11
October	15.32	35.88	234.00	0.56	0.39
November	0.58	2.35	400.00	0.91	0.88
December	2.87	11.50	400.00	0.90	0.87
Monsoon	1044.81	396.12	37.00	0.17	0.21
Non-Monsoon	37.08	49.96	134.00	0.53	0.41
Annual	1081.90	410.29	37.00	0.14	0.18

Table 1.16 Statistical parameters of rainfall at Mala Tank, District Damoh.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	1.87	7.28	389.00	0.90	0.88
February	4.51	10.37	204.00	0.68	0.64
March	2.48	8.98	361.00	0.88	0.85
April	2.23	6.17	276.00	0.54	0.35
May	2.06	7.17	307.00	0.85	0.79
June	88.13	80.88	91.00	0.31	0.25
July	328.57	141.60	43.00	0.06	0.11
August	377.60	205.50	54.00	-0.08	0.16
September	124.40	116.87	93.00	0.08	0.11
October	16.18	35.83	221.00	0.53	0.39
November	9.15	37.58	410.00	0.90	0.88
December	7.10	29.27	412.00	0.90	0.88
Monsoon	934.90	327.66	35.00	-0.06	0.14
Non-Monsoon	32.38	44.06	136.00	0.44	0.30
Annual	967.28	334.46	34.00	-0.08	0.14

Table 1.17 Statistical parameters of rainfall at Panna,
District Panna.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	20.62	25.24	123.00	0.27	0.16
February	19.00	26.18	137.00	0.28	0.14
March	10.50	11.91	11.91	0.11	0.05
April	6.57	11.04	168.00	0.24	0.09
May	2.58	5.27	203.00	0.35	0.17
June	112.37	78.61	69.00	0.06	0.05
July	355.80	124.58	35.00	0.09	0.08
August	429.37	210.21	48.00	0.14	0.09
September	235.63	208.14	88.00	0.29	0.15
October	22.66	32.73	144.00	0.25	0.11
November	12.50	26.47	211.00	0.40	0.21
December	10.24	17.45	170.00	0.33	0.18
Monsoon	1155.85	289.98	25.00	0.01	0.07
Non-Monsoon	84.20	53.02	62.00	0.10	0.06
Annual	1240.06	298.63	24.00	0.06	0.08

**Table 1.18 Statistical parameters of rainfall at Pawai,
District Panna.**

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	14.12	18.24	129.00	0.19	0.09
February	13.99	24.36	174.00	0.45	0.28
March	5.61	12.10	215.00	0.47	0.33
April	1.45	4.05	278.00	0.49	0.30
May	1.25	4.97	396.00	0.69	0.53
June	121.70	111.27	91.00	0.37	0.26
July	358.57	171.19	47.00	0.30	0.24
August	390.18	176.53	45.00	0.07	0.07
September	178.58	125.93	70.00	0.15	0.10
October	24.34	32.47	133.00	0.23	0.11
November	8.63	22.14	256.00	0.58	0.44
December	9.96	18.44	185.00	0.32	0.15
Monsoon	1073.39	394.29	36.00	0.11	0.12
Non-Monsoon	56.54	50.91	90.00	0.26	0.16
Annual	1129.94	390.62	34.00	0.11	0.12

Table 1.19 Statistical parameters of rainfall at Ajaygarh, District Panna.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	14.76	19.29	130.00	0.24	0.14
February	14.78	25.53	172.00	0.34	0.19
March	4.56	9.91	216.00	0.29	0.46
April	2.69	5.75	213.00	0.51	0.37
May	1.59	4.63	290.00	0.51	0.31
June	134.26	100.01	74.00	0.13	0.11
July	376.56	244.04	64.00	0.29	0.19
August	438.86	242.98	55.00	0.17	0.14
September	226.13	238.27	105.00	0.55	0.46
October	36.05	52.28	145.00	0.22	0.10
November	9.34	25.40	271.00	0.62	0.47
December	4.91	10.36	210.00	0.43	0.26
Monsoon	1211.89	497.04	41.00	0.09	0.08
Non-Monsoon	52.67	48.44	91.00	0.19	0.18
Annual	1264.56	480.23	37.00	0.08	0.08

Table 1.20 Statistical parameters of rainfall at Devendra nagar, District Panna.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	45.00	115.64	256.00	0.81	0.77
February	8.95	19.89	222.00	0.65	0.55
March	10.66	18.23	170.00	0.40	0.28
April	1.27	4.60	360.00	0.88	0.85
May	4.23	10.69	252.00	0.76	0.70
June	99.33	88.31	88.00	0.39	0.37
July	390.83	229.83	58.00	0.41	0.38
August	439.60	289.89	65.00	0.36	0.28
September	184.10	129.03	70.00	0.02	0.15
October	18.55	41.34	222.00	0.57	0.43
November	10.39	22.59	217.00	0.52	0.38
December	22.06	40.36	182.00	0.64	0.57
Monsoon	1106.06	375.78	33.00	0.09	0.16
Non-Monsoon	102.60	134.87	131.00	0.65	0.61
Annual	1208.66	352.56	29.00	0.09	0.16

Table 1.21 Statistical parameters of rainfall at Shahnagar, District Panna.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	4.92	9.40	190.00	0.46	0.32
February	20.74	26.68	128.00	0.34	0.27
March	3.64	9.36	256.00	0.72	0.65
April	2.43	7.12	278.00	0.54	0.36
May	2.60	6.90	265.00	0.63	0.51
June	127.57	138.51	108.00	0.47	0.42
July	328.97	137.37	41.00	0.07	0.18
August	426.77	170.95	40.00	0.21	0.17
September	200.92	163.07	81.00	0.18	0.12
October	29.84	55.77	189.00	0.67	0.60
November	17.25	55.89	328.00	0.87	0.84
December	5.12	14.14	276.00	0.80	0.75
Monsoon	1113.73	356.48	32.00	0.19	0.16
Non-Monsoon	54.29	60.36	111.00	0.40	0.31
Annual	1168.02	355.78	30.00	0.20	0.17

Table 1.22 Statistical parameters of rainfall at Tikamgarh, District Tikamgarh.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	16.48	22.39	135.00	0.26	0.14
February	8.72	17.89	205.00	0.55	0.41
March	2.64	6.56	248.00	0.53	0.34
April	1.08	3.18	294.00	0.59	0.45
May	1.41	4.05	286.00	0.72	0.64
June	88.05	76.57	86.00	0.15	0.11
July	309.55	162.22	52.00	0.09	0.08
August	373.48	162.66	43.00	0.18	0.13
September	171.22	145.16	84.00	0.26	0.16
October	34.50	66.42	192.00	0.56	0.44
November	15.61	37.23	238.00	0.60	0.50
December	5.13	13.05	278.00	0.22	0.18
Monsoon	977.27	292.56	29.00	0.05	0.07
Non-Monsoon	54.17	58.24	107.00	0.24	0.29
Annual	1240.06	298.63	24.00	0.06	0.08

Table 1.23 Statistical parameters of rainfall at Jatara,
District Tikamgarh.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	7.07	11.74	165.00	0.38	0.22
February	4.31	8.23	190.00	0.38	0.22
March	1.62	6.33	390.00	0.88	0.84
April	1.78	6.42	359.00	0.71	0.57
May	0.79	2.64	334.00	0.68	0.55
June	62.40	53.81	86.00	0.16	0.11
July	274.34	119.15	43.00	0.10	0.09
August	359.01	165.50	46.00	0.11	0.12
September	167.95	130.40	77.00	0.18	0.12
October	32.30	69.86	216.00	0.73	0.66
November	4.52	15.47	342.00	0.76	0.68
December	4.32	16.07	372.00	0.89	0.86
Monsoon	896.03	229.88	25.00	0.14	0.11
Non-Monsoon	24.44	28.44	116.00	0.32	0.21
Annual	920.48	238.17	25.00	0.14	0.11

