RESEARCH ARTICLE OPEN ACCESS

Rainfall data analysis in Yerraguntla Mandal, Y.S.R District, A.P

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ABSTRACT
The precipitation is the most important factor in both the climate and the hydrological cycles. The amount of rainfall in a region affects the availability of a region's water resources. The daily rainfall data for twenty eight years is used to understand normal precipitation, deficit precipitation. Rainfall records of the Yerraguntla mandal were collected for a period of 28 years (1990 to 2018). The minimum annual rainfall (422 mm) has been recorded during 2002-2003, whereas the maximum rainfall (1155mm), has been noted during 1996-97. Analysis of rainfall data helps in exploring problems related to rainfall that may be high intensity, low intensity, erratic or no rainfall. At the same time analysis of historical rainfall data in semi arid region helps in understanding issues related to drought. These estimates may act as possible pathways to and helps policymakers in understanding erratic rainfall distribution across semi arid region which is important for future planning and management strategies.

Key words: Statistical parameters, Rainfall data analysis, Yerraguntla, Y.S.R District, A.P

Date Of Submission: 16-01-2019 Date Of Acceptance:28-01-2019

I. INTRODUCTION:

Rainfall is one of the most important meteorological parameters in the recovery of groundwater systems [1]. Rainfall is the liquid form of' precipitation,' which acts as a primary important source for recharging the groundwater system in a certain area. The records of rainfall show a wide range of variations in quantity and frequency from place to place. The duration and frequency of rainfall helps to know the extent of surface runoff for recharging groundwater. In India, precipitation occurs mostly during the monsoon period. The amount of rainfall is not equal either in space or in time. It varies from heavy rain to scanty in various parts Analysis of rainfall data is important to understand the micro-level variability of the rainfall that is useful in the planning of agriculture, land and water development. Rainfall is therefore one of the climate variables that affect both spatial and temporal patterns in the availability of water [2].

In India, monthly, seasonal and annual temporal variation is observed [3-6]. All the above studies show an analysis of rainfall in various parts of India. However, there is limited information about the rainfall trends and their variability over the southwestern part of the Godavari River. Understanding rainfall fluctuations in this region is very important for studying the change in hydrology and water resources management [7].Therefore, this paper attempts to determine the long-term variability of both temporal and spatial rainfall over yerraguntla mandal of Y.S.R District, A.P., to determine the rainfall distribution pattern representing the spatial distribution of monthly and annual rainfall.

II. STUDY AREA

The town of Yerraguntla in the YSR district of Kadapa is situated in Andhra Pradesh (Fig: 1). The area is at 14.6333N and 78.5333E at a height of 152 metres. This is predominantly an area consisting of quartzite conglomerate, quartzite with dolomitic limestone shale formation [8]. This is mainly an arena consisting of quartzite conglomerate, quartzite with shale formation of lime stones. The main factors that control water quality are linked to soil and lithology. The quality of the water may vary depending on changes in geological formations. Yerraguntla is a taluk and mandal census in Andhra Pradesh, Kadapa District, India. Yerraguntla is also famous for its stones, which are used for flooring houses and building houses. Kadapa slabs occur in the Nidujivi, Koduru, Valasapalli and Jammalamadugu Mandal areas of Yerraguntla Mandal and Sugumanchupalli [9].The Middle-Upper Proterozoic Cuddapah Basin is well known for a variety of mineral resources, including barytes, asbestos, uranium, diamonds, gold, silver, copper and lead, as well as calcareous, steatite-talc, quartz and Cuddapah slabs[10]. Geologically speaking, mineral resources in the YSR district are widely distributed over time and associated with rocks from the Archaean to the

Kurnool rock group. Barytes, chrysotile asbestos, clays, cement grade calcareous black granites and Kadapa slabs / napa slabs are some of the well-known mineral deposits associated with Cuddapah Super group and Proterozoic sedimentary rocks. The main rivers that flow through the district are Pennar, which is permanent and flows in the direction of NW-SE. Its tributaries are in the nature of Chitravathi, Cheyyair, Papagni, Kundair and Sagileru. In general, the drainage pattern is subdendritic to parallel. The drainage is often parallel to subparallel denoting structural control. The study area was classified geomorphologically into three units on the basis of relief, slope factor and soil, structural land forms, denudational and fluvial forms.

