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Rainfall Characteristics, Pattern and Distribution at Cherapunjee, Meghalaya

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ABSTRACT

Rainfall plays a major role not only in agriculture but also in allied day to day activities. The knowledge amount of rainfall, number of rainy days and its distribution over the cropping season are important for timely preparation of seed bed, selection of crop varieties, choice of cropping pattern. Rainfall analysis with advanced statistics methods using computer programming and software bring out many features which can be directly used for crop planning, land-water management, aquaculture and floriculture planning *etc*. The analysis of 37years (1971-2007) daily rainfall data of Cherapunjee, Meghalaya has been done for determining the characteristics of rainfall and probability of occurrence of normal weekly rainfall.

1. Introduction

The amount of rainfall at a particular place is important, an equally important factors is its temporal distribution. The importance of this distribution is realised in agricultural and allied sectors. In most part of our country, rainfall is uneven, uncertain and erratic. The knowledge of distribution of dry spells and amount of rainfall during wet spells is very much essential for successful management of agriculture. The information of amount of rainfall during wet spell is useful for storage purpose based on the magnitude of dry spells and drought severity. Also the crop development is severely affected if dry spells coincide with the sensitive phonological stage of the crop and it is sometimes beneficial, if it coincide with ripening stage. An attempt has been made in this paper to analyse the rainfall in respect of standard week wise as well as monthly rainfall distribution at different probability levels for Cherapunjee, Meghalaya by using suitable techniques. Cherapunjee, in Meghalaya is happened to the wettest place on the world. The distribution of rainfall, weekly, monthly and seasonally is discussed in this paper.

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The probability of occurrence of a quantum of normal weekly rainfall is also analysed. A lot of work has been carried out in the past by various investigations on rainfall analysis (Chakraborty et al*.,* 2008.; Jakhar et al., 2011; Mohanty et al., 2001; Satapathy et al., 1998.; Sharda, and Bhushan, 1985.; Verma, and Sharma. 1989). The criteria set by Raman (1979) for rainfall of 1 mm for defining a rainy day are not suitable for agriculture purpose. Ashokraj (1979) used the criteria fixed by IMD for defining the rainy day i.e. the day i.e. the day with at least 2.5 mm rain is called rain day. When probability of occurrence of dry spell different length in a week bounded by wet weeks is know; adequate steps may be taken by shifting the sowing time or arranging minimal irrigation to get optimum yield.

2. Materials and methods

Cherapunjee, located at an elevation of 1,300 m above sea level is coming under East Khasi Hill district of Meghalaya. The amount of rainfall and number of rainy days in a week at Cherapunjee, Meghalaya from historic daily rainfall records (1971-2007) collected from India Meteorological Department (IMD) Pune are calculated using probabilistic approach.

Table 1. Number of years under different magnitude of rainy days

Annual rainy day	Number of years	Percentage of rainy day (%)
<100	0	0
100-150	14	37.84
>150	23	62.16

Weibull's Method of Probability Analysis

The weekly rainfall data have been analysis at different levels of probability by using Weibull's method. In this method the weekly rainfall are arranged in descending order of magnitude was given rank, 1 next magnitude was given rank 2 and so on. The probability 'p' of the week having rainfall exceeding or equalling normal value was calculated by using Weibull's formula: $P = \frac{m}{n+1}$ … (1) where ,

P = probability of occurrence
m = rank number
n = number of years of data used

Table 2. Average monthly rain and rainy days at Cherapunjee, Meghalaya

Month	Rainfall, mm	Rainy days
January	10.67	1
February	40.11	2
March	237.63	7
April	830.07	17
May	1164.79	19
June	2290.80	23
July	3273.93	28
August	1544.18	21
September	1167.54	17
October	409.67	7
November	68.62	2
December	22.43	1

Table 3. Weekly observed minimum, maximum and normal rainfall and the probability of the weekly normal rainfall equaling or exceeding the normal in a year at Cherapunjee station.