Table 1.24 Statistical parameters of rainfall at Palera, District Tikamgarh.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	4.40	8.16	185.00	0.51	0.43
February	6.80	17.42	256.00	0.76	0.72
March	1.40	3.09	221.00	0.57	0.47
April	1.30	4.11	316.00	0.84	0.81
May	2.55	8.06	316.00	0.84	0.81
June	26.45	32.82	124.00	0.39	0.37
July	275.30	158.37	57.00	0.02	0.25
August	492.02	211.41	42.00	-0.21	0.21
September	231.48	209.51	90.00	0.41	0.40
October	36.70	91.03	248.00	0.76	0.71
November	17.25	55.86	324.00	0.79	0.81
December	0.00	0.00	0.00	0.00	0.00
Monsoon	1061.95	276.66	26.00	-0.06	0.31
Non-Monsoon	21.65	20.75	95.00	0.12	0.17
Annual	1083.60	286.61	26.00	-0.07	0.31

**Table 1.25 Statistical parameters of rainfall at Baldevgarh,
District Tikamgarh.**

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	12.55	19.22	153.00	0.33	0.21
February	5.55	10.31	185.00	0.39	0.23
March	7.48	27.31	364.00	0.89	0.87
April	1.20	4.97	412.00	0.91	0.88
May	3.56	8.94	250.00	0.55	0.37
June	67.48	68.84	102.00	0.27	0.16
July	239.41	126.96	53.00	0.11	0.19
August	330.26	179.47	54.00	0.17	0.20
September	182.14	187.54	102.00	0.41	0.34
October	42.20	99.96	236.00	0.54	0.36
November	9.52	22.47	245.00	0.55	0.45
December	6.12	23.50	342.00	0.88	0.82
Monsoon	861.50	244.03	28.00	0.05	0.11
Non-Monsoon	38.08	38.64	101.00	0.27	0.19
Annual	899.58	253.85	28.00	0.03	0.10

Table 1.26 Statistical parameters of rainfall at Khurera,
District Tikamgarh.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	5.28	13.47	255.00	0.68	0.59
February	4.66	16.16	346.00	0.87	0.84
March	1.56	3.01	222.00	0.57	0.45
April	12.03	6.12	317.00	0.84	0.85
May	4.55	8.06	317.00	0.84	0.82
June	37.07	43.14	116.00	0.25	0.20
July	206.03	167.14	81.00	0.45	0.41
August	253.73	215.67	85.00	0.39	0.29
September	165.97	258.05	155.00	0.55	0.33
October	9.41	32.62	346.00	0.87	0.84
November	9.40	22.47	257.00	0.55	0.45
December	6.23	23.50	341.00	0.88	0.82
Monsoon	672.23	380.86	56.00	0.16	0.23
Non-Monsoon	18.86	27.90	147.00	0.41	0.32
Annual	691.10	397.10	54.00	0.18	0.25

Table 1.27 Statistical parameters of rainfall at Chattarpur, District Chhattarpur.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	11.63	16.99	146.00	0.47	0.37
February	5.20	13.20	254.00	0.82	0.78
March	2.19	6.49	296.00	0.86	0.82
April	2.53	5.04	199.00	0.44	0.29
May	3.08	10.47	339.00	0.87	0.84
June	78.83	64.37	81.00	0.24	0.23
July	288.67	157.53	54.00	0.33	0.28
August	335.56	140.01	41.00	0.03	0.11
September	205.03	151.26	73.00	0.38	0.27
October	27.33	47.23	172.00	0.53	0.41
November	12.36	24.58	198.00	0.45	0.31
December	9.40	21.26	226.00	0.62	0.52
Monsoon	935.45	279.25	29.00	0.04	0.13
Non-Monsoon	46.40	41.18	88.00	0.13	0.11
Annual	981.85	286.29	29.00	0.00	0.13

Table 1.28 Statistical parameters of rainfall at Laundi, District Chhattarpur.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	10.66	18.60	174.00	0.41	0.23
February	7.10	12.81	180.00	0.31	0.15
March	4.18	12.06	288.00	0.64	0.52
April	1.74	4.72	271.00	0.47	0.27
May	3.40	11.31	332.00	0.73	0.63
June	80.52	70.77	87.00	0.14	0.11
July	271.91	103.45	38.00	0.05	0.07
August	318.24	149.28	46.00	0.13	0.09
September	196.10	137.15	69.00	0.09	0.06
October	33.77	50.39	149.00	0.37	0.25
November	7.84	18.42	234.00	0.51	0.33
December	7.54	17.71	234.00	0.58	0.45
Monsoon	900.54	217.15	24.00	0.03	0.08
Non-Monsoon	42.48	37.59	88.00	0.09	0.07
Annual	943.03	225.11	23.00	0.01	0.09

Table 1.29 Statistical parameters of rainfall at Nawgaon, District Chhattarpur.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	17.34	25.87	149.00	0.35	0.20
February	8.59	21.20	246.00	0.76	0.69
March	2.75	5.73	208.00	0.68	0.58
April	3.53	7.29	206.00	0.40	0.23
May	3.15	9.96	316.00	0.85	0.81
June	71.64	60.84	84.00	0.18	0.13
July	288.66	120.04	41.00	0.22	0.18
August	326.44	157.11	48.00	0.07	0.11
September	163.82	125.39	76.00	0.19	0.13
October	22.50	45.24	201.00	0.52	0.36
November	13.45	27.17	201.00	0.45	0.31
December	7.06	21.40	303.00	0.86	0.83
Monsoon	873.54	286.40	32.00	0.07	0.11
Non-Monsoon	57.12	44.90	78.00	0.07	0.07
Annual	930.67	301.28	32.00	0.10	0.11

Table 1.30 Statistical parameters of rainfall at Baxwaha, District Chhattarpur.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	14.55	27.59	189.00	0.65	0.58
February	10.43	20.66	197.00	0.54	0.42
March	5.36	10.93	203.00	0.44	0.30
April	0.64	2.66	412.00	0.91	0.88
May	2.52	8.04	318.00	0.77	0.70
June	105.73	90.70	85.00	0.36	0.32
July	344.81	125.56	36.00	0.01	0.13
August	368.42	134.63	36.00	0.08	0.13
September	219.21	210.56	96.00	0.42	0.12
October	25.72	55.85	217.00	0.67	0.58
November	4.05	13.85	343.00	0.85	0.81
December	16.92	36.03	212.00	0.53	0.35
Monsoon	1063.90	339.89	31.00	0.08	0.15
Non-Monsoon	54.49	55.76	102.00	0.15	0.12
Annual	1118.39	324.80	29.00	0.15	0.16

Table 1.31 Statistical parameters of rainfall at Bijawar, District Chhattarpur.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	16.08	23.01	143.00	0.28	0.14
February	9.89	15.38	155.00	0.30	0.17
March	5.81	11.43	196.00	0.37	0.23
April	1.55	5.37	346.00	0.62	0.43
May	8.36	19.51	233.00	0.44	0.25
June	80.95	78.18	96.00	0.16	0.10
July	316.90	133.68	42.00	0.20	0.14
August	375.31	239.84	63.00	0.34	0.25
September	224.90	186.46	82.00	0.16	0.09
October	39.60	65.66	165.00	0.37	0.24
November	9.53	23.72	248.00	0.55	0.40
December	6.77	23.05	340.00	0.86	0.83
Monsoon	1037.67	334.32	32.00	0.05	0.11
Non-Monsoon	58.73	51.98	88.00	0.14	0.07
Annual	1096.41	340.65	31.00	0.08	0.13

Table 1.32 Statistical parameters of rainfall at Badamalhera, District Chhattarpur.

