

# Analysis of metrological drought for Latur and Osmanabad district of Maharashtra

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■ **ABSTRACT** : Drought is a natural hazard that has significant impact on economic, agricultural, environmental and social aspects. The main objective of the research reported herein has been to develop an approach to analyse of meteorological droughts based on annual precipitation data. If 'A' is the mean weekly rainfall for 22 years of data from 1991 to 2012, then a week receiving rainfall less than 75 per cent of 'A' value is defined as drought week and greater than 125 per cent of 'A' value is defined as surplus week. Week having rainfall between 75 per cent of 'A' value and 125 per cent of 'A' value is considered as normal week. The rainfall distribution of Latur and Osmanabad district of Maharashtra state is quite erratic in space and occurrence of drought is common. In this study 22 years (1991-2012) of rainfall data of Latur and Osmanabad district have been analyzed on yearly, monthly and weekly basis for predicting the water drought, normal and surplus event for crop planning in region. Weekly drought, normal and surplus events give a more precise idea about crop planning than yearly and monthly events. The analysis has reveals that the percentage of drought weeks is more than normal and surplus weeks. It has been also reveals that there is a need of supplemental irrigation during periods of water scarcity.

■ **KEY WORDS** : Drought, Rainfall analysis, Scarcity

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Rainfall is considered as principle source of water. The success or failure of crops particularly under rain fed conditions is closely linked with the rainfall patterns. Rainfall during the monsoon is not uniform. Frequent dry spells are common phenomena during the monsoon season. In rain fed agriculture, the adequacy of rainfall to meet the water requirements of crops and other consumptive and non-consumptive water needs is a basic requirement. The yearly, monthly and weekly analysis of rainfall will give general idea about the rainfall pattern of the region, whereas the monthly analysis of rainfall will be of much use as far agricultural planning is concerned. The spatial and

temporal variability of rainfall and its uneven and inadequate distribution determines the failure of crops especially in drought prone areas. Knowledge of the distribution of drought during the monsoon period is essential for successful rain fed farming. It is also important to know the chances of occurrence of drought during the critical stages of the crops for deciding the sowing date, cropping pattern and planning for protective irrigation and intercultural operations. With this view in mind, drought analysis was done for Latur and Osmanabad district have been analyzed on yearly, monthly and weekly basis for predicting the water drought, normal and surplus event for crop planning in region.

## ■ METHODOLOGY

### Location of study area :

The study was carried out for Latur and Osmanabad districts of Marathwada region. The details of stations are presented below.

### Osmanabad :

It is located between 18°08' N latitude and 76°06' E longitude and at an altitude of 462 m above msl. the average annual rainfall is 801.91 mm.

### Latur :

It is situated in subtropical zone at an altitude of 556 m above msl. Latur is intersected by 19°53' N latitude and 75°23' E longitude. Soil of Latur is medium black clay. The average annual rainfall is 754.2 mm. Daily data in respect of rainfall data collected from Water Resources Department, Hydrology Project (Surface Water), Government of Maharashtra, Nasik. Year wise, month wise and week wise rainfall was determined for Latur and Osmanabad district. Year, month and Weekwise events then classified as drought, normal and surplus depending upon the following criteria.

If 'A' is the mean weekly rainfall for 22 years of data from 1991 to 2012, then a week receiving rainfall less than 75 per cent of 'A' value is defined as drought week and greater than 125 per cent of 'A' value is defined as surplus week. Week having rainfall between 75 per

cent of 'A' value and 125 per cent of 'A' value is considered as normal week.

## ■ RESULTS AND DISCUSSION

Annual rainfall data of Latur and Osmanabad districts were analyzed statistically and results are presented in Table 1. The numbers of drought, surplus and normal years in Latur were 3, 1 and 18 years with 13.6, 4.5 and 81.80 per cent years, respectively from 1991 to 2012. The number of drought, surplus and normal years in Osmanabad was 0, 1 and 21 years with 0.00, 4.5 and 95.54 per cent years, respectively from 1991 to 2012. The percentage of co-efficient of variation between drought, normal and surplus years for Latur and Osmanabad districts were 126.70 per cent and 161.53 percentage, respectively. Also the annual drought variation curve in both districts is presented in Fig. 1.

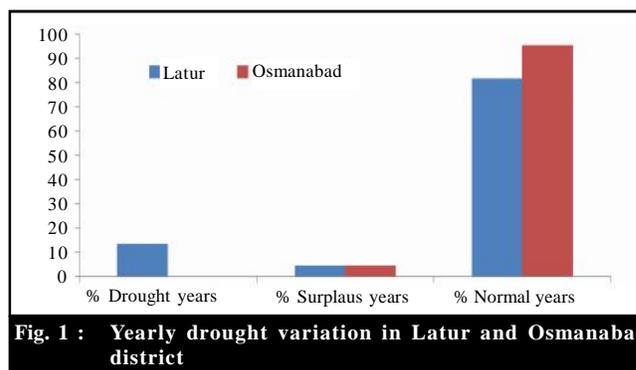


Fig. 1 : Yearly drought variation in Latur and Osmanabad district

Table 1 : Yearly drought investigations for Latur and Osmanabad district

| Sr. No. | Name of stations | No. of Drought year | No. of surplus year | No. of normal year | % of drought year | % of surplus year | % of normal year | Coeff. of variance in % |
|---------|------------------|---------------------|---------------------|--------------------|-------------------|-------------------|------------------|-------------------------|
| 1.      | Latur            | 3                   | 1                   | 18                 | 13.6              | 4.5               | 81.8             | 126.70                  |
| 2.      | Osmanabad        | 0                   | 1                   | 21                 | 0                 | 4.5               | 95.5             | 161.53                  |

