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# RAINFALL DISTRIBUTIONAL PATTERN AND VARIABILITY IN OSMANABAD DISTRICT OF MARATHWADA REGION: ANALYSIS OF PAST 35 YEARS DATA

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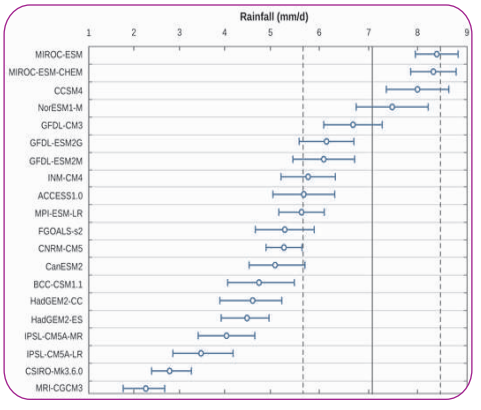
**ABSTRACT: -**

*Over decades, Marathwada region of Maharashtra faces severe drought condition for several times. This condition leads crop failure; several farmers committed suicides due to crop failure in their field. The Osmanabad district of Marathwada region also faces same condition. In last 16 months, 212 farmers committed suicide in Osmanabad district of Marathwada region, which is facing severe water crisis for four consecutive years. The major reason behind the farmers' suicide is the crop failure occurred due to uncertain and unreliable rainfall in this region. So the study of rainfall pattern is significant factor considering agricultural production and land use intensity. The intensity of farming operations, cropping pattern, irrigation and productivity are related to variability of rainfall. Variability of rainfall increases with decreasing mean annual rainfall. Variability in excess of 20 per cent implies great risk to farming. Therefore attempt is made here to assess the distributional pattern and variation of rainfall during the past 35 years in Osmanabad district of Marathwada region. The present study is entirely based on secondary data source. To examine the rainfall variability, the technique of Co-efficient of variation of annual rainfall data for 35 years has been utilized. The intensity of rainfall is calculated dividing total amount of rainfall by rainy days during the year. The study reveals that the Osmanabad district has 33.70 per cent rainfall variability which implies great risk to farming operation.*




**KEYWORDS:** *Rainfall distribution, Intensity of rainfall, Rainfall variability, Co-efficient of Variation.*

## INTRODUCTION :

Climate determines the agricultural land use and agricultural patterns of any region. It consists of temperature, rainfall, humidity, sunshine, fog, frost snow, hailstorms, winds and air pressure. All these elements of weather and climate, individually and collectively, determine the agricultural patterns of a region (Husain M, 2002). The potential crop-producing capability of a given area is depended mainly on the existing climatic condition. The success or failure of the cropping season is determined by the intensity of the climatic factors (Singh Jasbir & Dhillon S.S., 1984). Temperature and rainfall are important climatic inputs for agricultural production, especially in the context of climate change (Cong R.G. and Brady M, 2012). These factors fluctuate from time to time, season to season and from place to place as they determine the type of crops raised and caused regional differences in crop association. Different combinations of these factors are responsible for various types of cropping patterns. Rainfall is the most important factor of climate affecting agricultural activities

in the region. Total rainfall and its month wise distribution is a significant factor considering agricultural production and land use intensity. Aberrant monsoon may lead to moisture deficit which may affect the growth of crops (Malhotra S.K. 2012). The varying distribution of fresh water across the world, involving complex patterns of rainfall in space and time, crucially affects the diverse ecosystem and resources on which human societies depend (Allan R.P, 2011). Rainfall in greater part of India is not certain, depends on vagaries of monsoon, it is unevenly distributed and has no fixed course (Barkade A.J. and Sule B.M., 2011). The intensity of farming operations, cropping pattern, irrigation and productivity are related to variability of rainfall. Variability of rainfall increases with decreasing mean annual rainfall. Variability in excess of 20 per cent implies great risk to farming (Williamson, 1925). Therefore in the absence of irrigation or dry farming practices, agriculture is a gamble and consequently famines can be expected any time. In this situation, it is essential additional water supplies for successful agricultural practices.