Month/Season	Mean (mm)	Standard Deviation (mm)	Coefficient of Variation (%)	Coefficient of Skewness	Kurtosis
January	1.39	3.78	271.00	0.58	0.41
February	0.00	0.00	0.00	0.00	0.00
March	8.62	24.85	288.00	0.81	0.76
April	6.18	13.80	223.00	0.41	0.23
May	3.00	4.94	164.00	0.25	0.13
June	101.44	103.91	102.00	0.28	0.21
July	298.72	203.96	68.00	0.30	0.19
August	372.61	215.07	57.00	0.20	0.22
September	193.75	207.65	107.00	0.30	0.19
October	29.58	60.61	204.00	0.60	0.47
November	7.71	20.12	261.00	0.57	0.39
December	13.30	54.83	412.00	0.90	0.88
Monsoon	992.58	359.43	36.00	0.01	0.10
Non-Monsoon	63.37	80.40	126.00	0.47	0.38
Annual	1055.96	390.66	36.00	0.05	0.13

Table 2.1 Correlation Matrix for Sagar, Dist. Sagar							
	June	July	August	September	October	Seasonal	Annual
June	1.00	0.29	-0.09	0.10	0.16	0.44	0.42
July		1.00	0.18	0.21	0.11	0.74	0.71
August			1.00	0.16	-0.05	0.61	0.64
September				1.00	0.09	0.55	0.52
October					1.00	0.22	0.17
Seasonal						1.00	0.98
Annual							1.00

Table 2.2 Correlation Matrix for Khurai, Dist. Sagar							
	June	July	August	September	October	Seasonal	Annual
June	1.00	0.27	0.07	-0.34	-0.28	0.31	0.28
July		1.00	0.09	-0.02	-0.06	0.71	0.67
August			1.00	-0.14	-0.24	0.62	0.65
September				1.00	0.22	0.23	0.25
October					1.00	-0.04	-0.04
Seasonal						1.00	0.99
Annual							1.00

Table 2.3 Correlation Matrix for Banda, Dist. Sagar

	June	July	August	September	October	Seasonal	Annual
June	1.00	0.28	-0.07	-0.01	0.14	0.41	0.41
July		1.00	0.10	0.03	0.13	0.67	0.64
August			1.00	-0.02	-0.11	0.60	0.60
September				1.00	-0.01	0.41	0.43
October					1.00	0.16	0.11
Seasonal						1.00	0.99
Annual							1.00

Table 2.4 Correlation Matrix for Raheli, Dist. Sagar

	June	July	August	September	October	Seasonal	Annual
June	1.00	-0.04	-0.10	-0.20	-0.02	0.66	0.54
July		1.00	0.20	-0.09	0.16	0.46	0.25
August			1.00	0.04	-0.12	0.46	0.44
September				1.00	-0.01	0.17	0.07
October					1.00	0.13	0.08
Seasonal						1.00	0.77
Annual							1.00

Table 2.5 Correlation Matrix for Deori, Dist. Sagar

	June	July	August	September	October	Seasonal	Annual
June	1.00	-0.07	-0.12	0.22	0.04	0.44	0.43
July		1.00	0.30	-0.11	0.11	0.55	0.55
August			1.00	-0.33	-0.06	0.56	0.55
September				1.00	0.27	0.32	0.27
October					1.00	0.33	0.33
Seasonal						1.00	0.96
Annual							1.00

Table 2.6 Correlation Matrix for Malthon, Dist. Sagar

	June	July	August	September	October	Seasonal	Annual
June	1.00	0.50	-0.29	0.17	0.19	0.54	0.52
July		1.00	-0.15	0.14	0.16	0.71	0.70
August			1.00	-0.05	-0.13	0.31	0.27
September				1.00	-0.07	0.56	0.57
October					1.00	0.18	0.14
Seasonal						1.00	0.97
Annual							1.00

Table 2.7 Correlation Matrix for Damoh, Dist. Damoh.							
	June	July	August	September	October	Seasonal	Annual
June	1.00	-0.06	-0.22	0.02	-0.03	0.24	0.26
July		1.00	-0.03	-0.04	0.32	0.56	0.53
August			1.00	-0.27	-0.06	0.37	0.39
September				1.00	-0.01	0.45	0.40
October					1.00	0.29	0.28
Seasonal						1.00	0.98
Annual							1.00

Table 2.8 Correlation Matrix for Jabera, Dist. Damoh.							
	June	July	August	September	October	Seasonal	Annual
June	1.00	0.32	0.16	-0.02	-0.26	0.53	0.53
July		1.00	0.19	0.03	0.13	0.70	0.67
August			1.00	0.10	-0.11	0.61	0.62
September				1.00	0.20	0.51	0.49
October					1.00	0.12	0.10
Seasonal						1.00	0.98
Annual							1.00

Table 2.9 Correlation Matrix for Tendukhera, Dist. Damoh.

	June	July	August	September	October	Seasonal	Annual
June	1.00	0.65	0.71	0.29	-0.25	0.94	0.94
July		1.00	0.69	-0.27	0.02	0.83	0.83
August			1.00	-0.36	-0.13	0.83	0.83
September				1.00	-0.26	0.08	0.72
October					1.00	-0.10	-0.07
Seasonal						1.00	0.99
Annual							1.00

Table 2.10 Correlation Matrix for Mazgaon Hansaraj, Dist. Damoh.

	June	July	August	September	October	Seasonal	Annual
June	1.00	0.37	-0.18	-0.11	0.20	0.30	0.29
July		1.00	0.15	-0.01	0.62	0.68	0.62
August			1.00	0.10	0.08	0.68	0.70
September				1.00	0.11	0.42	0.44
October					1.00	0.50	0.47
Seasonal						1.00	0.99
Annual							1.00

Table 2.11 Correlation Matrix for Mala Tank, Dist. Damoh.							
	June	July	August	September	October	Seasonal	Annual
June	1.00	0.09	-0.35	0.10	0.42	0.15	0.15
July		1.00	0.31	-0.04	0.37	0.68	0.63
August			1.00	0.09	0.04	0.71	0.72
September				1.00	0.40	0.46	0.48
October					1.00	0.54	0.51
Seasonal						1.00	0.99
Annual							1.00

Table 2.12 Correlation Matrix for Panna, Dist. Panna.							
	June	July	August	September	October	Seasonal	Annual
June	1.00	0.09	0.03	-0.27	-0.19	0.12	0.11
July		1.00	-0.03	-0.26	0.23	0.26	0.24
August			1.00	-0.08	-0.18	0.66	0.64
September				1.00	0.27	0.49	0.51
October					1.00	0.21	0.20
Seasonal						1.00	0.99
Annual							1.00

Table 2.13 Correlation Matrix for Pawai, Dist. Panna.

	June	July	August	September	October	Seasonal	Annual
June	1.00	0.25	-0.07	0.16	0.15	0.42	0.45
July		1.00	0.37	0.21	0.49	0.78	0.78
August			1.00	0.31	0.13	0.70	0.66
September				1.00	0.12	0.60	0.61
October					1.00	0.43	0.43
Seasonal						1.00	0.99
Annual							1.00

Table 2.14 Correlation Matrix for Ajaygarh, Dist. Panna.

	June	July	August	September	October	Seasonal	Annual
June	1.00	0.26	0.07	-0.21	-0.27	0.23	0.24
July		1.00	0.28	-0.17	0.46	0.65	0.62
August			1.00	0.23	0.19	0.77	0.77
September				1.00	-0.02	0.46	0.48
October					1.00	0.36	0.33
Seasonal						1.00	1.00
Annual							1.00

Table 2.15 Correlation Matrix for Tikamgarh, Dist. Tikamgarh.

	June	July	August	September	October	Seasonal	Annual
June	1.00	0.25	0.04	-0.14	-0.05	0.34	0.34
July		1.00	0.01	-0.06	0.09	0.62	0.59
August			1.00	-0.14	0.17	0.54	0.54
September				1.00	0.06	0.37	0.35
October					1.00	0.39	0.40
Seasonal						1.00	0.98
Annual							1.00

Table 2.16 Correlation Matrix for Jatara, Dist. Tikamgarh.