Table 2 : Monthly drought investigations for Latur and Osmanabad districts

| Sr. No. | Name of stations | No. of drought month | No. of surplus month | No. of normal month | % of drought month | % of surplus month | % of normal month | Coeff. of variance in % |
|---------|------------------|----------------------|----------------------|---------------------|--------------------|--------------------|-------------------|-------------------------|
| 1.      | Latur            | 168                  | 78                   | 18                  | 63.64              | 29.55              | 6.82              | 85.79                   |
| 2.      | Osmanabad        | 162                  | 76                   | 26                  | 61.36              | 28.79              | 9.85              | 78.17                   |

Table 3 : Weekly drought investigations for Latur and Osmanabad district

| Sr. No. | Name of stations | No. of drought week | No. of surplus Week | No. of normal week | % of drought week | % of surplus week | % of normal week | Coeff. of variance in % |
|---------|------------------|---------------------|---------------------|--------------------|-------------------|-------------------|------------------|-------------------------|
| 1.      | Latur            | 822                 | 259                 | 63                 | 71.85             | 22.64             | 5.51             | 84.36                   |
| 2.      | Osmanabad        | 816                 | 266                 | 62                 | 71.33             | 23.25             | 5.42             | 83.50                   |

The frequency of drought was more in Latur as compared to Osmanabad district.

### Monthly drought investigation :

Monthly rainfall data of Latur and Osmanabad district were analyzed statistically and results presented in Table 2. The numbers of drought, surplus and normal months in Latur were 168, 78 and 18 month with 63.64, 29.55 and 6.82 per cent months, respectively. Similarly the number of drought, surplus and normal months in Osmanabad was 162, 76 and 26 months with 61.36, 28.79 and 9.85 per cent months, respectively. The number of drought months was more in Latur but number of normal months was less in Latur as compared to Osmanabad district. The percentage of co-efficient of variation between drought, normal and surplus months for Latur and Osmanabad was 85.79 and 78.17 per cent, respectively. Also the monthly drought variation in both the districts is presented in Fig. 2.

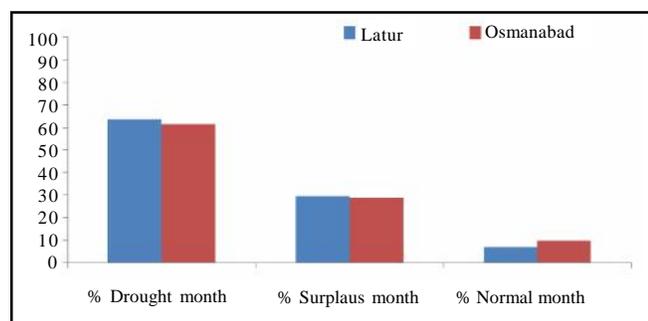


Fig. 2 : Monthly drought variation in Latur and Osmanabad district

### Weekly drought investigation :

Weekly rainfall data of Latur and Osmanabad districts were analyzed statistically and results presented in Table 3. The numbers of drought, surplus and normal weeks in Latur were 822, 259 and 63 weeks with 71.85, 22.64 and 5.51 per cent weeks, respectively. Similarly the numbers of drought, surplus and normal weeks in Osmanabad were 816, 266 and 62 months with 71.33, 23.25 and 5.42 per cent, respectively. The number of drought weeks was less in Osmanabad but number of normal weeks was more in Latur as compared to Osmanabad district. The percentage of co-efficient of variation between drought, normal and surplus weeks in Latur and Osmanabad district was 84.36 and 83.50 per cent, respectively. Also the weekly drought variation in both the districts is presented in Fig. 3.

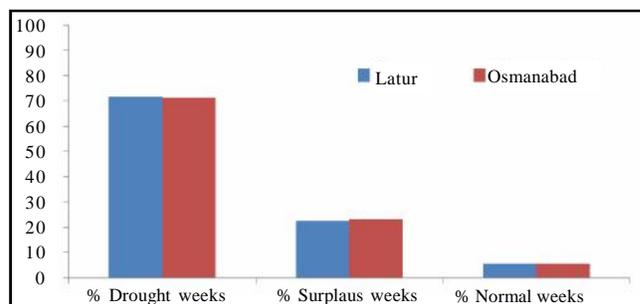


Fig. 3 : Weekly drought variation in Latur and Osmanabad district

### Conclusion :

Based on the study of rainfall data during 1991 to 2012 of Latur and Osmanabad district have been analyzed on yearly, monthly and weekly basis for predicting the water drought, normal and surplus event for crop planning in region. The numbers of drought, surplus and normal years in Latur were 3, 1 and 18 year with 13.6, 4.5 and 81.80 per cent years, respectively. The number of drought, surplus and normal years in Osmanabad was 0, 1 and 21 years with 0.00, 4.5 and 95.54 per cent years, respectively. The numbers of drought, surplus and normal months in Latur were 168, 78 and 18 month with 63.64, 29.55 and 6.82 per cent months, respectively. Similarly the number of drought, surplus and normal months in Osmanabad was 162, 76 and 26 months with 61.36, 28.79 and 9.85 per cent months, respectively. The numbers of drought, surplus and normal weeks in Latur were 822, 259 and 63 weeks with 71.85, 22.64 and 5.51 per cent weeks, respectively. Similarly the numbers of drought, surplus and normal weeks in Osmanabad were 816, 266 and 62 months with 71.33, 23.25 and 5.42 per cent, respectively.

The analysis has reveals that the percentage of drought weeks is more than normal and surplus weeks. It has been also reveals that there is a need of supplemental irrigation during periods of water scarcity.

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