

Assessment of Drought Intensity and Variability in Sangli District

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Abstract:

Rainfall plays an important role in arid regions. Geographical crop yield variability depends on the distribution of rainfall. As the rainfall is the key factor in deciding the crop yield, it is of prime importance to study its location specific variability. This study has been carried out for Sangli district to assess meteorological drought. The yearly drought condition was determined using the criteria suggested by IMD (1971) which is based on the percentage deviation of rainfall from its long-term mean. The average annual rainfall Sangli district was 622.52 mm in 28 rainy days. In the last 25 years every single year, one of the tehsils of district has passed through the one of the conditions of the dry spells. Hence, drought management strategies as well as contingent crop planning measures recommended by Agriculture University should be adopted by farmers as well as the different project implementing for sustainable crop production during aberrant weather condition.

Key words: Rainfall, rainy days, drought, scarcity zone.

INTRODUCTION

Drought is a disaster in slow motion covering large areas. It is characterized by deficient supply of moisture due to sub-normal rainfall or irregular distribution of rainfall or higher water need due to high temperatures or combination of all the three factors. Lack of rains over extended period of time affecting various human activities, results in widespread crop failure, un-replenished ground water resources, depletion in lakes / reservoirs, etc. As drought affects many economic and social sectors, quite good number of definitions has been developed by various disciplines. Sangli district is one of the regions who came under the drought conditions. Large area of the district especially northern and western is largely affected by the drought conditions. About seven tehsils of Sangli district are facing severe drought conditions the problem of the drought in averagely every 3 to 4 years. Agricultural sector of the district and industries depended on the agriculture are affected by this phenomenon.

OBJECTIVE

To understand the rainfall variability and study the rainfall intensity of the drought prone region of the Sangli district.

STUDY REGION

Sangli district is district of Maharashtra state located in the western part of Maharashtra. Sangli District lies between the 16° 45' N to 17° 22' N latitudes and 73° 42' E to 75° 40' E longitudes and it cover 8572 sq.km. area. Sangli city is the district headquarters. It is bounded by Satara and Solapur districts to the north, Bijapur District (Karnataka) to the

east, Kolhapur and Belgaum (Karnataka) districts to the south and Ratnagiri District to the west. Sangli district is situated in the river basins of the Warna and Krishna rivers. Other small rivers, such as the Warana and the Panchganga, flow into the River Krishna.

DATA SOURCE AND METHODOLOGY

This research paper is purely based on the secondary data. The rainfall anomalies are collected from the Indian Meteorological Department, Pune. The yearly drought condition was determined using the criteria suggested by IMD (1971). As meteorological drought is defined as the deviation of actual rainfall from long term average (normal) records at given station. It is calculated using the following formula:

$$\text{Rainfall Deviation (\%)} = \frac{\text{Actual Rainfall} / \text{Normal Rainfall}}{\text{Normal Rainfall}} \times 100$$

LIMITATIONS OF THE STUDY

There is no empirical touch to this paper. This study region comprises seven tehsils which are largely affected by the drought prone conditions. So, some time the conclusion and application of this research work is not in favor of some tehsils and this paper is purely based on the secondary data.

DISTRIBUTION OF INTENSITY OF DROUGHT CONDITION

Intensity of drought is an attractive aspect to study the impact of the drought intensity on the levels of agricultural progress on any piece of droughty India. In the district of Sangli in Maharashtra drought is very frequent under the drought phenomena with unstable intensity.

The phenomena of drought as a natural hazard are not new to Indian agriculture, particularly in the areas of less rainfall. Drought is typically defined as “Periods of dryness due to lack of rain”. Although the concept of drought differs from one place to place and time to time depending upon the typical climatic situation, erratic water resources, land use agricultural practices and number of other economic activities of the region. Drought is known as meteorological phenomena. This does not only occur depending on the annual rainfall, but also due to the erratic spatial distribution of rainfall, seasonal concentration, availability of irrigation facilities, topography, socio-economic factors etc. (M.R.Patnaik, & J.K.Routray 1983). An effort is made here to study the distinct drought characteristics of Sangli district in Maharashtra.