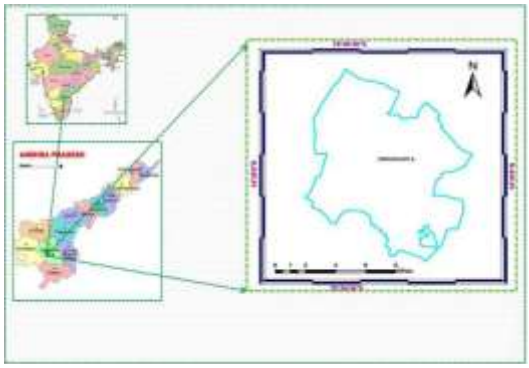

Fig: 1 Location map of the study area

III. METHODOLOGY

Several parameters for statistics (i.e. For annual rainfall analysis, monthly rainfall analysis and seasonal rainfall analysis, the mean, median, standard deviation, coefficient of skewing and coefficient of variation was adopted. The rainfall data for the period 1990 to 2018 for the yerraguntla region studied with the statistical parameters were used for 28 years.

IV. RESULTS AND DISCUSSION:

Analysis of rainfall year wise (Table-1), spatial variations in rainfall shows that the study area shows annual and seasonal fluctuations (month wise) in rainfall from 1990 to 2018 in Figure.3, which varies from mild to extreme. The year wise rainfall distribution classification shows that during the years 1996-97(1155 mm), 2015-2016(1029 mm), 1998-1999(890 mm), 2007-2008(887.5 mm) and 2010-11(880.4 mm) high rainfall was observed in the study area.The study area received very low rainfall in the years 1994-95(401 mm), 2002-2003(422 mm), 2004-2005(456 mm), 1999-2000(457 mm) and 2016-17(458 mm). Distribution of rainfall in fig's over twenty-eight years. It clearly shows that the study area plays a prominent role in high, moderate and low rainfalls.

Table 1: Year wise Rainfall during 1990-2018

S. No	Year	Annual Rainfall (mm)	S. No	Year	Annual Rainfall (Mm)
1	1990-1991	745.1	15	2004-2005	456.2
2	1991-1992	678.8	16	2005-2006	750.6
3	1992-1993	503.2	17	2006-2007	472.8
4	1993-1994	642.2	18	2007-2008	887.5
5	1994-1995	401.9	19	2008-2009	540.6
6	1995-1996	462.9	20	2009-2010	487.7
7	1996-1997	1155.1	21	2010-2011	880.4
8	1997-1998	851.3	22	2011-2012	487.4
9	1998-1999	890.17	23	2012-2013	631.6
10	1999-2000	457	24	2013-2014	627
11	2000-2001	798.4	25	2014-2015	466
12	2001-2002	870.2	26	2015-2016	1029.8
13	2002-2003	422.6	27	2016-2017	458.1
14	2003-2004	759	28	2017-2018	730.7

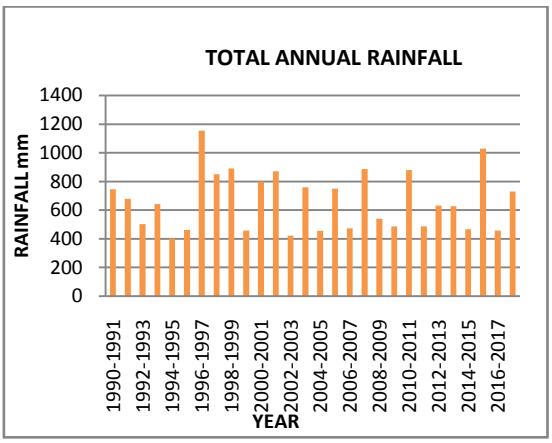

Fig 2: Rain fall distribution of year wise from 1990-2018

The bar in each station is proportional to the total annual at each station for each year (Figure 2). The various sectors marked by different months correspond to the monthly rainfall. Monitoring rainfall data from the groundwater studies is an important aspect. Since infiltration is the main source of recharge for the aquifer system in the area, it is essential to record the inflow factor

precisely. For this purpose, rainfall data were collected between 1990 and 2018 at monthly intervals (Table 2).

