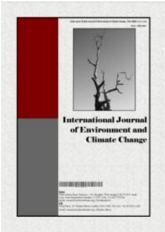

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Estimation of Meteorological Drought in Bhavanisagar Block using Weather Cock Software as a Tool

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Short Research Article

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ABSTRACT

Drought happen aimlessly and there is no periodicity in its event and can't be anticipated ahead of time. In semiarid stations, the event of precipitation is occasional and is known something else for its changeability regarding reality. Meteorological drought is characterized as the time of drawn-out dry weather pattern because of underneath ordinary precipitation. Drought is an extensive stretch of incredibly low precipitation that essentially affects crop result and individuals' prosperity. Recent study has made substantial progress in understanding drought in Tamil Nadu, as well as the implications of climate change, but more research is needed because regional climatic responses remain unknown. The Meteorological Drought Indicator was also a useful and appropriate index for drought monitoring in the research area since it provided drought analysis on a variety of timeframes. This study might help us better understand the features of drought.

Keywords: Weather cock; meteorological drought; mild drought; moderate drought; severe drought.

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1. INTRODUCTION

Drought is a normal, recurrent climatic feature that occurs in virtually around the world causing huge loss for the farming community [1]. Drought is universally acknowledged as a phenomenon associated with deficiency of rainfall [2]. There is no single definition, which is acceptable universally. Droughts occur at random and there is no periodicity in its occurrence and cannot be predicted in advance [3]. In semiarid stations, the occurrence of rainfall is seasonal and is known more for its variability with respect to space and time [4]. Meteorological drought is defined as the period of prolonged dry weather condition due to below normal rainfall [5]. Drought is a long period of exceptionally low rainfall that has a significant impact on crop output and people's well-being [6]. Drought affects must be understood in order to prepare, mitigate, and respond. The scientific underpinning for decision makers to lessen societal susceptibility to drought is the quantification of drought episodes.

2. METHODOLOGY

2.1 Study Area

Bhavanisagar is a revenue block in the Erode district of Tamil Nadu, India. Bhavani River, a major tributary of the Kaveri River originates from Nilgiri hills of the Western Ghats flows through this block and forms the major source of irrigation in this area. Bhavanisagar dam is located on the river Bhavani and the dam is used to divert water to the lower Bhavani Project for irrigating dry parts of the district (Fig 1).

2.2 Weather Data

Indian Meteorological Department (IMD) data from 1980 to 2020 was used in this study [7].

2.3 Weather Cock Software

Weather Cock software version 1.0 is used to the estimate the meteorological drought in this study [8].

2.4 Meteorological Drought

According to India Meteorological Department 3 types: based on rainfall deficit from normal they are Mild drought (0- 25%), Moderate drought (26-50%) and Severe drought (> 50%) [9].

3. RESULTS AND DISCUSSION

Variations and trend in the yearly rainfall for the span of 41 years from 1980 to 2020 in Bhavanisagar are represented in Fig 2. respectively.