According to government data, it has been reported that 852 farmer suicides in the four months between January to April of 2017 in Maharashtra. Out of these 291 cases were reported from Marathwada region which is 34 % of the total farmer suicides in Maharashtra (Times of India, 2017). In last 16 months, 212 farmers committed suicide in Osmanabad district of Marathwada region, which is facing severe water crisis for four consecutive years (The Indian Express, May13, 2016). The major reason behind it is the crop failure occurred due to uncertain and unreliable rainfall in the region.

## AIMS OF THE STUDY:

The present study aims to analyse the distributional pattern and variation of rainfall during past 35 years in Osmanabad district of Marathwada region. The study also aims to analyse the intensity of rainfall as it determines the water regime and thereby irrigation potentials of the region.

## STUDY AREA:

The Osmanabad district is situated in Marathwada region of Maharashtra state. The absolute location of district is in between 17°39’45” and 18°42’30” North latitudes and 75°18’30”and 76°46’15 East longitude. It is bounded to the South-West by Solapur district, to the North-West Ahmednagar and Beed districts, to the East by Latur district and to the South by Bidar and Gulbarga district of Karnataka State. The total geographical area of district is 7512.40 Square kilometers. As for as area is concerned the district ranks 24th in the state of Maharashtra out of which 248 sq km is urban area (3.21 % of total area) and 7321

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sq km is rural area (96.79 % of total area). It is extended with 280 kms from East to West and 240 kms from North to South. It lies on the Deccan plateau at an average height of 600 meter above mean sea level. Large area of the district is covered by Balaghat Ranges and uneven with patches of low level plain (District Gazetteer of Osmanabad, 1972).

For the administrative purpose the district is divided into 8 tehsils i.e., Paranda, Bhum, Washi, Kalam, Osmanabad, Tuljapur, Lohara, and Omerga and having 729 villages. (Fig no.1)

## MATERIALS AND METHODS:

The present study is based on secondary data source. In order to meet the aims of the study the relevant information of the study region is collected from District Gazetteer of Osmanabad, official website of Osmanabad district, District Socio-Economic Review and Statistical Abstract of Osmanabad. The spatial distribution and variation of rainfall is analysed by considering rainfall data from 1980 to 2014 i.e. for past 35 years have been collected from Indian Meteorological department (IMD), Pune by Vasantrao Naik Marathwada Agricultural University, Parabhani (Maharashtra). Collected rough data are processed. Tables and maps are prepared with the help of computer. Analysis of the study has been made with help of the statistical techniques. The intensity of rainfall is calculated dividing total amount of rainfall by rainy days during the year.

Rainfall variability is measured by the co-efficient of variation of average rainfall of past 35 years i.e. from 1980 to 2014. The Co-efficient of rainfall variability is calculated by the following formula.

$$\text{Co-efficient of Rainfall variability} = \frac{\text{S.D}}{\bar{X}} \times 100$$

X

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Where,

S.D = Standard Deviation

$\bar{X}$ = the arithmetic mean of rainfall during the 35 years

It is hypothesized that the higher the co-efficient of variability, the lower is the assurance of rainfall. On the basis of this results and conclusion are drawn.

## DISCUSSION AND RESULTS:

### Distributional Pattern of Rainfall in Osmanabad district:

Characteristics of rainfall distribution are interpreted over space and time. In the study area summer season is followed by the south west monsoon season from June to September. The region receives most of the rainfall from the south-west monsoon. In association with cyclonic storms in the Bay of Bengal in the post monsoon months and to a lesser extent in May, the district experience very strong winds and heavy rainfall occur. Occasionally these storms cross the some part of district and causing heavy damage to standing crops.

