Rainfall Trend in Drought Prone Region of Ahmednagar District of Maharashtra in India: A Geographical Study

Dr. Ramraje Shivajirav Mane-Deshmukh
Mr. Agastirishi Bharat Toradmal
Department of Geography
Chh. Shivaji College, Satara
Dist- Satara. [MS]
E.mail. agasti0809@gmail.com

Abstract

In this paper the present study reveal the tehsil wise annual rainfall trend in Ahmednagar District of Maharashtra State during 1984 to 2018. The rainfall is one of the significant parameter among the climate for the development of society. They determine the scarcity of particular region. The rate of rainfall is varied in different region. The average annual rainfall in the Ahmednagar district varies from about 625.09 mm to 405.3; some area has been traditionally affected by drought. The large area of the district comes under the agriculture due to large population depend on agricultural for employment. This studies focus on the nine (out of total 14) tahsils in Ahmednagar district which is particularly sensitive to drought Karjat, Jamkhed, Shrirampur, Sangamner, Shrigonda, Newasa, Shevgaon, Parner tahsils. The aim of this research to understand trends of rainfall Ahmednagar district. In a study on tahsil wise trend analysis nine tahsils had decreasing trend in annual rainfall. Among two tahsils showing increasing trend, Akole tahsil shows highest rainfall trend. Remaining three tahsil had the same direction of trend in annual rainfall and seasonal scale.

Keywords: Drought Prone, Annual Rainfall, Rainfall Variability, Trend

Introduction

To meet the various water demands of agriculture, industry, irrigation, hydroelectric power generation, and other human activities in district water budget is important factor. More than 70 per cent of the population in India is engaged in agricultural activities. Indian economy is completely depending on monsoon. The development of crops in any year is closely related to behavior of monsoon. The most of part of India receive 90 to 95 per cent rain from south-west monsoon. Rainfall is huge affecting on agriculture activity of man.

The Ahmednagar district comes under western Maharashtra region which is known as rain shadow zone. The Maharashtra State has Suffering drought frequently because of monsoon behavior. The highest rainfall receives in western part of the Ahmednagar district in Akole tahsil. The rainfall generally decreases toward east and south east part of the Ahmednagar district. The government of Maharashtra and Central government of India declared total nine tahsil of Ahmednagar district are comes under drought prone area. This attempt has been made 1984 to 2018 annual rainfall tabulation and use help of mean, standard deviation and variation of rainfall in Ahmednagar district.

Study Area:

The Ahmednagar district is one of the crucial districts of the Maharashtra state. Ahmednagar is the largest district of Maharashtra state. Near about 17418 Sq. Km area is

covered by Ahmednagar district. The geographical extension of Ahmednagar district is 18° 2' N to19° 9'N latitude and 73° 9' E to 75° 5' E longitude. This district has comprised by fourteen tehsil. According to the 2011 census the population of Ahmednagar is 4,543,159.

Objectives:

The objectives of the present study are:
1. To study the average annual rainfall during the year 1984 to 2018.
2. To find out trends of rainfall and coefficient of variations.

Data Base and Methodology:

The present study is based on the rainfall data which collected from Indian Metrological Department for 35 years. The data has been collected from 1984 to 2018. The trend of rainfall is calculated and represent by mean, Standard Deviation, and Coefficient of Variation in percentage of rainfall in Ahmednagar District. The result of these analysis shows with the help of chart, graph method. For the data analysis following formula has been used.
Where,

Mean = Mean of Rainfall

S.D. = Standard Deviation of Rainfall

C.V. = Coefficient of variability of Rainfall

Annual Rainfall Distribution:

Rainfall is a vital factor, considered by impacts the agricultural economy of the district. It also determines the cropping pattern, performance of various cultural and agricultural practices.

Table 1.1 Average Annual Rainfall in Ahmednagar District 1984 to 2018 (in mm)

Tahsil	Akola	Sangamner	Shrirampur	Kopargaon	Rahuri	Newasa	Rahata
1984	374	204	350	518	427	407	0
1985	184	204	392	300	301	302	0
1986	244	260	335	319	242	375	0
1987	296	306	582	460	533	488	0
1988	734	461	546	575	725	583	0
1989	444	558	585	594	524	593	0
1990	503	445	752	499	788	786	0
1991	544	450	401	296	466	395	0
1992	404.5	342	456	418	407	380	0
1993	636.3	435	566	408	548	447	0
1994	509.8	416.6	463.9	440.2	455	531.3	0
1995	374	290	508	321	642	664	0
1996	620	566	611	537	555	623	0
1997	587	402	312	290	345	312	0
1998	814.5	489	819	582	585	681	0
1999	403	348	315	384	581	461	0
2000	439	528	354	428	587	516	525
2001	473	337	341	360	358	312	413
2002	445	459	391	366	302	305	385