Table 2: Total rainfall data month wise from 1990-2018 at Yerraguntla

Seasons	Months	Total Rainfall mm
Winter Season	January	42
	Feb	56
Summer Season	March	42
	April	56
	May	1278.7
SouthWest Monsoon	Jun	2024
	July	2131.9
	Aug	3186.5
	Sep	4018.1
NorthEast Monsoon	Oct	3580.57
	Nov	1672.3
	Dec	456.2

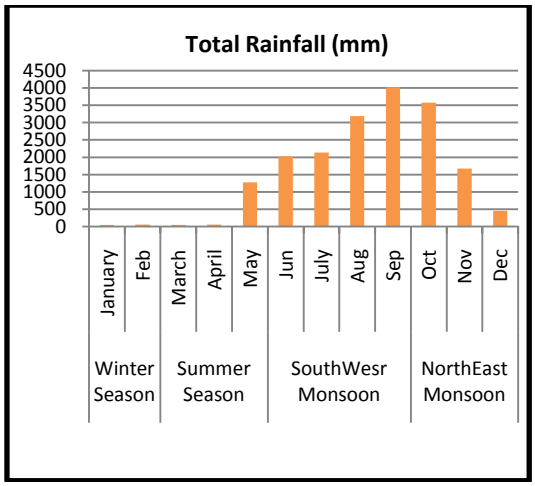

Fig 3: Total Rainfall Season and month wise

The mean monthly rainfall analysis of Yerraguntla shows that the highest rainfall during September (143.5 mm) followed by October (127.9 mm) and August (113.8 mm). The lowest rainfall in January and March (1.5 mm) is observed. The standard deviation values are lower than their corresponding mean values in the months of May, June, July, August, Sep and Oct (Table 3). For the remaining months, however, the standard deviation values are higher than their corresponding mean values, showing greater variation in the distribution of rainfall over the months. From the above table it is clear that normal series data is positive, except that it is negative in the month of July. The rainfall coefficient of variation (Vijay Kumar et al.2010) was calculated using selected 28-year data to measure the spatial variations of the rainfall in the study area. The coefficient of variation (CV) is defined as the ratio of the standard deviation to the average, so that the results of the standard deviation and the mean values are used for each month. The results of the CV were traced to prepare the spatial variation of the rainfall (Figure 4).

Table 3: Statistical Parameters for Monthly Rainfall Analysis

Month	Mean	St.dev	Co-efficient of variation	Co-efficient of Skewness
Jan	1.5	6.45	430.33	0.69
Feb	2	6.68	334.44	0.89
Mar	1.5	6.45	430.33	0.69
Apr	2	6.68	334.44	0.89
May	45.7	40.15	87.92	0.86
Jun	72.3	59.12	81.79	0.62
July	76.1	53.51	70.28	-0.03
Aug	113.8	83.04	72.96	0.80
Sep	143.5	95.18	66.32	0.04
Oct	127.9	77.63	60.70	0.30
Nov	59.7	66.38	111.15	1.26
Dec	16.3	29.47	180.90	1.41

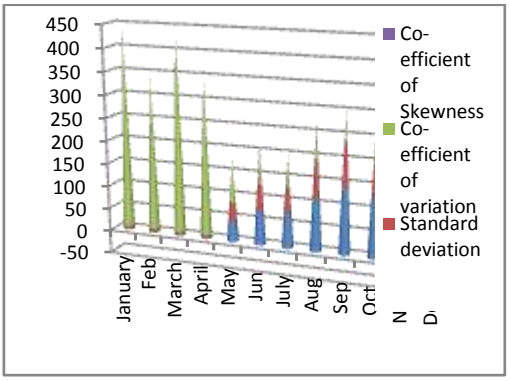

Fig 4: Statistical Parameters for Monthly Rainfall Analysis

4.2 Seasonal Rainfall Analysis

From Table 4 above, it is shown that yerraguntla receives the rainfall seasonally on average of 66,775 mm during the South-West (SW) and 108,7 mm North-East (NE) monsoons respectively and that the extent to which the rainfall distribution varies over the study area during the respective monsoons is shown. The monthly rainfall data of the two monsoons are skewed.