### A) Average Annual Rainfall:

Osmanabad districts falls under the rain shadow of Sahyadri Mountains and therefore the beginning and end of the rainy season is quite uncertain in these parts. The rainfall is scanty all over the district. The rainfall is uncertain and the year- to - year variations in the annual rainfall of the district are large. Average annual rainfall is 729.32 mm in the region. The rainfall in the district varies from 609.9 mm in Paranda to 835.67 mm in Tuljapur. It is high in eastern part and low in western part of the study region. There are two peaks of rainfall pattern in June-July and September-October. In September the highest maximum rainfall is received when retreating monsoon and cyclonic rainfall occurs. At some times, the eastern winds during the end of monsoon cause precipitation here, which enables growing rabbi crops and vegetables after harvest of kharip crops on residual moisture. About 81.54 per cent of total rainfall is received in four months from June to September. In the month of April and May sometimes thundershowers occur in the region causing damage to horticultural crops.

The above characteristics of rainfall have led to semi- arid condition in the region, which put limitation the quantity of surface as well as groundwater in the region. The region therefore has the problem of inadequate water hampering over all agricultural landscape.

### B)Seasonal Distribution of Rainfall:

### i)South-west Monsoon period:-

The period of this season is from June to September. During the south west monsoon season skies are overcast with clouds. During this season district as whole receives about 81.54 per cent of the total annual rainfall (Table No. 1. ), but spatial distribution varies ranging from 78 to 86 per cent. The low rainfall in south-west monsoon period is recorded in Omerga, Paranda and Bhum tehsils i.e. < 80 percent. The moderate rainfall is recorded in Kalam and Lohara tehsils i.e. 80 to 83 percent, where as it is high in Osmanabad, Tuljapur and Washi tehsils i.e. > 83 percent.

The hot and humid climate adversely effects on fruit crops as many diseases spread all over the plants. Therefore the frequency of spraying pesticides and insecticides are being increased.

**Table No.1: Seasonal Distribution of Rainfall (in mm) in Osmanabad District.**

| Sr. No. | Tehsils | Monsoon June-Sept. | % to total rainfall | Post-Monsoon Oct-Nov. | % to total rainfall | Win-ter Season Dec-Feb | % to total rainfall | Hot Season Mar-May | % to total rainfall | Total Rainfall | % to total rainfall |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | Paranda | 475.11 | 77.90 | 89 | 14.63 | 8.03 | 1.32 | 37.54 | 6.16 | 609.90 | 100.00 |
| **2** | Bhum | 562.03 | 77.85 | 120 | 16.62 | 6.70 | 0.93 | 33.21 | 4.60 | 721.93 | 100.00 |
| **3** | Washi | 586.93 | 84.62 | 70 | 10.11 | 6.00 | 0.87 | 30.55 | 4.40 | 693.62 | 100.00 |
| **4** | Kallam | 640.37 | 81.01 | 106 | 13.45 | 3.53 | 0.45 | 40.23 | 5.09 | 790.46 | 100.00 |
| **5** | Osmanabad | 664.10 | 85.78 | 74 | 9.52 | 11.09 | 1.43 | 25.34 | 3.27 | 774.23 | 100.00 |
| **6** | Tuljapur | 696.30 | 83.32 | 93 | 11.19 | 6.84 | 0.82 | 39.06 | 4.67 | 835.67 | 100.00 |
| **7** | Lohara | 525.93 | 81.46 | 84 | 13.09 | 3.93 | 0.61 | 31.27 | 4.84 | 645.62 | 100.00 |
| **8** | Omerga | 606.73 | 79.51 | 105 | 13.78 | 9.86 | 1.29 | 41.35 | 5.42 | 763.12 | 100.00 |
| | **District** | **594.7** | **81.54** | **92.8** | **12.73** | **7.00** | **0.96** | **34.82** | **4.77** | **729.32** | **100.00** |

Source: Compiled by researcher on the basis of data of IMD, Pune. (1980-2014).