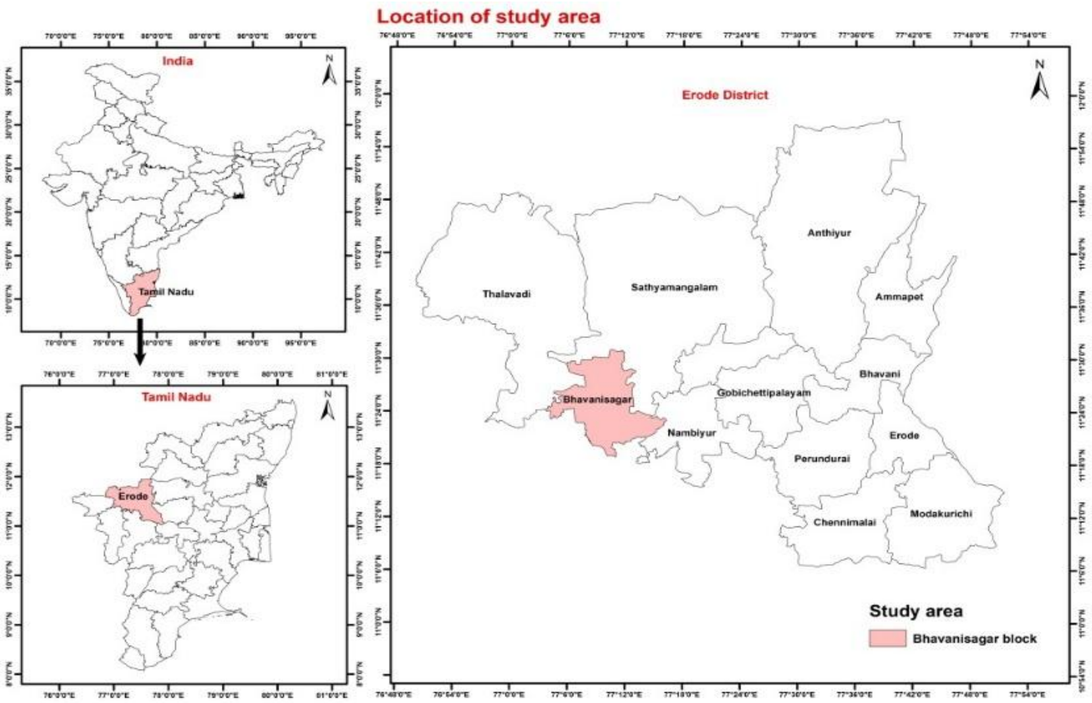

Fig 1. Study area of Bhavanisagar block

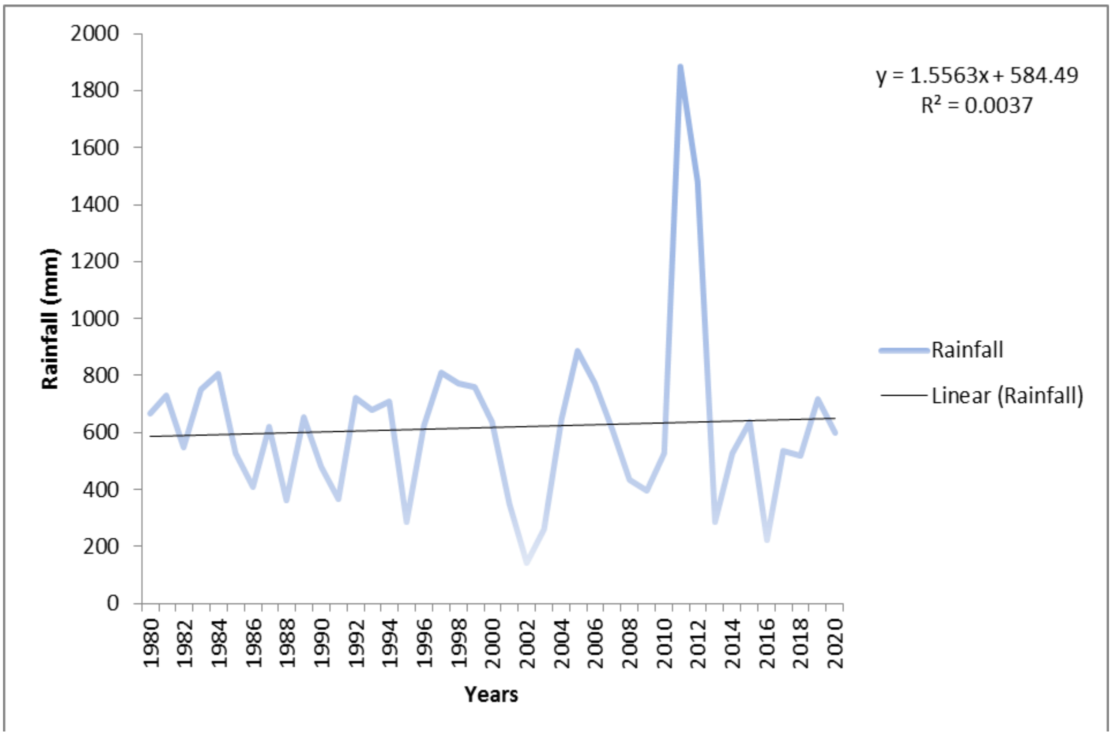

Fig 2. Variations and trend over Bhavanisagar block

The average annual rainfall of Bhavanisagar block is 617.2 mm. The variation if rainfall ranged from 145.8 mm to 1884.9 mm respectively. The deviation of the rainfall in percentage showed the variation ranging from -76.4 to 205.4. The Meteorological drought analysis derived from the weather Cock software revealed that among the 41 years (Table 1), 30 years were No drought years, six years were Moderate drought years (1986, 1988, 1991, 2001, 2008, 2009), five years were severe drought years (1995, 2002, 2003, 2013, 2016). The frequency of occurrence of drought in Bhavanisagar block is varied between four to five respectively.