Standard week	Minimum (mm)	Maximum (mm)	Normal (mm)	Probability (%)
1	0.00	18.00	1.68	15.58
2	0.00	18.20	1.67	22.24
3	0.00	17.50	2.68	35.56
4	0.00	20.40	2.56	21.55
5	0.00	15.00	3.05	34.25
6	0.00	81.70	7.05	23.56
7	0.00	64.20	7.90	26.72
8	0.00	112.10	15.91	26.84
9	0.00	121.00	15.88	30.33
10	0.00	720.80	57.40	23.86
11	0.00	553.00	61.08	22.65
12	0.00	306.30	39.28	26.58
13	0.00	382.60	84.33	37.28
14	0.40	687.00	159.23	34.85
15	1.80	725.70	161.63	23.84
16	1.00	1341.00	188.93	26.68
17	0.00	830.80	231.83	31.57
18	0.00	1237.80	260.88	30.84
19	0.00	579.50	153.32	35.96
20	0.00	1728.30	310.91	33.48
21	0.00	2078.00	276.05	27.86
22	9.20	2217.50	398.96	26.88
23	0.00	2048.00	388.13	34.68
24	0.00	1707.30	563.45	36.27
25	0.00	1975.50	587.87	50.25
26	44.60	2363.50	635.53	40.22
27	30.40	1484.60	630.71	49.86
28	103.80	2482.30	681.81	30.24
29	58.00	2163.20	725.26	42.68
30	52.00	3524.10	874.54	41.68
31	0.00	1616.80	495.12	39.86
32	0.00	1237.40	247.33	34.65
33	0.00	1095.00	382.30	36.88
34	0.00	1019.20	300.47	33.58
35	0.00	1631.00	254.64	24.68
36	0.00	1601.80	290.53	35.82
37	0.00	4038.20	502.43	31.66
38	0.00	755.80	156.93	30.62
39	0.00	834.40	114.51	35.68
40	0.00	1425.00	146.72	24.58
41	0.00	1026.40	118.58	26.74
42	0.00	366.20	54.83	23.28
43	0.00	486.60	30.46	18.88
44	0.00	775.40	43.64	12.35
45	0.00	294.00	33.35	15.54
46	0.00	218.40	16.15	20.15
47	0.00	268.70	11.96	10.22
48	0.00	91.40	5.27	21.22
49	0.00	119.10	5.11	8.84
50	0.00	123.40	10.89	14.26
51	0.00	10.60	0.44	6.62
52	0.00	42.10	2.44	12.24

Figure 1. Number of rainy days in a standard week at Cherapunjee

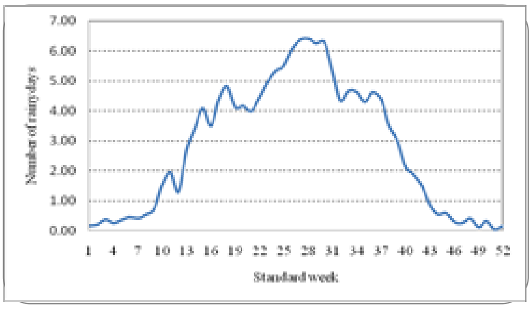


Figure 2. Depth of rainfall in mm at Cherapunjee on standard week basis

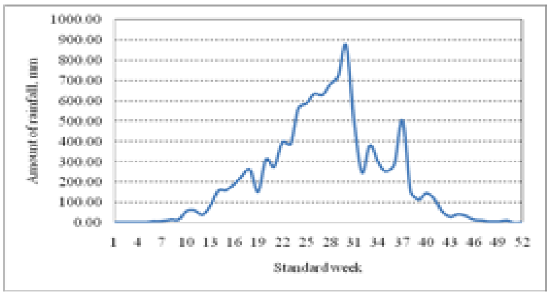


Figure 3. Probability distribution of number of rainy days in a standard week at Cherapunjee

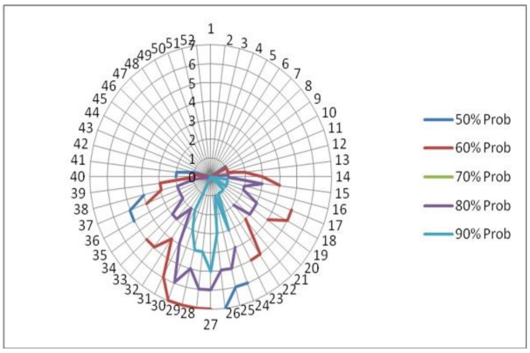


Figure 4 .Probability distribution of amount of rainfall in a standard week at Cherapunjee

