

Rainfall Variation and Frequency Analysis Study in Attur Taluk, India

Dr.V.Rajendran¹, S.Vijitha², H. Pushpalatha³, T.Thangabalu⁴, M.Mohan⁵

Professor & Head, Department of Civil Engineering, Muthayammal Engineering College, Namakkal, Tamilnadu, India¹

UG students, Department of Civil Engineering, Muthayammal Engineering College, Namakkal, Tamilnadu, India^{2,3,4,5}

ABSTRACT: Last ten years (2009-2019) of daily rainfall data is collected from the attur taluk in salem district. These samples are collected from (TWAD) Tamilnadu water supply and drainage board to analyse the nature of distribution and frequency of rain fall. Average annual rain fall for 10 years data was calculated as 914.80 mm and average annual rainy days were 48. Maximum monthly rainfall (160.52 mm) was received during the month of October which was mostly by southwest monsoon. Maximum rainy days were in October (8.73 days). The rainfall received during the southwest, northeast, winter and summer seasons were 374.56, 382.46, 11.2 and 914.80 mm respectively. Rainfall frequency analysis done by weibull's method revealed that the annual rainfall of 914.80 mm respectively.

I.INTRODUCTION

The water is indispensable to human life, and is also a vital necessity to plants and animals. A person requires three litres of potable water per day to maintain the essential fluids of the body. The total world population is growing at an alarming rate, but the rainfall on land is more or less constant. The Attur taluk receives the rain under the influence of both southwest and northeast monsoons. The northeast monsoon chiefly contributes to the rainfall in the area. The Area on the whole enjoys a dry climate. Weather is pleasant during the period from November to January. The driest months are from January to April, the average relative humidity in afternoons being about 40%. considering the importance and issues of rainfed farming, a study on distribution and frequency of rainfall in the attur taluk of salem district was undertaken which will be usefull for proper crop planning.

II.MATERIALS AND METHODS

Attur taluk is one of taluk or administrative division of Salem District in the state of Tamil Nadu, India. The division's headquarters is Attur town. The total area of Attur taluk is 132.32 sq.km and the Attur taluk lies between North latitudes 11°27'33" to 11°39'44" and east longitudes 78°31'57" to 78°39'31". The Attur lies on 225m above sea level. The climate here is tropical. The summers are much rainier than the winters in Attur.

The rainfall of this taluk depends it's climatic conditions also. Even during the rainy months the average humidity is appreciably below the saturation level. Winds are generally light. From November to April winds blow mainly from north-easterly direction, from May to September south-westerly predominates. The hot weather begins early in March, the highest temperature being reached in April and May. Weather cools down progressively from about the middle of June and by December the mean daily maximum temperature drops to 30.2°C, while the mean daily minimum drops to 19.2°C in January.

Here last ten years (2009-2019) of rainfall data was collected from (TWAD) Tamilnadu water supply and drainage board and the frequency of the rainfall calculated weekly, monthly and yearly. The rainfall and rainy days are calculated for previous ten years.

The probability of each event is calculated by Weibull's method (chow, 1964)

$$P = M / (N+1) * 100 \text{----- (1)}$$

Where,

P is the probability of each event in present

M is order number of each event when the data are arranged in decreasing order

N is the total number of events in the data series the return periods (recurrence interval) were calculated by using the formula

$$\text{Return period, } T = 1/P = N+1/M \text{----- (2)}$$



III.RESULTS AND DISCUSSION

Annual rainfall and rainy days

The rainfall frequency calculated for weekly monthly and yearly. The one day maximum rainfall and rainy days and total rainfall were calculated for ten years separately. Annual rainfall data and rainy days for 10 years from 2009 to 2019 are given in table 1. Maximum and minimum rainfall occurred in 2010 (1566.7 mm) and 2012 (519.5 mm) with 70 and 34 rainy days, respectively. Average for this 10 years rainfall was 914.80 mm. average annual rainy days were 48. The rainfall and rainy days are calculated based on season wise and the graph is plotted between the season wise rainfall and rainy days in fig 1.