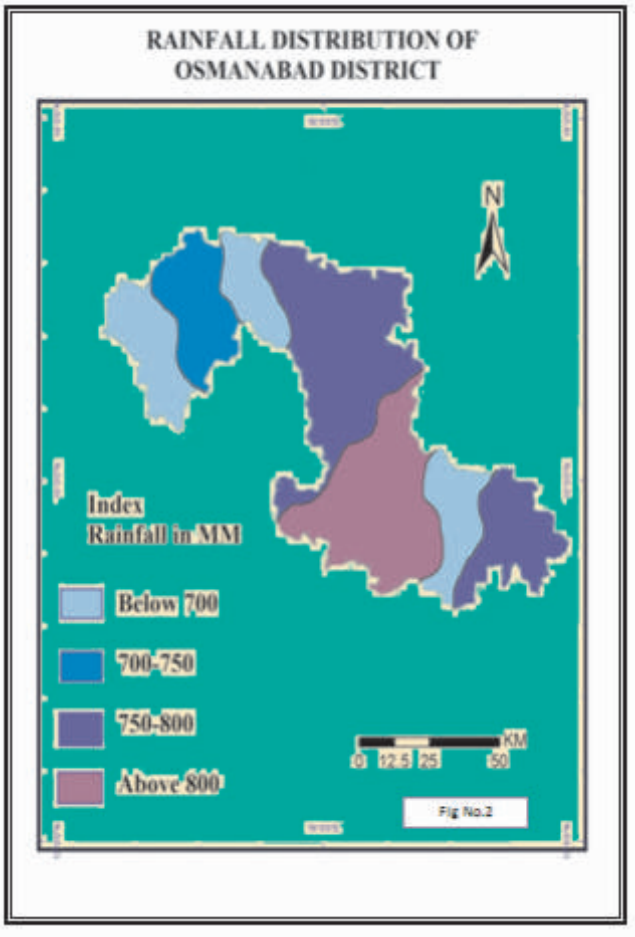
**ii)Post Monsoon Period:**

During this season district as whole receives about 12.73 per cent of the total annual rainfall from retreating monsoon and cyclonic rainfall, but tehsil wise distribution varies ranging from 10 to 17 per cent of total rainfall. The low rainfall in post monsoon period is recorded in Osmanabad, Tuljapur and Washi tehsils i.e. < 12 percent. The moderate rainfall is recorded in Kalam, Omerga and Lohara tehsils i.e. 12 to 14 percent, where as it is high in Paranda and Bhum tehsils i.e. > 14 percent.

Post monsoon rainfall is useful to horticultural crops particularly flowers and vegetables. If this rainfall is sufficient, the intensity of horticultural crops operations are increased.

**iii)Winter Season:**

During December to February district as whole receives only about 0.96 per cent of




the total annual rainfall, but spatial distribution varies from 0.45 to 1.43 per cent of total annual rainfall. (Table 2) The low rainfall in winter is recorded in Kalam tehsil i.e. < 0.80 per cent. The moderate rainfall is recorded in Tuljapur, Bhum and Washi i.e. 0.80 to 1.10 percent, where as it is high in Osmanabad, Omerga and Paranda tehsils i.e. > 1.10 percent. Sometimes cyclonic rainfall occurs in the month of February which is harmful to fruit crops such as grapes and mangoes.

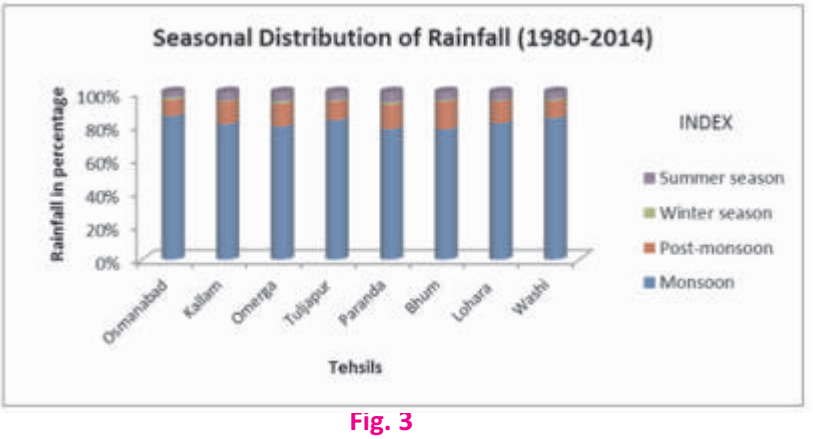



**Fig. 3**

### iv) Summer Season:

In summer season district as whole received 4.77 per cent of annual total rainfall. It varies from tehsil to tehsil ranging from 3.27 to 5.42 per cent of annual total rainfall. The low rainfall in summer season is recorded in Osmanabad tehsil i.e. < 4 percent. The moderate rainfall is recorded in Kalam, Tuljapur, Bhum, Lohara and Washi

