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# Annual and seasonal rainfall variability of Bidar taluka (Karnataka)

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## ABSTRACT

**Daily rainfall data of thirty fours (1976-2009) have been analyzed for establishing the long term averages of monthly, seasonal and annual and its variability. The mean annual rainfall is 937.3 mm with coefficient of variation of 22.2 per cent indicated that the annual rainfall was more or less stable over the years. The season wise per cent contribution to annual rainfall was 1.6, 8.4, 75.5 and 14.5 per cent of winter, summer, monsoon and post monsoon seasons, respectively. Within the rainy season, August was the highest rainfall contributing month (21.3 per cent) followed by July (19.9 per cent). There is an ample scope for rain water harvesting from July to September which can be utilized as crop saving irrigation as well as per sowing irrigation for succeeding *Rabi* crops which are generally sown on residual soil moisture.**

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**Key words :** Rainfall, Rainy days, Seasonal rainfall

## INTRODUCTION

Rainfall analysis is important for crop planning for any region. In order to stabilize crop yields at reasonable levels in rainfed situation, it is essential to plan rainfed crops and their management practices, in consonance with the rainfall pattern prevalent in the region (Deka and Nath, 2000). So, studying rainfall and its variability is becoming important for agricultural production and management. It was noticed that monsoon rainfall does not follow any definite trend in all India scale (Mooley and Parthasarathty, 1984, Kripalani *et al.,* 2003) although some significant trends exist in some pockets of India when long term data are analyzed (Kolli *et al.,* 1992).

Knowledge of average monthly, seasonal and annual rainfall is helpful in understanding the general picture of the particular region. Annual rainfall varies greatly from year to year. Generally higher the rainfall less is the coefficient of variation (CV). Rainfall received during specified intervals like week, month or season indicate its distribution, which can be known by the rainy days. Distribution of rainfall is more important than total rainfall in a season for optimum crop yield. Rainfall analysis for crop planning was carried out in different regions of the country as reported by Singh *et al.* (2008) for Pusa, Bihar and Singh *et al.* (2008) for Sabour region of Bihar. Jat *et al.* (2003) reported rainy season and its variability for crop planning in Udaipur region and Victor *et al.* (1991) reported for Andhra Pradesh. Rana and Thakur (1998) reported rainfall analysis for crop planning in Kullu valley, Himachal Pradesh. In this context, a similar attempt was made at Agriculture Research Station, Bidar, to analyze the rainfall variability in month, season and annual wise for Bidar region

## MATERIALS AND METHODS

Daily rainfall data for the past 34 years (1976-2009) were collected from District Statistical Office, Bidar, for analysis. The rainfall data were critically examined for annual, seasonal and monthly values following the procedure of Panse and Sukhatme (1985). The standard deviation (SD) and Coefficient of Variance (CV) of rainfall were worked out.

## RESULTS AND DISCUSSION

The daily rainfall data for the period from 1976 to 2009 were analyzed and the results were presented under different heads for mean, standard deviation (mm) and coefficient of variance (%) of annual and seasonal rainfall and the per cent of different seasonal rainfall *vis-à-vis* annual rainfall. The highest and lowest rainfall (mm) recorded in annual and in different seasons was also presented as shown in Table 2. The coefficient of variability (CV) indicates the dependability or reliability on rainfall for any period. Lower values of CV indicate better reliability (Ramana Rao, 1988).

### Annual rainfall :

The overall mean annual rainfall for the past thirty four years (1976-2009) was 937.3 mm (range: 562.1 to 1347.6 mm) with a standard deviation (SD) of 208.6 mm

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**Table 1 : Monthly mean, highest and lowest rainfall (mm) and rainy days along with SD and CV as observed at Bidar (1976-2009)**