	June	July	August	September	October	Seasonal	Annual
June	1.00	-0.21	-0.49	-0.13	0.05	-0.30	-0.31
July		1.00	-0.03	-0.10	0.15	0.44	0.43
August			1.00	-0.04	0.06	0.58	0.60
September				1.00	0.09	0.48	0.49
October					1.00	0.48	0.44
Seasonal						1.00	0.99
Annual							1.00

Table 2.17 Correlation Matrix for Palera, Dist. Tikamgarh.							
	June	July	August	September	October	Seasonal	Annual
June	1.00	-0.27	-0.79	0.20	-0.23	-0.57	-0.55
July		1.00	0.27	-0.40	0.08	0.47	0.47
August			1.00	-0.17	-0.16	0.64	0.62
September				1.00	-0.16	0.37	0.39
October					1.00	0.10	0.08
Seasonal						1.00	0.99
Annual							1.00

Table 2.18 Correlation Matrix for Baldevgarh, Dist. Tikamgarh.							
	June	July	August	September	October	Seasonal	Annual
June	1.00	-0.13	-0.16	-0.11	-0.16	-0.05	-0.09
July		1.00	-0.72	-0.12	0.46	0.05	0.97
August			1.00	0.16	-0.18	0.36	0.39
September				1.00	-0.12	0.74	0.72
October					1.00	0.38	0.34
Seasonal						1.00	0.99
Annual							1.00

Table 2.19 Correlation Matrix for Khurera, Dist. Tikamgarh.							
	June	July	August	September	October	Seasonal	Annual
June	1.00	-0.04	-0.13	-0.16	-0.07	-0.07	-0.08
July		1.00	0.32	0.17	0.83	0.08	0.79
August			1.00	-0.16	-0.02	0.59	0.59
September				1.00	0.44	0.53	0.52
October					1.00	0.66	0.68
Seasonal						1.00	0.99
Annual							1.00

Table 2.20 Correlation Matrix for Chattarpur, Dist. Chattarpur.							
	June	July	August	September	October	Seasonal	Annual
June	1.00	-0.19	0.05	-0.01	0.00	0.20	0.20
July		1.00	-0.04	-0.21	0.09	0.27	0.25
August			1.00	0.05	-0.35	0.60	0.60
September				1.00	0.12	0.58	0.58
October					1.00	0.11	0.09
Seasonal						1.00	0.98
Annual							1.00

Table 2.21 Correlation Matrix for Nawgaon, Dist. Chattarpur.

	June	July	August	September	October	Seasonal	Annual
June	1.00	0.03	-0.25	0.07	0.12	0.15	0.12
July		1.00	-0.10	0.23	0.05	0.51	0.49
August			1.00	0.43	-0.05	0.63	0.65
September				1.00	0.02	0.81	0.80
October					1.00	0.20	0.18
Seasonal						1.00	0.99
Annual							1.00

Table 2.22 Correlation Matrix for Baxwaha, Dist. Chattarpur.

	June	July	August	September	October	Seasonal	Annual
June	1.00	0.21	-0.04	0.24	-0.11	0.46	0.45
July		1.00	0.32	0.03	0.35	0.63	0.64
August			1.00	0.00	-0.11	0.49	0.51
September				1.00	-0.08	0.68	0.66
October					1.00	0.17	0.13
Seasonal						1.00	0.98
Annual							1.00

Table 2.23 Correlation Matrix for Bijawar, Dist. Chattarpur.							
	June	July	August	September	October	Seasonal	Annual
June	1.00	0.36	-0.37	-0.09	-0.08	0.05	0.06
July		1.00	-0.15	-0.12	0.23	0.31	0.31
August			1.00	0.12	0.16	0.67	0.67
September				1.00	0.03	0.56	0.56
October					1.00	0.31	0.29
Seasonal						1.00	0.99
Annual							1.00

Table 3.1 Decadal Mean and Tk values of Annual rainfall series.

District/Station	(1961-70)		(1971-80)		(1981-90)		(1991-97)	
	D. Mean	Tk	D. Mean	Tk	D. Mean	Tk	D. Mean	Tk
SAGAR								
Sagar	968.5	-0.57	1341.9	0.33	1197.4	-0.02	1179.7	-0.06
Khurai	1169.4	-0.13	1298.6	0.24	1227.8	0.04	1135.1	-0.23
Banda	990.5	-0.19	1157.1	0.34	1002.4	-0.16	1154.9	0.33
Raheli	1186.2	-0.20	1242.5	-0.06	1325.7	0.14	1342.9	0.18
Deori	1035.2	-0.05	1296.8	0.05	1156.3	0.00	1125.7	-0.01
DAMOH								
Damoh	1285.6	0.01	1381.5	0.34	1246.8	-0.12	1179.8	-0.35
Jabera	1125.5	-0.22	1172.6	-0.07	1260.7	0.19	1179.1	-0.05
Hatta	1092.5	0.11	720.1	-1.01	1120.9	0.20	1059.0	0.01
PANNA								
Panna	1106.3	-0.44	1217.3	-0.08	1355.3	0.39	1301.9	0.21
Pawai	970.5	-0.41	1225.6	0.24	1084.0	-0.19	1243.3	0.29
Ajaygarh	1161.5	-0.21	1472.2	0.43	1106.1	-0.33	1232.9	-0.07
TIKAMGARH								
Tikamgarh	1003.1	-0.79	1242.4	0.01	1272.2	0.11	908.8	-1.10
Jatara	973.7	0.22	820.4	-0.42	933.5	0.05	943.0	0.09
CHATTARPUR								
Laundi	901.4	-0.19	1000.0	0.24	944.4	0.01	1208.4	1.18
Bijawar	990.8	-0.31	1091.1	-0.01	1136.6	0.12	1283.1	0.55

Table 4.1 Linear Regression Coefficient of rainfall at Sagar, District Sagar				
Month	Correlation Coefficient	constant	Regression coefficient	t value
January	0.099	16.69	0.36	0.54
February	0.026	13.48	0.06	0.15
March	-0.067	10.49	-0.11	-0.37
April	0.131	2.05	0.09	0.73
May	0.213	7.11	0.33	1.20
June	0.026	136.77	0.33	0.14
July	0.080	341.80	1.63	0.44
August	-0.065	444.39	-0.11	-0.03
September	-0.032	172.15	-0.45	-0.18
October	0.027	24.50	0.14	0.15
November	0.034	16.60	0.16	0.19
December	-0.052	14.17	-0.15	-0.29
Seasonal	0.036	1119.64	1.55	0.20
Annual	0.053	1200.80	2.28	0.29

Table 4.2 Linear Regression Coefficient of rainfall at Khurai, District Sagar				
Month	Correlation Coefficient	constant	Regression coefficient	t value
January	-0.104	16.72	-0.25	-0.59
February	0.135	8.37	0.18	0.77
March	0.237	7.57	0.30	1.38
April	0.005	2.35	0.00	0.03
May	0.038	3.43	0.02	0.21
June	0.111	114.66	0.94	0.63
July	-0.078	377.76	-1.38	-0.44
August	0.005	472.20	0.10	0.02
September	-0.034	170.49	-0.43	-0.19
October	0.191	22.59	0.83	1.10
November	-0.018	11.76	-0.04	-0.10
December	0.072	10.06	-0.12	-0.35
Seasonal	0.002	1157.72	0.06	0.01
Annual	0.004	1218.01	0.16	0.02

Table 4.3 Linear Regression Coefficient of rainfall at Banda, District Sagar				
Month	Correlation Coefficient	constant	Regression coefficient	t value
January	0.004	13.08	0.01	0.03
February	-0.110	8.51	-0.15	-0.59
March	-0.130	12.33	-0.29	-0.74
April	0.213	3.23	0.27	1.16
May	0.254	4.32	0.18	1.39
June	0.031	85.58	0.25	0.17
July	0.073	299.81	0.95	0.39
August	0.071	412.99	1.12	0.38
September	-0.025	173.68	-0.27	-0.13
October	0.070	18.59	0.23	0.37
November	0.137	9.23	0.22	0.74
December	-0.109	10.21	-0.22	-0.58
Seasonal	0.086	990.61	2.27	0.46
Annual	0.085	1051.27	2.29	0.45