i.e. 4 to 5 percent, where as it is high in Omerga and Paranda tehsils i.e.> 5 per cent. This rainfall is useful for horticultural crops like mango, flowers and onion but it is largely limited by concentration in few days of the summer. This rainfall is not sufficient to meet annual water need for successful horticultural production. It is also not well distributed spatially as well as temporally (Table No.2.2 and Fig.2.5).

## Intensity of Rainfall:

The term intensity of rainfall is used in the context of rainfall received during 24 hours period. It is important as it determines the intensity of soil erosion. More ever the intensity of rainfall determines the water regime and thereby irrigation potentials of the region. In other words higher the intensity of rainfall higher is the degree of erosion, lower is the water regime and irrigation potentials, and vice versa (Nanaware A.H., 2007). The district as a whole has 13.42 intensity of rainfall, but the spatial distribution of intensity of rainfall varies from tehsil to tehsil. The low intensity of rainfall i.e. < 13 is found in Bhum, Paranda and Lohara. The moderate intensity of rainfall is observed in Osmanbad and Washi tehsils i.e.13 to 13.8, whereas it is high in Kallam, Omerga, and Tuljapur i.e. > 13.8(Fig. 2.6).

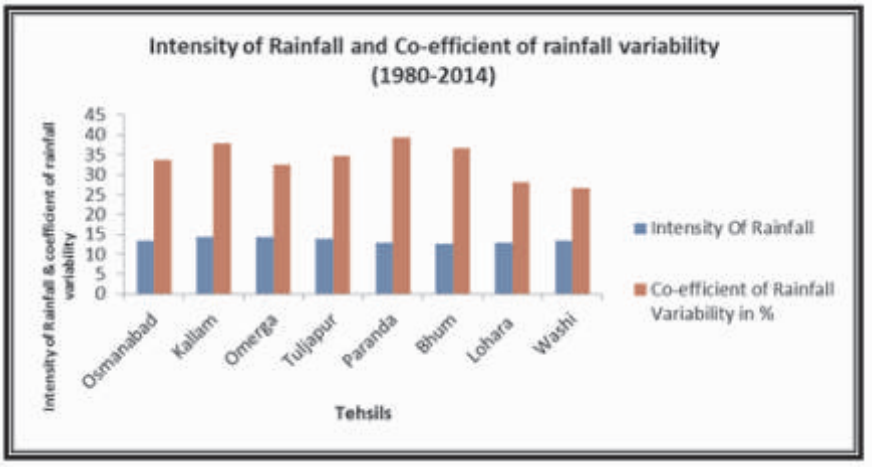



**Fig. No. 4**

## RAINFALL VARIABILITY:

The table No.2 and Fig. no. 4 show that the spatial pattern of average rainfall variability in the region. The district as a whole has 33.70 per cent rainfall variability but the

**Table No.2: Intensity of Rainfall and Co-efficient of rainfall variability (1980-2014)**

| Sr.No. | Tehsils | Rainy Days | Average Annual Rainfall in M.M | Intensity Of Rainfall | Co-efficient of Rainfall Variability in % |
|---|---|---|---|---|---|
| **1** | Paranda | 47.91 | 609.90 | 12.73 | 39.37 |
| **2** | Bhum | 57.41 | 721.93 | 12.58 | 36.61 |
| **3** | Washi | 52.27 | 693.62 | 13.27 | 26.69 |
| **4** | Kallam | 55.04 | 790.46 | 14.36 | 37.79 |
| **5** | Osmanabad | 57.87 | 774.23 | 13.38 | 33.80 |
| **6** | Tuljapur | 60.52 | 835.67 | 13.81 | 34.61 |
| **7** | Lohara | 50.18 | 645.62 | 12.87 | 28.01 |
| **8** | Omerga | 53.48 | 763.12 | 14.27 | 32.37 |
| | **Total District** | **54.34** | **729.32** | **13.42** | **33.70** |

spatial distribution varies from tehsil to tehsil. The low rainfall variability is observed in Lohara and Washi tehsils i.e. < 31 percent. It is moderate in Osmanabad, Omerga and Tuljapur tehsils i.e. 31 to 35, whereas it is high in

Kalam, Paranda and Bhum i.e. > 35 percent.