| Month | Rainfall | | | | | | Rainy days | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lowest (mm) | Highest (mm) | Mean (mm) | SD (mm) | CV (%) | Percent of annual RF | Lowest (mm) | Highest (mm) | Mean (mm) | SD (day/s) | CV (%) |
| January | 0 | 66.6 | 9.8 | 18.4 | 187.7 | 1 | 0 | 3 | 0.6 | 0.8 | 133 |
| February | 0 | 66.8 | 5.6 | 13.2 | 235.7 | 0.6 | 0 | 3 | 0.5 | 0.7 | 140 |
| March | 0 | 83.5 | 15.9 | 23.3 | 146.5 | 1.6 | 0 | 4 | 1.2 | 1.3 | 108 |
| April | 0 | 78.3 | 25.1 | 21.5 | 85.6 | 2.6 | 0 | 5 | 2.5 | 1.5 | 60 |
| May | 0 | 295.4 | 37.8 | 57.6 | 152.3 | 4.1 | 0 | 13 | 3.0 | 2.4 | 80 |
| June | 30.6 | 310.5 | 137.7 | 70.4 | 51.1 | 14.7 | 3 | 16 | 8.0 | 2.8 | 35 |
| July | 56.2 | 349.6 | 186.6 | 114.4 | 61.3 | 19.9 | 5 | 19 | 10.7 | 3.2 | 29 |
| August | 35.3 | 439.8 | 199.4 | 97.1 | 48.6 | 21.3 | 5 | 18 | 11.2 | 3.3 | 29 |
| September | 13.9 | 322.8 | 183.8 | 105.3 | 57.2 | 19.6 | 1 | 18 | 9.0 | 3.9 | 43 |
| October | 0 | 298.2 | 97.4 | 87.8 | 90.1 | 10.4 | 0 | 11 | 4.8 | 3.3 | 68 |
| November | 0 | 225.6 | 33.6 | 55.1 | 163.9 | 3.6 | 0 | 8 | 1.6 | 2.1 | 131 |
| December | 0 | 27.2 | 5.2 | 8.1 | 155.7 | 0.6 | 0 | 3 | 0.5 | 0.8 | 160 |

**Table 2 : Characteristics of seasonal rainfall (mm) and rainy days as observed at Bidar (1976-2009)**

| Year | Particulars | Lowest (mm) | Highest (mm) | Mean (mm) | SD | CV (%) | Percent of annual rainfall |
|---|---|---|---|---|---|---|---|
| Annual | Rainfall | 562.1 | 1347.6 | 937.3 | 208.6 mm | 22.2 | - |
| | Rainy days | 38 | 69 | 53.3 | 7.7 days | 14.4 | - |
| Winter | Rainfall | 0 | 70.4 | 15.4 | 23.4 mm | 151.9 | 1.6 |
| | Rainy days | 0 | 5 | 1.0 | 1.2 days | 120.0 | - |
| Summer | Rainfall | 5.8 | 297.4 | 78.7 | 56.1 mm | 71.2 | 8.4 |
| | Rainy days | 1 | 13 | 6.7 | 2.5 days | 37.3 | - |
| Monsoon | Rainfall | 427.7 | 1254.3 | 707.3 | 209.6 mm | 29.6 | 75.5 |
| | Rainy days | 27 | 53 | 38.9 | 6.1 days | 15.6 | - |
| Post monsoon | Rainfall | 7.0 | 353.0 | 136.1 | 102.4 mm | 75.2 | 14.5 |
| | Rainy days | 1 | 15 | 6.9 | 3.9 days | 56.5 | - |

Annual : January – December Winter : January – February Summer : March- May
Monsoon : June - September Post monsoon/north east monsoon: October - December
SD : Standard Deviation CV : Coefficient of variation

and coefficient of variance (CV) 22.2 per cent. The over all mean rainy days came to be 53 days (range: 38 to 69) with a standard deviation (SD) of 7.7 mm and coefficient of variance (CV) 14.4 per cent.

**Seasonal rainfall :**

South west (SW) monsoon season (June - September) contributed 75.5 per cent of total mean annual rainfall with coefficient of variance of 29.6 per cent and standard deviation of 209.6 mm indicating its dependability. Rainfall during this period varied between 427.7 to 1254.3 mm with mean value of 707.3 mm. Mean number of rainy days during SW monsoon season was 38 days (range : 27 to 53 days). For post monsoon season (October – December) the mean rainfall was 136.1 mm (range: 7 to 353 mm) contributeing 14.5 per cent to the total annual rainfall with coefficient of variance of 75.2 per cent and standard deviation of 102.4 mm. The mean rainy days during this period was 6 days (range: 1 to 15). Summer rainfall (March - May) also contributed substantial amount of 78.7 mm and contributed 8.4 per cent of the total mean annual rainfall. The winter rainfall contributed 1.6 per cent (mean - 15.4 mm) to the mean annual rainfall. The mean rainy days was less in winter (1 day) as compared to summer (6.7 days) and so also the highest rainy days recorded (Table 2, Fig 3 and 4).

**Monthly rainfall :**

Rainfall quantum and distribution during different months was shown in Table 1 and Fig.1. It is evident that monthly rainfall had unimodal peak. August month received maximum mean rainfall of 199.4 mm with coefficient of variance of 48.6 per cent and standard deviation of 97.1 mm, distributed in 11 mean rainy days

followed by July (186.6 mm) in 10 rainy days and so also it contributed highest (21.3) per cent of the annual rainfall. The CV was highest in February month indicating more variability in rainfall. Monthly rainfall during November to May remained lowest in the range of 5.2 to 37.8 mm. The highest rainfall of 439.8 mm was reported in the August month (Table 1 and Fig. 1 and 2).