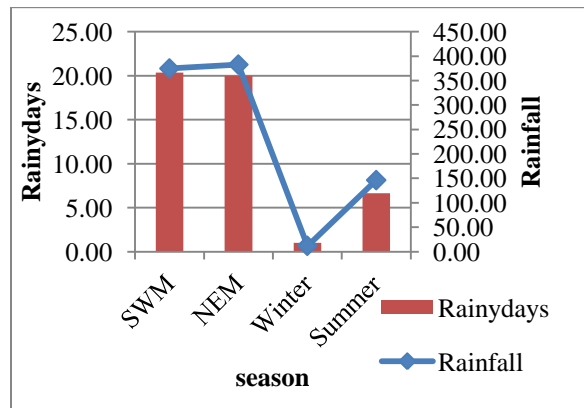


Figure 1 Seasonal Distribution Of Rainfall And Rainy Days

In season wise rainfall the north east monsoon contain high rainfall (382.46 mm) and the winter contain low rainfall (11.72 mm). The rainfall was calculated for 52 week in a year. The graph was plotted for weekly rainfall for 10 years fig 2.

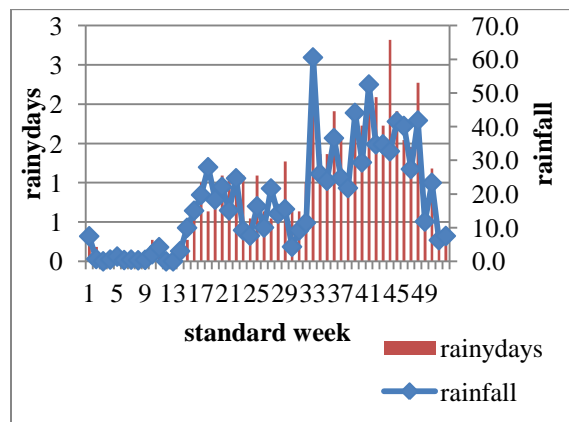


Figure 2 mean weekly rainfall and rainy days for year 2009 to 2019

This graph (fig 2) give the result of increasing and decreasing of the rainfall for 52 weeks and it also contain the rainy days for 52 weeks.

The weekly rainfall was classified in to 6 classes and the number of weeks under each classes (Table 2). The no of weeks are separated based on rainy days. The weeks separated with the rainfall >20,>40,>60,>80 and >100 mm.



Table 1. Annual rainfall and rainy days for the period 2009 to 2019

Year	Annual Rainfall	Annual Rainydays	One day maximum rainfall
2009	624.4	46	49.4
2010	1566.7	70	108.4
2011	1030.9	49	107.2
2012	519.5	34	54.6
2013	999.1	47	90.5
2014	931	48	97.6
2015	1208.6	61	97.6
2016	521.4	31	85.6
2017	1115.4	53	106.4
2018	798.9	46	196
2019	747.7	43	98.6

The rainfall and rainy days analyzed for standard month and the graph is plotted between rainfall and rainy days in standard month (fig 3). The October month contain the maximum rainfall 160.52 mm and the February month contain the minimum rainfall of 1.64 mm. the winter season contain lowest rainfall than other months so January February have minimum rainfall.

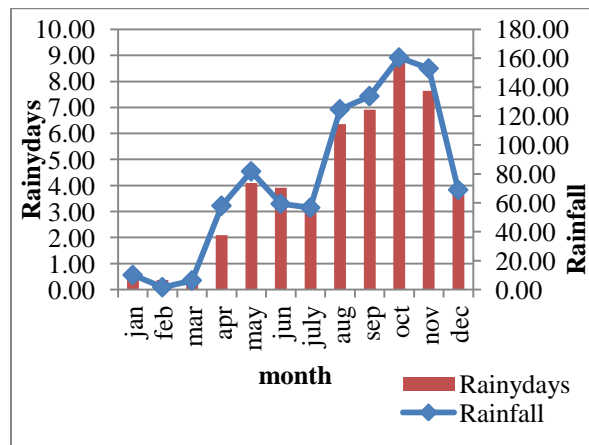


Fig 3 Mean Monthly Rainfall And Rainy Days For The Period 2009 To 2019

Rainy days of January and February are 0.64 and 0.36 respectively. October have maximum rainy days (8.73). In monthly rainfall SWM, NEM, winter and summer have rainfall is 374.56, 382.46, 11.72 and 146.05 respectively. Rainy days for this four season months are 20.36, 20, 1 and 6.64 respectively.

Relationship between rainfall and rainy days

It is generally believed that the total rainfalls the function of total rainy days. the correlation coefficient between the two reveals that there exist a linear relationship between these two. Weekly rain fall against weekly rainy days were potted (fig 4) and the regressive equation was developed between the variables rainfall (Y) and rainy days (X).