Generally, rainfall variability decreases from west to east in the study region. Therefore, rainfall reliability is low in western part in relation to eastern part of the region. District as whole has over 33 per cent of rainfall variability so that agriculture without irrigation in the region becomes uneconomic.

The patterns of rainfall variability determine the areal extent of water balance. This in turn affects the horticultural cropping intensity and practices. No wonder that these rainfall characteristics deeply influence the traditional agriculture, which is depending on rainfall in the absence of irrigation facilities. But one important point to note is that fruit crops can withstand these rainfall variations and longer dry spells better.

## CONCLUSION:

Some important conclusions have been drawn from the present study of rainfall distribution and variability that occurred during the past 35 years i.e. from 1980 to 2014. The study reveals that rainfall is scanty and uncertain all over the district. Average annual rainfall is 729.32 mm in the region. Rainfall decreases from East to west. About 81.54 per cent of total rainfall is received in four months from June to September. These characteristics of rainfall have led to semi- arid condition in the region, which puts limitation to the quantity of surface as well as groundwater in the region. So the region has the problem of inadequate water hampering over all agricultural landscape. The district as whole has 13.42 intensity of rainfall. Spatial distribution of intensity of rainfall varies from tehsil to tehsil i.e. 12.58 to 14.36. Almost all tehsils of study area have above 28 per cent of rainfall variability. It decreases from west to east, so rainfall reliability is low in western part in relation to eastern part of the region. District as a whole has over 33 per cent of rainfall variability which indicates agriculture without irrigation in the region becomes uneconomic. These rainfall characteristics deeply influence the traditional agriculture which is totally depended on rainfall. But one important point to note is that fruit crops can withstand these rainfall variations.

## REFERENCES:

1. Allan R.P. (2011): Climate Change: Human influence on Rainfall. Nature, 470: 344-345.
2. Barkade A.J. and Sule B.M. (2011): Rainfall Variability in Solapur District of Maharashtra: A Geographical Study, Review of Research, Vol.1 Issue-2 page 1-4.
3. Cong R.G. & Brady M (2012): The Interdependence between Rainfall and Temperature:Copula Analysis, The Scientific World Journal, Vol.2012, Article ID405675 page-11 Available http://dx.doi.org/10.1100/2012/405675
4. District Gazetteer of Osmanabad (1972), Gazetteer Department, Government of Maharashtra. Pp-31.
5. Hussain M (2002): Systematc Agricultural Geography, Rawat Publication, Jaipur pp 92.
6. Malhotra S.K. (2012), "Rain Deficit Moisture Stress Management in Horticulture crops". Commissioner of Horticulture & ADG (Hort) pp-17.
7. Singh Jasbir & Dhillon S.S.(1984): Agricultural Geography (3rd Edition), Tata McGraw-Hill Publishing Company, New Delhi. Pp. 60.
8. The Indian Express (May 13, 2016): Osmanabad: Help proposals in 76 farmer suicide cases rejected, by PTI/osmanabad(mah) Available http://indianexpress.com/article/india/india-news-india/osmanabad-help-proposals-in-76-farmer-suicide-cases-rejected-2798315/
9. The Times of India (May 18, 2017): 852 farmer suicides in four months in Maharashtra, Priyanka Kakordkar/ TNN.Available http://timesofindia.com/city/mumbai/852-farmer-suicides-in-four-months-inmah/articleshow/58723266.cms
10.Williamson (1925): "Irrigation in Indo-Gangetic Plain", Geographical Journal Vol. 65 pp-143-153.

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