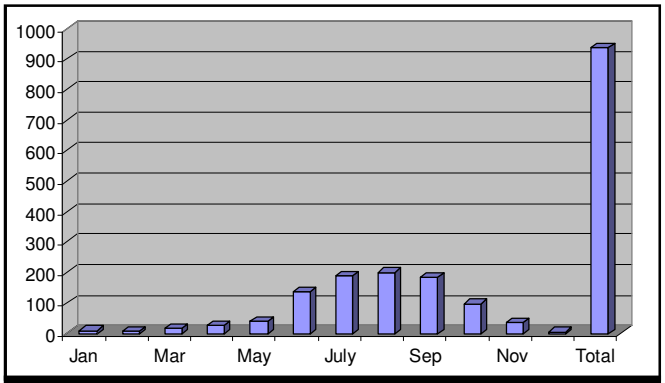


**Fig . 1 : Monthly average rainfall (mm) as recorded at Bidar**

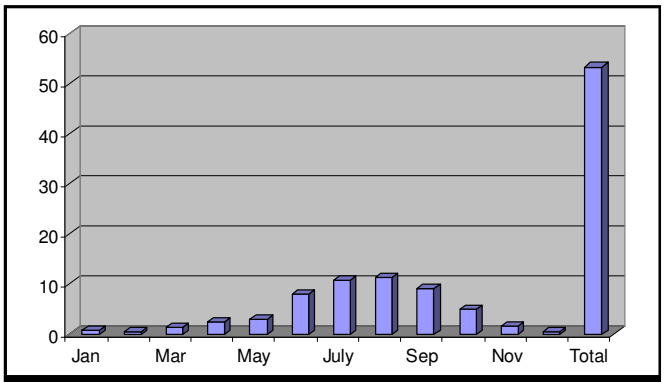


**Fig . 2 : Monthly average rainy days as recorded at Bidar**

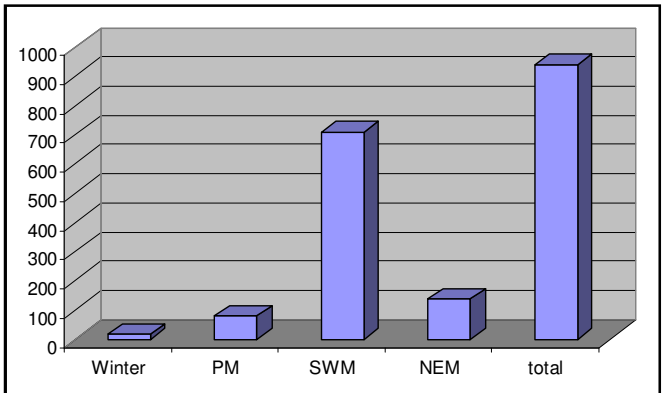


**Fig . 3 : Average season wise rainfall as observed at Bidar**

## Crop planning :

Based on the present study, the following recommendations could be made to increase the land productivity in the region. During summer season as the rainfall receipt was too low for crop cultivation, it is recommended to go for land preparation, especially summer ploughing and make the soil fit for cultivation during the succeeding year. Or else, less water requiring short duration crops such as millets, forage crops etc. can be grown with supplement irrigation practices. During *Kharif* season, arable short duration crops like pulses, sunflower, millets, maize can be grown. In uplands and in the embankments of water harvesting structures, cultivation of vegetables like cucumber and fruit crops like water melon can be done after the cessation of northeast monsoon rains for effective utilization of land and other resources. Since the winter rainfall is uncertain and erratic, residual moisture and lowland area can be utilized for growing a second crop under rainfed conditions. Wheat may be grown only with assured irrigation during *Rabi* season.

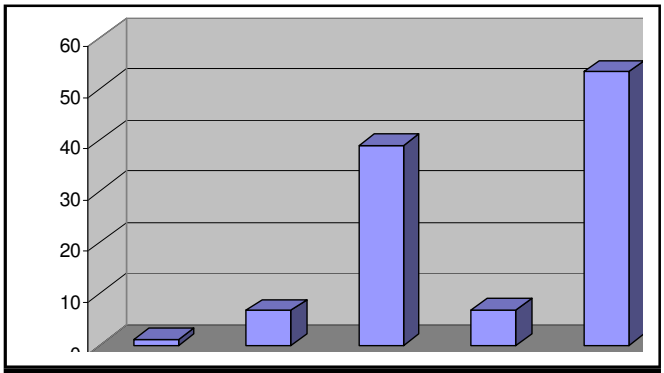


**Fig. 4 : Average season wise rainy days as observed at Bidar W : winter PM : pre monsoon SWM : South west monsoon NEM (post monsoon) : north east monsoon**

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