Table No. 1.1

Tehsil-wise Rainfall Deviation of Sangli District from 1990 To 2014

Year	Tehsils									
	Walwa	Shirala	Miraj	Atpadi	Tasgaon	Khanapur	K. Mahankal	Jath	Palus	Kadegaon
1990	81.08	61.93	18.29	-22.96	15.69	-15.57	73.87	58.40	0.00	0.00
1991	-20.15	-11.61	-28.99	-43.21	-30.25	-40.49	-19.25	7.76	0.00	0.00
1992	35.962	44.68	3.88	-0.25	27.03	-4.59	34.74	47.51	0.00	0.00
1993	34.41	19.03	-19.38	-41.23	-35.54	6.89	55.45	56.78	0.00	0.00
1994	-14.41	6.13	13.64	-8.15	23.25	-4.59	28.04	-8.81	0.00	0.00
1995	-8.99	14.68	61.33	-6.42	52.74	-19.34	47.20	20.28	0.00	0.00
1996	-29.61	-30	-0.18	-35.80	-13.61	-41.97	-13.40	17.84	0.00	0.00
1997	-15.5	15.65	41.44	31.60	43.29	29.34	1.56	-0.70	0.00	0.00
1998	-44.49	-25.48	3.68	13.33	10.21	-28.36	10.12	14.48	0.00	0.00
1999	-12.4	-12.42	10.13	-28.64	20.60	4.10	4.67	-3.36	2.94	0.00
2000	-3.25	-13.45	29.35	-13.52	39.82	43.33	19.83	-10.37	-34.03	0.00
2001	-2.84	-35.71	-28.54	-40.00	-37.64	-10.72	-15.16	-20.99	-71.01	0.00
2002	-48.37	-69.12	-47.17	-63.94	-42.23	-60.83	-57.41	-33.65	-67.02	0.00
2003	14.22	-2.73	37.85	-8.45	23.85	-10.50	7.28	3.88	-34.03	43.85
2004	51.62	14.50	54.25	-56.90	14.00	-20.13	149.91	99.62	-5.88	103.58
2005	35.36	30.25	52.23	-37.18	34.79	17.72	64.19	55.76	-16.81	109.17
2006	26.62	36.76	41.50	62.54	23.41	11.82	37.68	26.94	-26.26	64.21
2007	-31.17	-24.34	21.71	-25.76	-27.24	-15.95	18.10	-2.87	-59.32	38.34
2008	-23.49	-13.79	11.14	-16.39	13.92	-26.51	20.78	-11.62	-44.76	39.65
2009	-23.49	-13.79	11.14	-16.39	13.92	-26.51	20.78	-11.62	-44.76	39.83
2010	-17.01	-49.10	-37.42	-28.58	-6.14	-26.60	-10.27	12.93	-56.14	-1.24
2011	-6.03	-44.93	-27.45	-56.51	-49.67	-43.24	-35.82	-28.92	-62.50	-7.41
2012	-8.9	-25.64	3.94	-24.25	-26.37	-24.98	-37.41	9.55	-42.42	5.66
2013	1.07	-91.95	-23.60	-26.43	-6.66	-1.95	-20.58	18.30	-17.46	-88.19
2014	-40.41	-52.36	-28.31	-36.86	-46.41	-45.13	-60.16	-38.99	-45.75	-26.91

Source: Calculated by Researcher.

AREAS WITH SEVERE RISK OF DROUGHT CONDITIONS

The pattern of incidence of severe droughts during a period of 25 years in the tehsils of the Sangli district shows very exciting features. First one is that not a single severe drought occurred in Shirala and Miraj tehsils, for the whole period of 25 years, i.e. from 1991 to 2015. And except above two tehsils all tehsils of the Sangli district experienced the severe drought situations in different magnitude in the same year i.e. in 2003, except Jathtehsil because it faces severe drought in the year of 2004.

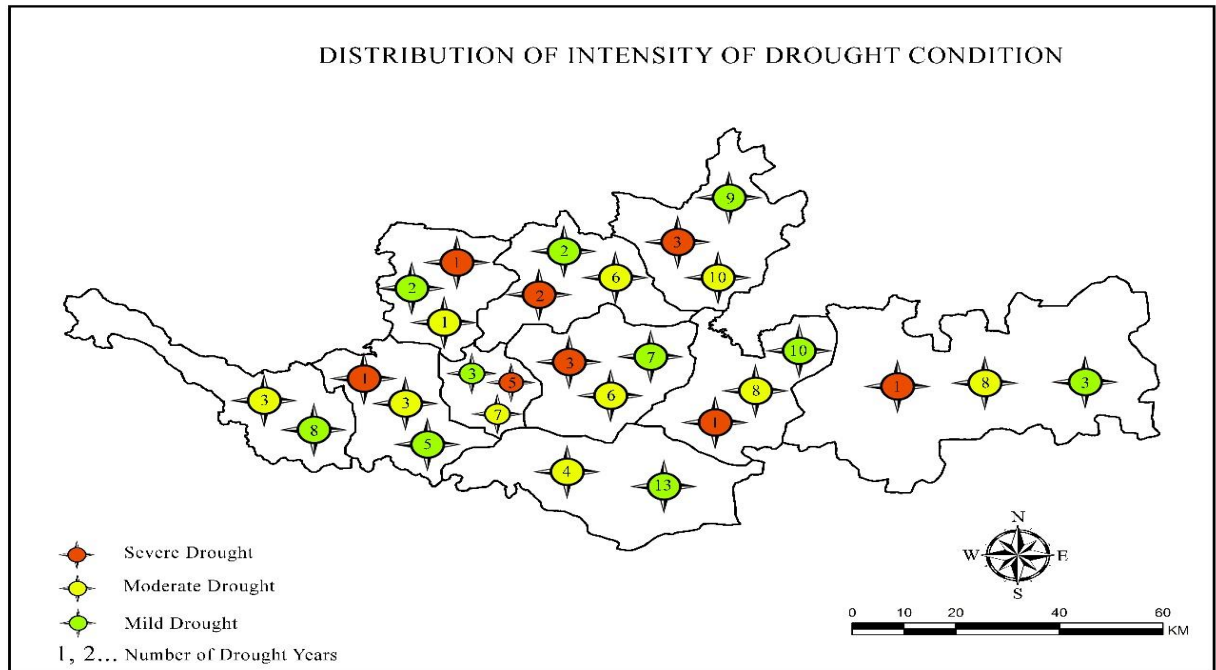
The interesting feature of Atpadi, and Tasgaon tehsils is these tehsils experienced the severe droughts condition for three times in the whole period of 25 years. But the time when the droughts occurred in each tehsil coincide each other for one year i.e. 2003. The three severe drought years of Atpadi tehsils is are 2003, 2005 and 2012 and 2003, 2014 and 2015 years are Tasgaon tehsils in the whole period of 25 years (Table no.4.1). Palus tehsil faced the highest number of severe droughts for five years is are in 2002, 2003, 2007, 2011 and 2012, while Walwa and KavatheMahankal tehsils experienced it for only once in the year 2003, Jath and Kadegaon tehsils for 2004 and 2014 year only in these 25 years respectively. The Khanapur tehsil faced severe drought situation for two years in these 25 investigated years, those are 2003 and 2014. After overall observation of table, no 1.1 it indicates that the most of tehsils namely Walwa, Atpadi, Tasgaon, Khanapur, KavatheMahankal and Palus tehsils experience the drought in the same year i.e. 2002-03.