Table 4.4 Linear Regression Coefficient of rainfall at Raheli, District Sagar				
Month	Correlation Coefficient	constant	Regression coefficient	t value
January	0.049	52.93	1.24	0.29
February	0.103	7.79	0.15	0.61
March	-0.108	6.06	-0.11	-0.64
April	-0.330	2.74	-0.22	-2.04
May	0.030	2.03	0.02	0.18
June	0.172	193.24	4.80	1.02
July	0.043	332.09	0.63	0.26
August	0.010	448.34	0.17	0.06
September	0.015	180.36	0.18	0.09
October	0.179	27.85	0.85	1.06
November	-0.019	12.83	-0.05	-0.12
December	-0.111	10.63	-0.02	-0.65
Seasonal	0.188	1181.91	6.63	1.12
Annual	0.192	1276.95	7.43	1.14

Table 4.5 Linear Regression Coefficient of rainfall at Deori, District Sagar				
Month	Correlation Coefficient	constant	Regression coefficient	t value
January	-0.044	14.87	-0.15	-0.24
February	0.102	11.86	0.30	0.57
March	0.012	7.34	0.02	0.07
April	-0.191	1.18	-0.07	-1.08
May	-0.150	6.99	0.31	0.85
June	-0.034	153.17	-0.42	-0.19
July	0.092	341.84	-0.70	0.35
August	0.036	396.97	0.66	0.20
September	-0.117	176.74	-1.43	-0.66
October	0.236	27.62	1.25	1.36
November	0.142	12.75	0.46	0.80
December	-0.122	14.82	-0.33	-0.69
Seasonal	0.027	1096.34	0.76	0.15
Annual	0.046	1166.18	1.29	0.26

Table 4.6 Linear Regression Coefficient of rainfall at Malthon, District Sagar				
Month	Correlation Coefficient	constant	Regression coefficient	t value
January	-0.212	13.52	-0.67	-0.87
February	-0.114	11.08	-0.27	-0.46
March	0.168	5.56	0.29	0.68
April	-0.178	1.34	0.09	-0.73
May	0.049	5.08	0.07	0.20
June	-0.125	124.18	-1.30	-0.50
July	-0.053	367.17	-0.97	-0.22
August	0.261	336.33	4.59	1.08
September	-0.014	205.19	-0.32	-0.06
October	-0.263	16.42	-1.18	-1.09
November	-0.280	10.31	-0.89	-1.19
December	-0.269	1.30	-0.11	-1.12
Seasonal	0.022	1049.29	-812.00	0.09
Annual	-0.025	1098.01	-0.85	-0.10

Table 4.7 Linear Regression Coefficient of rainfall at Damoh, District Damoh.				
Month	Correlation Coefficient	constant	Regression coefficient	t value
January	-0.159	15.22	-0.33	0.19
February	0.057	20.54	0.25	0.32
March	-0.077	8.50	-0.09	-0.44
April	-0.281	3.57	-0.31	-1.65
May	0.147	3.58	0.09	0.84
June	-0.090	136.22	-0.94	-0.51
July	0.066	364.86	0.97	0.38
August	0.115	464.05	1.90	0.66
September	-0.032	223.21	-5.23	-1.94
October	0.068	28.89	0.28	0.39
November	0.061	7.07	0.11	0.35
December	-0.225	7.16	-0.29	-1.30
Seasonal	-0.120	1217.25	-3.02	-0.68
Annual	-0.138	1282.93	-3.60	-0.79

Table 4.8 Linear Regression Coefficient of rainfall at Hatta, District Damoh				
Month	Correlation Coefficient	constant	Regression coefficient	t value
January	-0.046	13.01	-0.09	-0.24
February	0.178	11.80	0.31	0.94
March	-0.027	7.29	-0.04	-0.14
April	-0.025	4.43	-0.24	-1.38
May	-0.222	7.65	-0.44	-1.18
June	0.065	111.59	0.60	0.34
July	0.068	307.31	0.93	0.36
August	0.057	366.82	0.54	0.30
September	-0.093	184.30	-1.24	-0.49
October	0.090	27.86	0.40	0.47
November	0.077	5.45	0.11	0.40
December	-0.336	7.96	-0.40	-1.85
Seasonal	0.045	997.90	1.22	0.24
Annual	0.014	1055.53	0.41	0.08

Table 4.9 Linear Regression Coefficient of rainfall at Jabera, District Damoh.

Month	Correlation Coefficient	constant	Regression coefficient	t value
January	0.028	14.05	0.07	0.13
February	-0.037	23.69	-0.11	-0.17
March	0.302	9.01	0.47	1.48
April	-0.233	1.11	-0.06	-1.12
May	0.161	7.22	0.21	0.76
June	0.134	136.60	1.15	0.64
July	0.092	348.40	1.17	0.44
August	0.215	406.76	2.52	1.04
September	-0.243	216.66	-2.88	-1.18
October	0.311	19.16	0.80	1.54
November	-0.162	6.04	-0.15	-0.77
December	-0.091	8.71	-0.11	-0.43
Seasonal	0.102	1127.60	2.76	0.48
Annual	0.114	1197.47	3.08	0.53

Table 4.10 Linear Regression Coefficient of rainfall at Mazgaon Hansaraj, District Damoh.

Month	Correlation Coefficient	constant	Regression coefficient	t value
January	-0.188	4.43	-0.45	-0.72
February	-0.201	4.37	-0.39	-0.77
March	-0.188	6.62	-0.50	-0.72
April	-0.123	1.06	-0.05	-0.47
May	-0.274	0.75	-0.06	-1.07
June	-0.388	102.83	-6.26	-1.58
July	-0.090	354.91	-2.31	-0.34
August	0.022	381.09	0.82	0.08
September	0.127	190.65	2.89	0.48
October	-0.146	15.32	-0.77	-0.55
November	0.351	0.58	-0.12	-1.41
December	0.311	2.87	-0.53	-1.23
Seasonal	0.095	1044.81	-5.63	-0.36
Annual	0.125	1065.53	-7.75	-0.48

Month	Correlation Coefficient	constant	Regression coefficient	t value
January	-0.06	1.87	-0.2	-0.77
February	-0.201	4.37	-0.39	-0.77
March	-0.21	2.48	-0.31	-0.95
April	-0.233	1.11	-0.06	-1.12
May	0.161	7.22	0.21	0.76
June	-0.29	88.13	-3.44	-1.2
July	0.077	328.57	1.56	0.29
August	0.149	377.6	4.4	0.58
September	-0.239	124.4	-4.02	-0.95
October	-0.102	16.18	-0.53	-0.4
November	-0.112	9.15	-0.68	-0.44
December	-0.294	7.1	-1.24	-1.2
Seasonal	-0.042	934.9	-2.02	-0.17
Annual	-0.09	955.51	-4.39	-0.35

Month	Correlation Coefficient	constant	Regression coefficient	t value
January	0.014	20.62	0.03	0.08
February	0.113	18.99	0.27	0.66
March	0.037	10.49	0.39	0.21
April	-0.140	6.57	-0.14	-0.81
May	0.110	2.58	0.05	0.64
June	0.180	112.37	1.27	1.06
July	0.053	355.79	0.60	0.31
August	-0.051	429.37	-0.98	-0.30
September	0.296	235.63	5.53	1.78
October	0.190	22.66	0.56	1.11
November	-0.133	12.50	-0.32	-0.77
December	0.024	10.35	0.04	0.14
Seasonal	0.268	1155.85	6.99	1.60
Annual	0.258	1238.00	6.97	1.53

Table 4.13 Linear Regression Coefficient of rainfall at Pawai, District Panna.

Month	Correlation Coefficient	constant	Regression coefficient	t value
January	0.064	14.12	0.12	0.36
February	0.261	13.99	0.63	1.51
March	0.022	5.61	0.03	0.12
April	0.081	1.45	0.03	0.45
May	0.266	1.25	0.13	1.53
June	0.068	121.69	0.75	0.38
July	-0.185	358.57	-3.14	-1.04
August	0.217	390.18	3.79	1.23
September	0.203	178.58	2.53	1.15
October	-0.052	24.34	-0.16	-0.29
November	-0.029	8.63	-0.06	-0.16
December	-0.009	9.96	-0.01	-0.05
Seasonal	-0.096	1073.39	3.76	0.54
Annual	0.119	1128.42	4.62	0.67

Table 4.14 Linear Regression Coefficient of rainfall at Ajaygarh, District Panna.