Table 4: Statistical Parameters for Seasonal Rainfall analysis

Statistical Parameters	SW Monsoon	NE Monsoon
Mean Rainfall(mm)	66.77	108.7
Median	92.58	51.4
Standard deviation	72.716	57.8
Co-efficient of Skewness	2.92	7.4
Co-efficient of variation	111.51	63.7

V. CONCLUSION:

Twenty-eight years of rainfall data were analyzed from Yerraguntla Town, Y.S.R district of Andhra Pradesh State, India using statistical parameters such as Mean, Median, Standard Deviation, Skew Coefficient and Variation Coefficient. The spatial and temporal variability of the precipitation was investigated. The results showed that the rainfall in all stations varied significantly. The total annual average rainfall was 662,2954 mm for the entire station. The average annual maximum and minimum rainfall varied between 96,3 mm (1996-97) and 33,5 mm (1994-95). The highest and lowest average rainfall ranged from 66,775 mm to 108.7 mm. Rainfall throughout the study area is not distributed uniformly throughout the season. It varies from place to location. The data collected were used to analyze annual spatial variations of the average rainfall, standard deviation and coefficient of variation to evaluate the area with a mean rainfall of about 178 mm, the highest rainfall recorded in 2010-11, where the lowest rainfall was 42,86 mm in 2015-16. The variation coefficient varies from low to high moonsoon, with a high standard deviation.

REFERENCES:

[1]. Anil Katara and Pramendra Dev 2016. Rainfall Data Analysis and its Environmental Impact on Ground Water Recharge of Thandla, District Jhabua, Madhya Pradesh. Asian Journal of Multidisciplinary Studies 4(2).

[2]. UmamaheswaraRao,B and Sankara,Pitchaiah,P.2015. Spatial and Temporal analysis of Rainfall Variation in Vadalavagu Hydrological Unit GIS, Prkasam district, A n d h r a Pradesh, India, International Research of Environment Sceinces,4(4) ,pp 30-35.

[3]. Sawant Sushant, K. Balasubramani and K. Kumaraswamy, 2015.Spatio-temporal Analysis of Rainfall Distribution and Variability in the Twentieth Century, Over the Cauvery Basin, South India.Springer International Publishing Switzerland, pp.21-41.

[4]. Joy Rajbanshi, 2015. Rainfall distribution and its spatial and temporal variability over Damodar Basin under climate change scenario (1901-2002).IOSR Journal of Environmental Sciences.Vol.9.II pp 95-104.

[5]. Rathdo and Aruchamy, 2010. Spatial Analysis of rainfall variation in Coimbatore district ,Tamilnadu using GIS International Journal of Geomatics and GeosciencesVol.1,No.2.pp 106-118

[6]. Khan Asim, 2000. A Spatio-Temporal analysis of rainfall in the canal command areas of the Indus plains, International water management Institute,Report.No.R-104,pp 1-35

[7]. Mallika Roy 2013. Time series, factors and impacts analysis of rainfall in North Eastern Part in Bangladesh. Int. Jou. Of Scientific and Research Publication, Vol.3( ), pp.1- 7.

[8]. B.Suvarna, Y.Sudharshan Reddy, Y.G.Saisudha, M.Prasad, V.Sunitha, M.Ramakrishna Reddy. 2018. Preliminary Groundwater Quality assessment in and around Limestone quarries, Yerraguntla, Y.S.R District, Kadapa, A.P Presented at Fourth A.P Science Congress at Yogi Vemana University, Kadapa, A.P during 9-11 November.

[9]. V. Sunitha,B. Muralidhara Reddy and M. Ramakrishna Reddy.2014.Mineral Resources of Cuddapah Basin. Journal of Biological and Chemical Research, 31(1): 226-235.

[10]. V.Sunitha,D.Venkatreddy and P.R.Reddy.2015.Mineral wealth of Cuddapah basin and its use for sustainable development-an overview International Journal of Earth Sciences and Engineering.Editorial Note.

B.Suvarna" Rainfall data analysis in Yerraguntla Mandal, Y.S.R District, A.P" International Journal of Engineering Research and Applications (IJERA), vol. 9, no.1, 2019, pp 39-42