2003	489	380	313	280	299	219	249
2004	1074	570	485	428	509	508	490
2005	1080	518	396	541	465	479	588
2006	1090	576	557	745	777	629	690
2007	913	478	587	583	656	391	523
2008	1006	487	401	503	651	591	385
2009	549	329	333	485	551	456	337
2010	829	572	644	853	866	860	814
2011	500	240	455	636	589	474	395
2012	648	496.2	402	408	513	502.5	548
2013	767	378.3	413.3	504	501.4	489.4	690.4
2014	733	391.7	273	491	321.9	337	327.5
2015	847.6	385.5	383.8	374	381	457	367.8
2016	1030.1	495.5	616.6	480.1	540.5	615.7	494
2017	1265	580.3	793.5	519.8	622.1	786.5	712.9
2018	962.5	302.2	382.7	381.1	239.5	331.5	303.4
Total	21878.	14680.3	15470.8	16307.2	17196.4	15943.9	7701
Mean	625.09	419.43	442.02	465.92	491.32	455.54	405.31
S.D.	278.63	110.28	142.85	127.67	153.51	143.48	282.97
CV in %	44.57	26.29	32.32	27.40	31.24	31.50	69.81

Source- Indian Meteorological Department

Tahsil	Shevgaon	Pathardi	Parner	Shrigonda	Karjat	Jamkhed	Nagar
1984	309	351	575	496	532	727.0	497
1985	247.0	824	714	359	456.0	540	400
1986	422	318	313	460	637	872	498
1987	596	714	472	497	432	996	827
1988	824	807	738	531	689	1040	772
1989	730	701	713	610	864	920	914
1990	697	716	630	614	597	523	1446
1991	391	485	442	438	391	480	950
1992	369	434.5	551	521.6	352	603.2	572
1993	519	720	696	496	651	823	655
1994	584.6	571.6	486.9	359	493	583.3	531.1
1995	363	533	259	460	498	570	372
1996	782	932	656	497	514	922	710
1997	226	448	361	531	328	427	347
1998	780	1095	702	610	920	1070	730
1999	366	360	245	571	405	409	479
2000	531	471	456	392	400	661	580
2001	349	332	384	352	495	333	380
2002	449	502	438	334	436	561	394
2003	320	476	190	87	281	460	199
2004	715	595	695	527	565	570	518
2005	491	464	451	524	606	484	634
2006	798	703	751	843	746	505	906
2007	631	450	488	388	401	675	628
2008	648	473	625	388	763	448	715
2009	563	633	620	464	710	499	615
2010	791	824	932	604	729	710	770
2011	374	741	614	368	413	326	712
2012	224.8	276	250	248.5	245	258	345
2013	563.3	668	622	544	676	777	682
2014	429	379	414	176	343.7	268	464.8
2015	406.8	441.2	434.2	394.3	330.9	437.2	415.5
2016	698.7	686.9	437	523	631.7	844	575.6
2017	640.5	611	589.5	606.2	813.2	869.9	726.7
2018	292.3	288	235.2	203.1	264.9	377.5	261.7
Total	16041	20024.2	18179.8	14716.7	18153.4	20842.1	21222.4
Mean	458.31	572.12	519.42	420.47	518.6	595.48	606.35
S.D.	180.79	194.13	176.96	133.85	180.54	226.93	237.02
CV in %	39.45	33.93	34.07	31.83	34.81	38.11	39.09

The analysis of rainfall for the period 1984 – 2018 reveals that the normal annual rainfall over the district varies from 405.31 to about 625.09 mm. In the northeast, north and south part of the district around Shevgaon, Rahata, Newasa, Rahuri, Kopargaon, Shirampur, Sangamner,

Shrigonda, Karjat they are receive low rainfall and the rate of rainfall is increases towards the west around the area of Akola tehsil. The study also determines that entire eastern, north eastern, south and south eastern parts of the district comprising almost entire Shevgaon, Rahata, Newasa, Rahuri, Kopargaon, Shirampur, Sangamner, Shrigonda, Karjat which experienced droughts for more than 20% of the years can be categorized as "Drought Area". The average rainfall data for the period (1984-2018) are presented in Table-1. The mean annual rainfall for Ahmednagar district is 683.22 mm. The highest rainfall recorded in Akola 625.09 mm, Nagar 606.35 mm, Jamkhed 595.0 mm and Pathardi572.12 mm. Parner, Karjat, Rahuri, Kopargaon, Shevgaon, Newasa have medium rainfall which is 519.42, 518.60, 491.32, 465.92, 458.31, 455.54 respectively and rainfall rapidly decreases towards the Shrirampur 442.02 mm, Shrigonda 420.47, Sangamner 419.43, and Rahata 405.31.