Rainfall frequency analysis

Probability of the rainfall analyzed by using the formula. $P = M / (N + 1) * 100$

This probability graph (fig 5) was plotted based on rank of rainfall and return period

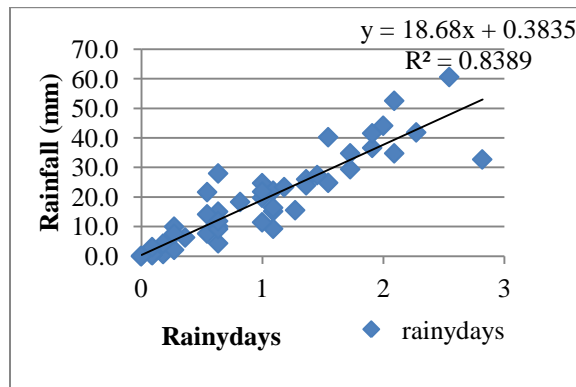


Figure 4 relationships between rainfall and rainy days

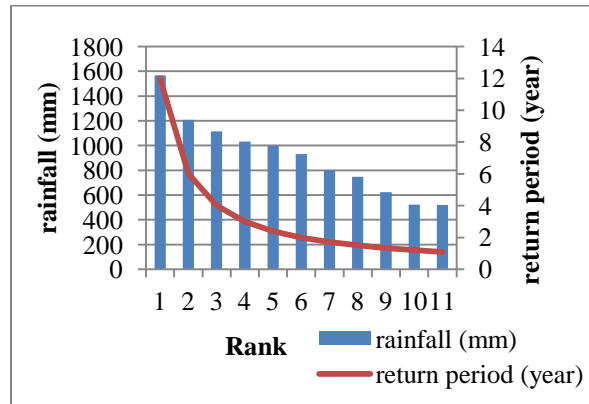


Figure 5 Probability Analysis For The Annual Rainfall Of The Period 2009 To 2019.

Frequency analysis for the 10 years annual rainfall data were done by weibull's method.

Table 2 no of weeks under different amount of rainfall

Amount of rainfall (mm)

Year	>=0	> 20	> 40	> 60	> 80	> 100
2009	42	4	4	1	1	0
2010	30	9	4	2	1	6
2011	38	6	2	1	1	4
2012	42	7	1	2	0	0
2013	36	8	3	1	2	2
2014	39	4	3	3	2	1
2015	35	5	4	3	1	4
2016	44	2	4	1	0	1
2017	34	9	2	2	1	4
2018	44	1	4	0	1	2
2019	41	3	4	1	2	1
total	425	58	35	17	12	25
mean	38.64	5.27	3.18	1.55	1.09	2.27

The monthly dependable rainfall with probability > 75 percent is expected to occur in every year during the month of April to December with higher accumulation during September to October period (Table 3).

IV.CONCLUSION

In this study the frequency of the rainfall analyzed to know about the rainfall pattern in the Attur taluk. The rainfall study of the last 10 years gives some answers to the water supply system, drinking water, ground water and irrigation. The study of daily, weekly, monthly and seasonal rainfall gives some results to the water supply in drought period.

Table 3 monthly rainfall probability (P) and return period(T)

Rank	T	P	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	12	8.33	73	5.6	33.4	232.4	189	146.60	211	218.60	282.6	288.6	490.10	113.4
2	6	16.67	21.4	4.8	19.80	124.40	178.2	124.4	118.4	209	201.1	278.8	231.8	109.30
3	4.00	25.00	8.9	4.2	12.8	124.1	122.4	100	86	158.4	186.9	272.8	211.1	104
4	3	33.33	5	3.4	3.4	61.4	95.20	81.6	52.80	156	173.6	231.6	185.60	86.4
5	2.4	41.67	2.60	0	0	51.8	80.6	51.4	47.2	155	158.40	171.30	160.4	81.2
6	2.00	50.00	0	0	0	21.2	65.00	44.4	30.00	140.2	136.80	130.9	127.5	77.20
7	1.7	58.33	0	0.00	0	16.60	56	41.2	24.2	92.4	121.8	113.1	111.6	73.8
8	1.5	66.67	0	0	0	6	46.2	19.80	21.4	82.1	99.6	111.3802	73	63
9	1.3	75.00	0	0	0	0	46.1	19.6	14.2	74.8	90.8	86	64.8	24.8
10	1.2	83.33	0	0	0	0	16.4	13.1	12.2	60.20	14.4	70.4	27	20.4
11	1	91.67	0	0	0	0	4.2	10.8	6	25.4	5.8	10.80	0	5

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