AREAS WITH MODERATE RISK OF DROUGHT CONDITION

Table No. 1.1 presents the occurrence of Moderate droughts in all tehsils of the Sangli district during the period from 1991 to 2015. In whole 25 years of rainfall of the district, the extremely suffered tehsil is Atpadi. It was under Moderate drought situation for ten times during the period of 25 years. They were in 1992, 1994, 1997, 2000, 2002, 2006, 2008, 2001, 2014 and 2015. Thus, there remains a gap of about 2-year between two successive droughts, except for three continuous years in 2003 to 2006.

Compared to other tehsils Atpaditehsil suffered maximum number of moderate droughts. The KavatheMahankal and Jathtehsils ranks next to the Atpadi, suffering 8-time moderate drought situation in these investigated years from 1991 to 2015. The KavatheMahankal tehsil suffering moderate drought in the years of 1991, 1997, 1999 and from 2009 to 2015 continuously except two years, those are 2013 and 2014.

While Jath tehsil face the moderate drought conditions in the years of 1992, 1994, 2002, 2003, 2009, 2012, 2013 and 2015. The Palustehsil experienced the drought for seven times. These years are 2001, 2004, 2006, 2009, 2010, 2013 and 2015. In other tehsils starting from Tasgaon and Khanapur to Kadegaontehsil, the number of droughts gradually decreases from six times to one. Tasgaon and Khanapur tehsils experienced the droughts for 6 years, Miraj tehsil for 4 years, Walwa and Shirala for 3 years and 1-year moderate drought condition experienced by Kadegaon tehsil in 2015.



AREAS WITH MILD RISK OF DROUGHT CONDITION

A drought condition is measured as mild or slight condition when the rainfall is between the range of 300 mm and 600 mm. So, the area where the rainfall lies is just above or below 500 mm can be measured as an area of slight risk or mild risk of drought situation. The Miraj tehsil was in such a situation for thirteen times in the whole period of 25 years from 1992 to 2015 except 1993, 1994, 1999, 2003 to 2008, 2014 and 2015, followed by KavatheMahankal tehsils faced the mild drought condition ten times in the year 1991, 1993, 1995, 1996, 2002, 2004, 2005, 2008, 2013 and 2014. Here the rainfall lies between 315 mm and 587 mm respectively. Atpadi, Shirala, and Tasgaon tehsils experienced this condition of slight risk of drought 9, 8 and 7 times respectively in the whole period of 25 years. Remaining all tehsils from Walwa to Khanapur experienced 5 to 2 times mild drought situation in these 25 investigated years.

CONCLUSION

This study indicates the drought experienced years. In these 25 years Atpaditehsil from 1991 to 2003 faces moderate and nearer to severe drought conditions and after that the palustehsil faces moderate to severe drought conditions. Nearly all tehsils experienced drought situations from 2002 to 2005 and 2012 to 2015 years. In these years worst drought situation experienced by Sangli district with water scarcity and received less rain than normal rainfall.

Tehsil wise different drought conditions observed in Sangli district. Not a single severe drought occurred in Shirala and Miraj tehsils for the whole period of 25 years. Except these two tehsils all tehsils of the Sangli district experienced the severe drought situations in different magnitude in the same year i.e. in 2003, except Jathtehsil because it faces severe drought in the year of 2004. Atpadi, KavatheMahankal, Jath, Palus, Tasgaon, Khanapur, Kadegaon, Walwa and Shiralatehsil experienced moderate drought situation in different year with different magnitude. The largest mild drought situation experienced by Miraj tehsil,

followed by KavatheMahankal,Atpadi, Shirala, Tasgaon, Walwa and Khanapurtehsils. Overall, all tehsils of the Sangli district experienced different types of drought with different magnitude in different year in these 25 investigated years.

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