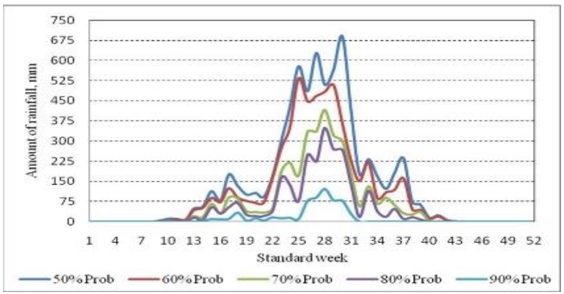


Figure 5. Average number of rainy days in a month at Cherapunjee station

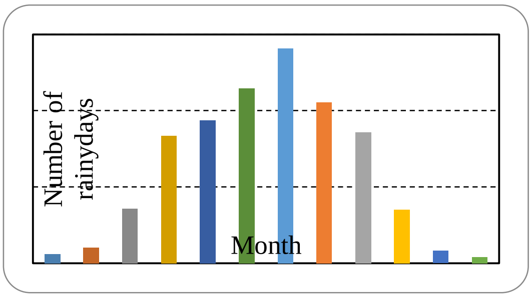


Figure 6. Yearly distribution of rainy day at Cherapunjee station

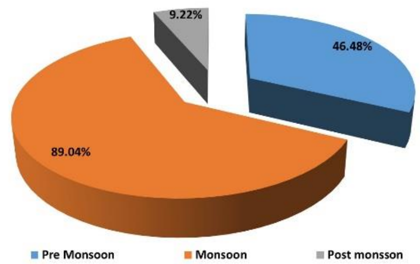
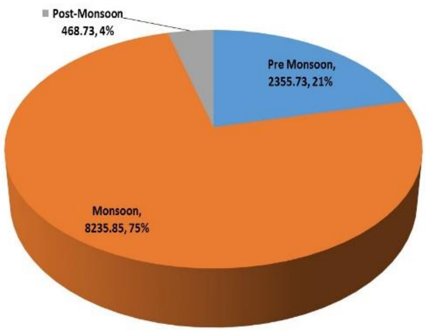


Figure 7. Yearly distribution of rainfall at Cherapunjee station



3. Results and Discussion

The number of rainy days and amount of rainfall in a standard week throughout a water year was calculated by simple average of the 37 years of daily rainfall. The average number of rainy days and amount of rainfall in a standard week at Cherapunjee is presented in Figures 1 and 2 respectively. It is found that the average number of rainy day is more than four (4) from 16th to 37th week in a year. Annual rainy day is always more than 100 for the analysed period. It is found that more than 62% of the analysed years is having rainy days more than 150 days and there is no year where the number of rainy days is less than 100 days (Table 1).

Average weekly rainfall exceeds 100 mm for standard week 12th to 41st. Probability level prediction from 50% to 90% was made to find out the approximate number of rainy days and amount of rainfall in a standard week at Cherapunjee is shown in Figures 3 and 4 respectively. The weekly observed minimum, maximum and normal rainfall and the probability of the weekly normal rainfall equalling or exceeding the normal in a year is presented in Table 3. The weekly quantum of rainfall is more than 35 mm from 15th week to 32nd week of the year for probability of 50% to 90%. The monthly distribution of rainy days and amount of rainfall is presented in Figures 5 and 6 respectively. It is found that around 86% of rainfall is confined to five months of the year (i.e. May to September). During these five months the number of rainy days exceeds more than fifteen (15). Normally at the first week of October the seasonal rainfall analysis for rainy days and amount of rainfall is presented in Fig-7 and 8, respectively. Monsoon rainfall accounts for 75% of the whole rainfall, with pre-monsoon and post-monsoon shower of 21% and 4%, respectively. The monsoon rainy days limits to 62% of the total rainy day in a year.

The average monthly rainfall and number of rainy days is presented in Table 2. It is found that the chances of occurrence of normal weekly rainfall are more than 35% for the standard week 23rd to 39th. However, for the 37th and 38th week the probability of getting normal rainfall is around 31%. On 25th week there is a chance of getting a huge shower of 587.87 mm with a probability level of more than 50%. It indicates that 25th week in Cherapunjee is the wettest week. This indicates there is a chance for critical dry spell in this week. Minimum value of 0 mm rainfall is recorded for the weeks 1st to 14th; 17th to 21st; 23th; 25th and 31st to 52nd week. The normal weekly rainfall is more than 100 mm for standard week 14th to 41st. The average annual rainfall of Cherapunjee is worked out to be 10,753.61 mm with a maximum of 23,442.4 mm corresponding to the year 1974 and a minimum of 5967.7 mm corresponding to the year 1971. The average monthly rainfall of the place is 237.63, 830.07, 1,164.79, 2,290.80, 3,273.93, 1,544.18, 1,167.54 and 409.67 mm for the months of March, April, May, June, July, August, September and October respectively. The maximum average rainfall is received during the month of July of a tune of 3,273.93 mm and the minimum average rainfall is received during the month of January of a tune of 10.67 mm.

4. Conclusion

Rainfall is the most component in agriculture production an and temporal distribution is uneven, uncertain and erratic Cherapunjee, Meghalaya has an average annual rainfall of 10, and its trend is alternatively increasing and decreasing.

The average annual rainy days are 145 days and number of rainy days in a month varies from 1 to 20 days. More than 80 percent rainfall occurs during 17th to 42nd week. There is a good amount of rainfall (more than 800 mm) both in the months of April and May, which is considered as pre-monsoon showers, help in seed bed preparation. Hence the length of monsoon is about 145 days which helps in growing paddy and other cereal crops in valley and foot hills of Meghalaya. Since winter season gets only four percent of total rainfall, it is necessary to construct water harvesting systems, to store excess water during rainy season, which will be utilized as lifesaving irrigation for fruit crops, vegetables and other cash crops during winter season. A good amount of rainfall during monsoon season helps the farmer to go for fish cum paddy culture and pisciculture in the water harvesting ponds. In Meghalaya the temperature is low, humidity is high and almost all weeks get some rainfall, whatever small the amount may be; which helps this place as a centre for Orchids and other floriculture activities.

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