Month	Correlation Coefficient	constant	Regression coefficient	t value
January	0.149	14.76	0.36	0.74
February	0.170	14.78	0.54	0.85
March	0.029	4.56	0.04	0.14
April	0.019	2.69	0.01	0.09
May	0.110	1.59	0.06	0.54
June	0.106	134.26	1.31	0.52
July	-0.126	376.56	-3.81	-0.62
August	-0.130	438.87	-3.91	-0.64
September	-0.095	226.14	-2.81	-0.47
October	-0.047	36.05	-0.30	-0.23
November	-0.158	9.34	-0.49	-0.78
December	0.022	4.91	0.03	0.11
Seasonal	-0.155	1211.89	-9.54	-0.76
Annual	-0.151	1264.57	-9.00	-0.75

Month	Correlation Coefficient	constant	Regression coefficient	t value
January	0.47	45	6.9	1.76
February	0.465	8.95	1.17	1.74
March	-0.159	10.66	-0.36	-0.53
April	-0.419	1.27	-0.24	-1.53
May	0.279	4.23	0.37	0.96
June	-0.106	99.33	1.19	-0.35
July	0.19	390.83	5.54	0.64
August	-0.347	439.6	-12.79	-1.23
September	-0.205	184.1	-3.36	-0.69
October	0.471	80.55	2.47	1.77
November	-0.278	10.39	-0.79	-0.96
December	-0.509	22.06	-2.6	-1.96
Seasonal	-0.168	1132.43	-9.33	-0.56
Annual	-0.094	1235.03	-4.89	-0.31

Month	Correlation Coefficient	constant	Regression coefficient	t value
January	-0.069	16.48	-0.13	-0.37
February	0.009	8.72	0.01	0.05
March	-0.280	2.64	-0.16	-1.55
April	-0.179	1.08	-0.05	-0.96
May	-0.017	1.41	-0.01	-0.09
June	-0.213	88.50	-1.41	-1.15
July	-0.142	309.55	-2.00	-0.76
August	-0.106	373.48	-1.49	-0.56
September	0.079	171.22	1.00	0.42
October	0.177	34.50	1.02	0.95
November	-0.328	15.61	-1.05	-1.83
December	0.075	8.22	0.15	0.40
Seasonal	-0.114	977.44	-2.89	-0.61
Annual	-0.162	1031.44	-4.13	-0.86

Table 4.17 Linear Regression Coefficient of rainfall at Jatara, District Tikamgarh.

Month	Correlation Coefficient	constant	Regression coefficient	t value
January	0.076	7.07	0.09	0.37
February	-0.014	4.31	-0.01	-0.06
March	0.321	1.62	0.20	1.67
April	0.057	1.78	0.04	0.28
May	-0.169	0.79	-0.04	-0.84
June	-0.233	62.40	-1.28	-1.17
July	-0.101	274.34	-1.23	-0.49
August	0.046	359.01	0.69	0.20
September	0.268	167.96	3.58	1.36
October	-0.029	32.30	-0.21	-0.14
November	-0.298	4.52	-0.47	-1.53
December	-0.351	4.31	-0.57	-1.83
Seasonal	0.065	896.00	1.53	0.31
Annual	0.031	920.48	0.76	0.15

Table 4.18 Linear Regression Coefficient of rainfall at Palera, District Tikamgarh.

Month	Correlation Coefficient	constant	Regression coefficient	t value
January	0.442	4.40	0.71	1.39
February	0.178	6.80	0.61	0.51
March	0.420	1.40	0.26	1.30
April	0.200	1.30	0.16	0.57
May	0.062	2.55	0.10	0.18
June	0.011	26.45	0.07	0.03
July	0.398	275.30	12.12	1.19
August	0.182	492.02	7.57	0.52
September	0.091	231.48	3.76	0.25
October	-0.374	36.70	-6.22	-1.04
November	-0.086	3.70	-0.08	-0.24
December	-0.427	4.80	-0.52	-1.33
Seasonal	0.318	1061.95	17.31	0.95
Annual	0.331	1086.90	18.54	1.00

Table 4.19 Linear Regression Coefficient of rainfall at Baldevgarh, District Tikamgarh.				
Month	Correlation Coefficient	constant	Regression coefficient	t value
January	-0.123	12.55	-0.46	-0.48
February	-0.141	5.55	-0.28	-0.55
March	0.330	7.48	1.83	1.39
April	0.255	1.20	0.25	1.02
May	-0.090	3.56	-0.16	-0.35
June	0.149	67.48	2.06	0.58
July	-0.166	239.41	-4.17	-0.65
August	0.115	330.26	4.11	0.45
September	0.303	182.14	11.28	1.23
October	-0.370	42.20	-7.53	-1.54
November	0.225	1.35	-0.12	-0.61
December	0.287	7.70	1.38	1.16
Seasonal	0.122	861.50	5.92	0.47
Annual	0.168	899.58	8.47	0.66

Table 4.20 Linear Regression Coefficient of rainfall at Khurera, District Tikamgarh.				
Month	Correlation Coefficient	constant	Regression coefficient	t value
January	-0.326	5.28	-1.08	-1.09
February	-0.077	4.66	-0.30	-0.24
March	-0.303	2.33	-0.23	-0.66
April	-0.304	1.66	0.11	0.36
May	-0.347	2.66	-0.26	-0.65
June	0.186	37.07	1.98	0.60
July	-0.271	206.03	-11.25	-0.91
August	-0.375	253.73	-19.91	-1.28
September	0.341	165.97	16.77	1.14
October	-0.309	9.41	-2.48	-1.02
November	-0.151	0.43	-0.04	-0.48
December	-0.201	0.63	-0.07	-0.64
Seasonal	-0.159	672.23	-14.91	-0.50
Annual	-0.174	683.24	-16.14	-0.55

Month	Correlation Coefficient	constant	Regression coefficient	t value
January	0.175	11.63	0.63	0.67
February	0.128	5.20	0.36	0.48
March	-0.075	2.19	-0.10	-0.28
April	0.334	2.53	0.36	1.32
May	0.367	3.08	0.81	1.47
June	-0.056	78.83	-0.76	-0.21
July	0.147	288.67	4.89	0.55
August	0.240	335.56	7.06	0.93
September	-0.443	205.03	-14.10	-1.85
October	0.232	27.33	2.30	0.89
November	-0.330	12.36	-1.73	-1.33
December	-0.293	9.40	-1.30	-1.14
Seasonal	-0.010	935.45	-0.60	-0.03
Annual	-0.026	981.85	-1.60	-0.09

Month	Correlation Coefficient	constant	Regression coefficient	t value
January	-0.221	10.66	-0.38	-1.20
February	-0.002	7.10	0.00	-0.01
March	0.181	4.18	0.21	0.98
April	-0.040	1.74	-0.02	-0.25
May	0.037	3.40	0.04	0.19
June	0.078	80.51	0.52	0.42
July	0.021	271.91	0.21	0.11
August	0.066	318.23	0.93	0.35
September	0.376	196.09	4.86	2.15
October	0.040	33.76	0.19	0.22
November	-0.152	7.84	-0.26	-0.81
December	0.298	7.54	0.50	1.65
Seasonal	0.328	900.53	6.73	1.84
Annual	0.320	943.02	6.80	1.79