For the IPCC [10], it is likely that the frequency and intensity of droughts have increased in the Mediterranean and West Africa. Projected future changes for Representative Concentration Pathways (RCPs) indicate that changes in soil moisture could occur early in the 21st century, by the end of the century, under the RCP 8.5 scenario, these changes will intensify agricultural drought in currently dry regions, on a regional scale [10].The projections published by the IPCC are limited by the use of a scale that is too coarse, which makes it difficult to apply them in regional and local studies. On the other hand, they do not report information on drought in Latin America, for the projections of climate change scenarios, even though the impact of drought in this region is increasingly important [11,12]. According to the FAO [13], for the period between 2005 and 2015, droughts caused agricultural losses equivalent to 13,000 million dollars in this region, who's most devastating years were between 2012 and 2014. In tropical countries, the evaluation of meteorological drought has been widely addressed [14, 15, 16, 11, 17], and characterized in the Semiarid Region of Venezuela [18], in the Cordillera Central [19]; in the Llanos [20, 12], and in the Andes [21, 22], however, not enough studies have been carried out where this phenomenon is evaluated under scenarios climate change futures and even less in one of the main agricultural areas. Therefore, there is a need to know the characteristics of drought management in each context and to develop specific methodologies for its evaluation [23,24]. This would help to better understand how we are addressing the problem of drought [25, 26]. Determining the degree of adoption of the risk approach and the factors that facilitate or hinder its implementation would be very useful to improve drought management [27,28,29] and make concrete recommendations on the design of related public policies [31,32].

Table 1. Meteorological drought analysis derived from the weather cock software (1980 – 2020)

Year	Annual Condition	Deviation	Meteorological Drought Classification
1980	666.08	7.9242	No Drought
1981	727.52	17.8794	No Drought
1982	544.62	-11.7564	No Drought
1983	748.52	21.2826	No Drought
1984	804.64	30.375	No Drought
1985	524.24	-15.0573	No Drought
1986	407.63	-33.9515	Moderate Drought
1987	620.26	0.4997	No Drought
1988	361.33	-41.4538	Moderate Drought
1989	653.76	5.9275	No Drought
1990	478.06	-22.5407	No Drought
1991	367.01	-40.5336	Moderate Drought
1992	720.53	16.7468	No Drought
1993	677.85	9.8316	No Drought
1994	705.65	14.3355	No Drought
1995	284.74	-53.863	Severe Drought
1996	621.17	0.6478	No Drought
1997	809.71	31.1968	No Drought
1998	771.42	24.9926	No Drought
1999	760.04	23.1479	No Drought
2000	636.31	3.1014	No Drought
2001	349.3	-43.4024	Moderate Drought
2002	145.71	-76.3901	Severe Drought
2003	260.41	-57.8054	Severe Drought
2004	644.51	4.4293	No Drought
2005	885.85	43.5329	No Drought
2006	770.29	24.809	No Drought
2007	612.03	-0.8333	No Drought
2008	433.16	-29.8158	Moderate Drought
2009	393.71	-36.2079	Moderate Drought
2010	527.29	-14.5641	No Drought
2011	1884.82	205.3961	No Drought
2012	1476.13	139.1762	No Drought
2013	282.56	-54.2171	Severe Drought
2014	524.78	-14.9709	No Drought
2015	636.25	3.0914	No Drought
2016	222.3	-63.9817	Severe Drought
2017	535.61	-13.2163	No Drought
2018	515.69	-16.4432	No Drought
2019	715.87	15.9921	No Drought
2020	596.74	-3.3112	No Drought

4. CONCLUSION

The Meteorological drought analysis derived from the weather Cock software revealed that among the 41 years , 30 years were No drought years, six years were Moderate drought years (1986, 1988, 1991, 2001, 2008, 2009), five years were severe drought years (1995, 2002, 2003, 2013, 2016). The frequency of occurrence of drought in Bhavanisagar block is varied between four to five respectively. The Meteorological Drought Indicator was also a useful and appropriate index for drought monitoring in the research area since it provided drought analysis on a variety of timeframes. This study might help us better understand the features of drought.

Drought evaluation must incorporate an accurate picture of the water available in soils, drought propagation, feedback from plant cover, and human involvement during these episodes.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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