The Coefficient of variation is 69.81 percent Rahata, 44.57 per cent Akole, 39.45 percent Shevgaon tehsil, 39.09 per cent Nagar tahsil and results comes to Parner, Karjat, Rahuri, Kopargaon, Newasa, Sangamner, Shrirampur, Shrigonda, Pathardi and Jamkhed tahsils respectively 34.07, 34.81, 31.24, 27.40, 31.50, 26.29, 32.32, 31.83, 33.93 38.11 per cent.
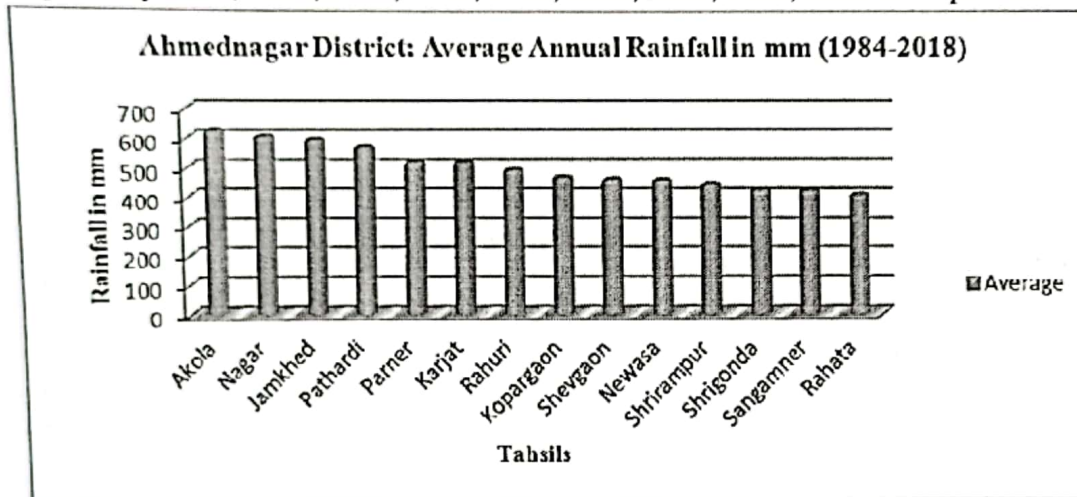

Figure 1: Average Annual Rainfall Distribution in Ahmednagar District (1984-2018)

Table No 1 and Fig. No. 1 shows that the Akole tehsil recorded highest average rainfall during the 35 years. Nagar, Jamkhed, Pathardi, Parner, Karjat, normal rainfall recorded in during the time. Then Kopergaon, Shevgaon, Rahuri recorded medium rainfall. Rahata, Shigonda, Sangamner and Shrirampur tahsils show the less amount of rainfall during the1984 to 2018 years. The results of some tahsils are mainly depending on physiographical condition and local level climatic condition.

Rainfall Trend in Ahmednagar District of the Drought Prone Region:

The data obtained on the average annual rainfall Ahmednagar district for the period in Four decade viz. 1984 to 2018 were analyzed by simple tabular method. The proportion were estimated for each of the below years to know the variation in the rainfall of the Ahmednagar district for period under the study. As the result of the rainfall variability in the Ahmednagar district. During the period 1984-2018, the difference of the actual average rainfall and trend of the rainfall in Ahmednagar district of eastern part of the drought prone region. This means that

the trend is negative. The deficit of the drinking water, reducing level of water, food shortage, shortage of grain for cattle, effects on agriculture, population emigrated searching of water another district.

Conclusion:

The study has presented a detailed analysis of rainfall variability and trend of rainfall in the drought prone area of the Ahmednagar district. By using 35 years recoded of rainfall in fourteen tahsils, the study examined the spatial and temporal variation of rainfall on the Ahmednagar district. The main conclusion of the study is summarized below.

Annual rainfall in the Ahmednagar district varies from about 625.09 mm in Akole to 405.31and 420.47 Rahata, Shrigonda respectively.

Trend analysis of annual average rainfall indicators shows to fluctuations in 35 years. During the period of 1985, 1986, 1997, 1999, 2001, 2003, 2012, 2014, and 2018 shows decreasing trends in drought prone region. In 1989, 1990, 1996, 1998, 2006, 2010,2016, 2017 shows pattern of increasing trends in heavy rainfall in the study region.

References:

1. Pratik S. Matkar, Dr. Abhijeet Zende 2017 Rainfall Trend in Drought Prone Region of Satara District of Maharashtra in India, International Conference on Innovations & Recent Trends in Engineering (ICIRTE)-2017

2. Abhijit M, Zende, R. Nagarajan and K. R. Atal 2012: Rainfall Trend in Semi arid region –Yerala River Basin, Western Maharashtra, India, International Journal of Advancement in Technology, Vol. 3, No. 3, pp:137-145.

3. Buishand, T.A., 1982,Some methods for testing homogeneity of rainfall records M. Wegmuller, J. P. von der Weid, P. Oberson, and N. Gisin, "High resolution fiber distributed measurements with coherent OFDR," in Proc. ECOC'00, 2000, paper 11.3.4, pp.109.

4. Khan, M.A., Gupta, V.P. and Moharana, P.C., 2001, 'Watershed prioritization using remote sensing and geographical information system: a case study from Guhiya, India, Journal of Arid Environments', 49, pp 465475

5. Barakade, A.J. 2014,Rainfall Trend in Drought Prone Region in Eastern Part of Satara District of Maharashtra, India European Academic Research Vol. II, Issue 1/ April 2014

6. https://ahmednagar.nic.in/ahmednagar-sites/

7. https://ahmednagar.nic.in/about-district/rainfall/#

8. https://www.india.gov.in/gsearch?s=maharashtra+rainfall+data&op=Search