Table 4.23 Linear Regression Coefficient of rainfall at Nawgaon, District Chhattarpur.				
Month	Correlation Coefficient	constant	Regression coefficient	t value
January	-0.420	17.22	-1.70	-2.07
February	0.156	8.48	0.51	0.69
March	-0.224	2.81	-0.19	-1.01
April	-0.019	3.70	-0.02	-0.08
May	-0.478	1.08	-0.16	-2.37
June	-0.100	69.74	-0.95	-0.44
July	0.245	291.70	4.50	1.10
August	0.068	399.84	1.52	0.30
September	-0.020	170.49	-0.54	-0.12
October	-0.070	23.58	-0.51	-0.32
November	-0.240	14.10	-1.01	-1.09
December	-0.174	7.40	-0.57	-0.77
Seasonal	0.097	895.36	4.01	0.42
Annual	0.019	950.18	0.84	0.08

Table 4.24 Linear Regression Coefficient of rainfall at Baxwaha, District Chhattarpur.				
Month	Correlation Coefficient	constant	Regression coefficient	t value
January	-0.153	14.45	-0.46	-0.60
February	0.138	10.44	0.31	0.54
March	-0.369	5.35	-0.44	-1.53
April	-0.029	0.64	-0.01	-0.11
May	0.024	2.52	0.02	0.09
June	-0.270	105.66	-2.74	-1.11
July	-0.380	344.67	-5.27	-1.61
August	-0.414	368.26	-6.10	-1.76
September	-0.002	219.21	-0.04	-0.01
October	0.114	25.74	0.70	0.45
November	-0.522	4.01	-0.79	-2.37
December	-0.065	16.92	-0.25	-0.25
Seasonal	-0.362	1063.55	-13.48	-1.50
Annual	-0.425	1118.00	-15.11	-1.82

Table 4.25 Linear Regression Coefficient of rainfall at Bijawar, District Chhattarpur.				
Month	Correlation Coefficient	constant	Regression coefficient	t value
January	-0.049	16.08	-0.11	-0.25
February	-0.001	9.89	0.00	0.00
March	-0.256	5.31	-0.29	-1.35
April	-0.170	1.55	-0.09	-0.89
May	-0.010	8.36	-0.02	-0.05
June	0.194	80.95	1.15	1.01
July	-0.085	316.90	-1.14	-0.43
August	0.098	375.30	2.34	0.50
September	0.032	224.80	6.10	1.77
October	-0.090	39.60	-0.59	-0.46
November	-0.243	9.53	-0.57	-1.28
December	-0.248	0.77	-0.57	-1.31
Seasonal	0.248	1037.65	8.23	1.30
Annual	0.193	1095.68	6.56	1.00

Table 4.26 Linear Regression Coefficient of rainfall at Badamalhera, District Chhattarpur.				
Month	Correlation Coefficient	constant	Regression coefficient	t value
January	-0.406	1.27	-0.53	-1.25
February	-0.348	2.01	-0.48	-1.05
March	-0.290	10.16	-3.07	-0.85
April	-0.152	4.31	-0.60	-0.43
May	-0.161	2.70	-0.24	-0.46
June	-0.469	71.46	-14.45	-1.50
July	0.111	300.68	8.53	0.31
August	0.428	387.61	38.18	1.34
September	-0.152	155.59	-8.24	-0.43
October	0.195	30.72	4.60	0.56
November	-0.406	6.61	-2.80	-1.25
December	-0.290	22.61	-6.85	-0.85
Seasonal	0.215	946.06	28.62	0.62
Annual	0.097	990.52	14.65	0.27

Table 5.1 Polynomial regression coefficient of Monthly rainfall time series

District / Station	No of Observations	Degree	Intercept	1st Reg. Coeff.	2nd Reg. Coeff.	F-Value
SAGAR						
Sagar	372	2	80.01	0.2707	-0.0007	0.35
Khurai	408	2	86.21	0.2110	-0.0005	0.24
Banda	348	2	76.22	0.1210	-0.0002	0.23
Raheli	420	2	92.94	0.0784	-0.0001	0.51
Deori	384	2	83.74	0.1759	-0.0004	0.20
Gadakota	120	2	70.91	0.1043	0.0009	0.19
Malthon	192	2	99.42	-0.6022	0.0039	0.75
Bina	132	2	109.68	-0.9273	0.0073	0.21
Rahatgarh	108	2	60.54	1.0734	-0.0055	0.45
Jaisinagar	108	2	67.63	1.3930	-0.0116	0.21
DAMOH						
Damoh	408	2	105.23	0.0597	-0.0002	0.08
Jabera	288	2	98.12	-0.0444	0.0003	0.09
Hatta	348	2	88.63	-0.0383	0.0001	0.04
Mazgaon H.	192	2	72.47	0.5668	-0.0031	0.52
Mala Tank	204	2	55.21	0.7379	-0.0037	1.80
PANNA						
Panna	420	2	86.41	0.1216	-0.0001	0.71
Pawai	396	2	81.22	0.1092	-0.0002	0.15
Ajaygarh	312	2	22.88	0.4120	-0.0015	0.60
D. nagar	156	2	67.99	1.3010	-0.0082	0.48
TIKAMGARH						
Tikamgarh	360	2	82.99	0.1072	-0.0004	0.25
Jatara	312	2	83.23	-0.1518	0.0005	0.11
Palera	120	2	67.33	0.5948	-0.0026	0.19
Baldevgarh	204	2	79.80	-0.3096	0.0019	0.30
Khurera	144	2	62.62	-0.0753	0.0000	0.04
CHATTARPUR						
Chattarpur	192	2	80.43	-0.0007	0.0001	0.01
Laundi	360	2	79.72	-0.1469	0.0006	0.90
Nawgaon	252	2	89.73	-0.2962	0.0013	0.30
Baxwah	204	2	119.17	-0.6131	0.0026	0.36
Bijawar	336	2	74.97	0.1616	-0.0003	0.26
Badamalhera	120	2	30.19	2.2301	-0.0169	0.77

Table 5.2 Polynomial regression coefficient of Monsoon total rainfall time series

District / Station	No of Observations	Degree	Intercept	1st Reg. Coeff.	2nd Reg. Coeff.	F-Value
SAGAR						
Sagar	31	2	930.21	30.70	-0.88	0.40
Khurai	34	2	961.43	31.26	-0.89	0.90
Banda	29	2	847.55	19.13	-0.48	2.26
Raheli	35	2	1218.50	-18.34	0.61	0.62
Deori	32	2	1007.20	13.53	-0.37	0.18
Gadakota	10	2	831.47	0.55	2.53	2.22
Malthon	16	2	1219.20	104.45	7.39	7.26
Bina	11	2	1441.30	-162.35	13.35	0.77
Rahatgarh	9	2	708.91	152.71	-10.31	1.24
Jaisinagar	9	2	772.63	211.73	-21.01	0.52
DAMOH						
Damoh	34	2	1200.80	8.51	-0.33	0.35
Jabera	24	2	1189.90	-23.01	1.10	0.35
Hatta	29	2	989.48	-2.35	0.15	0.69
Mazgaon H.	16	2	834.68	81.24	-5.14	0.52
Mala Tank	17	2	619.46	104.23	-5.93	1.43
PANNA						
Panna	35	2	980.84	14.18	-0.19	1.28
Pawai	33	2	971.73	9.60	-0.16	0.18
Ajaygarh	26	2	1072.90	48.01	-2.13	0.91
D. nagar	13	2	644.69	223.27	-17.01	4.49
TIKAMGARH						
Tikamgarh	30	2	909.30	20.18	-0.78	0.68
Jatara	26	2	981.85	-20.94	0.83	0.45
Palera	10	2	881.83	43.42	1.63	2.07
Baldevgarh	17	2	948.74	-38.45	2.47	0.52
Khurera	12	2	806.68	-28.68	0.96	0.12
CHATTARPUR						
Chattarpur	16	2	993.04	-18.10	1.03	0.04
Laundi	30	2	943.72	-23.30	1.01	1.54
Nawgaon	21	2	1036.50	-44.98	2.24	0.88
Baxwah	17	2	1394.80	-83.94	4.04	0.80
Bijawar	28	2	822.80	24.25	-0.50	0.93
Badamalhera	10	2	150.80	334.65	-29.00	2.05

Table 5.3 Polynomial regression coefficient of Non-monsoon total rainfall time series

District / Station	No of Observations	Degree	Intercept	1st Reg. Coeff.	2nd Reg. Coeff.	F-Value
SAGAR						
Sagar	31	2	37.29	7.05	-0.21	0.53
Khurai	34	2	73.18	-1.75	0.03	0.26
Banda	29	2	79.94	-2.79	0.07	0.35
Raheli	35	2	52.32	22.39	-0.60	2.84
Deori	32	2	8.44	10.64	-0.33	2.15
Gadakota	10	2	81.90	-3.84	-0.31	6.11
Malthon	16	2	41.19	10.28	-0.85	1.01
Bina	11	2	28.09	-6.14	0.44	0.44
Rahatgarh	9	2	8.00	2.89	-0.01	0.58
Jaisinagar	9	2	15.21	-8.56	1.21	2.48
DAMOH						
Damoh	34	2	83.65	-1.70	0.03	0.20
Jabera	24	2	21.61	12.81	-0.55	1.61
Hatta	29	2	99.24	-5.28	0.13	0.69
Mazgaon H.	16	2	31.10	2.06	-0.30	0.73
Mala Tank	17	2	35.92	1.29	-0.26	1.22
PANNA						
Panna	35	2	62.93	3.14	-0.09	0.40
Pawai	33	2	12.76	5.48	-0.13	1.29
Ajaygarh	26	2	6.21	8.84	-0.31	1.53
D. nagar	13	2	213.33	-63.31	5.28	6.11
TIKAMGARH						
Tikamgarh	30	2	101.09	-5.69	0.13	1.29
Jatara	26	2	52.91	-4.04	0.11	1.68
Palera	10	2	31.20	26.22	-2.29	3.78
Baldevgarh	17	2	68.80	-14.40	0.94	4.97
Khurera	12	2	1.50	7.97	-0.73	0.79
CHATTARPUR						
Chattarpur	16	2	39.09	4.28	-0.31	0.25
Laundi	30	2	36.48	1.15	-0.04	0.07
Nawgaon	21	2	93.23	-3.67	0.01	2.73
Baxwah	17	2	123.80	-15.10	0.63	1.58
Bijawar	28	2	85.61	-1.32	-0.03	1.92
Badamalhera	10	2	98.72	1.03	-1.42	0.99

Table 5.4 Polynomial regression coefficient of Annual rainfall time series

District / Station	No of Observations	Degree	Intercept	1st Reg. Coeff.	2nd Reg. Coeff.	F-Value
SAGAR						
Sagar	31	2	967.51	37.75	-1.09	0.61
Khurai	34	2	1042.60	29.51	-0.86	0.80
Banda	29	2	927.49	16.34	-0.41	0.26
Raheli	35	2	1185.60	-13.22	0.53	0.62
Deori	32	2	1015.70	24.17	-0.70	0.62
Gadakota	10	2	913.37	-3.29	2.22	1.12
Malthon	16	2	1060.40	-94.17	6.55	4.37
Bina	11	2	1469.40	-168.49	13.79	0.76
Rahatrgarh	9	2	716.91	155.60	-10.32	1.38
Jaisinagar	9	2	787.84	203.17	-19.81	0.46
DAMOH						
Damoh	34	2	1284.40	6.81	-0.30	0.39
Jabera	24	2	1211.60	-10.21	0.56	0.13
Hatta	29	2	1088.70	-7.63	0.28	0.04
Mazgaon H.	16	2	865.78	83.30	-5.44	0.58
Mala Tank	17	2	655.38	105.51	-6.19	1.55
PANNA						
Panna	35	2	1043.80	17.33	-0.28	1.25
Pawai	33	2	984.49	15.08	-0.30	0.30
Ajaygarh	26	2	1079.10	56.85	-2.44	1.16
D. nagar	13	2	858.01	159.95	-11.79	0.48
TIKAMGARH						
Tikamgarh	30	2	1010.40	14.49	-0.65	0.73
Jatara	26	2	1034.80	-24.97	0.93	0.51
Palera	10	2	951.89	35.90	-1.41	0.21
Baldevgarh	17	2	1017.50	-52.85	3.41	0.98
Khurera	12	2	805.17	-20.71	0.23	0.16
CHATTARPUR						
Chattarpur	16	2	1032.10	-13.82	0.72	0.02
Laundi	30	2	980.21	-22.15	0.97	3.14
Nawgaon	21	2	1129.70	-48.65	2.26	0.68
Baxwah	17	2	1518.60	-99.04	4.68	1.36
Bijawar	28	2	908.41	22.93	-0.53	0.57
Badamalhera	10	2	248.17	345.53	-30.08	1.43

Table 6.1 Serial Correlation Coefficient of rainfall series

District / Station	Lag Value			
	3	5	15	20
SAGAR				
Sagar	-0.21	-0.28	0.02	-0.30
Khurai	-0.24	-0.30	-0.25	-0.31
Banda	-0.21	-0.29	-0.21	-0.28
Raheli	-0.19	-0.22	-0.19	-0.19
Deori	-0.22	-0.30	-0.23	-0.30
Gadakota	-0.21	-0.33	-0.20	-0.26
Malthon	-0.21	-0.29	-0.22	-0.30
Bina	-0.25	-0.27	-0.23	-0.28
Rahatgarh	-0.24	-0.31	-0.26	-0.30
Jaisinagar	-0.22	-0.31	-0.26	-0.29
DAMOH				
Damoh	-0.21	-0.28	-0.23	-0.30
Jabera	-0.24	-0.30	-0.25	-0.32
Hatta	-0.21	-0.29	-0.21	-0.28
Mazgaon H.	-0.19	-0.25	-0.19	-0.25
Mala Tank	-0.19	-0.26	-0.22	-0.25
PANNA				
Panna	-0.23	-0.27	-0.22	-0.27
Pawai	-0.21	-0.27	-0.22	-0.29
Ajaygarh	-0.18	-0.25	-0.16	-0.25
D. nagar	-0.20	-0.21	-0.21	-0.22
TIKAMGARH				
Tikamgarh	-0.20	-0.27	-0.21	-0.27
Jatara	-0.20	-0.27	-0.22	-0.27
Palera	-0.20	-0.23	-0.24	-0.23
Baldevgarh	-0.16	-0.24	-0.18	-0.26
Khurera	-0.14	-0.17	-0.17	-0.19
CHATTARPUR				
Chattarpur	-0.16	-0.29	-0.20	-0.26
Laundi	-0.21	-0.30	-0.21	-0.29
Nawgaon	-0.21	-0.28	-0.24	-0.27
Baxwaha	-0.20	-0.28	-0.24	-0.30
Bijawar	-0.19	-0.26	-0.18	-0.25
Badamalhera	-0.11	-0.19	-0.15	-0.19

8.0 CONCLUSIONS

The present report presents the analysis of monthly, monsoon , non-monsoon and annual rainfall data for the five districts of Sagar Division of Madhya Pradesh. From the results of the statistical analysis of rainfall it could be broadly concluded that

1. There is significant rising trend observed in rainfall series at Raheli of Sagar district.
2. There is significant falling trend observed in rainfall series at Ajaygarh of Panna district.
3. From the comprehensive study of rainfall series in the Sagar division, rising trend is seen in Sagar, Damoh and Chhattarpur districts. Whereas falling trend is observed in Panna and Tikamgarh districts.
4. The rainfall series of non-monsoon season in the region does not indicates any trend.
5. The coefficient of skewness of monsoon season and annual rainfall is nearly zero indicating a near normal distribution of rainfall in the region.
6. All the raingauge stations in the division show very good correlation with their neighbouring raingauge stations.

The presence of any trend or persistence in the rainfall series is studied for the Sagar division. This however, needs more studies required to be carried out in drought prone areas of South Ganga Plains Region. Also the spatial and temporal variation study of rainfall in the region is of equal importance.

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DIRECTOR

DR. S.M. SETH

HEAD

DR. BHISHMA KUMAR

STUDY GROUP

RAVI GALKATE

T. THOMAS