RAINFALL CLIMATOLOGY - A TOOL FOR CROP PLANNIN

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ABSTRACT

Analysis of rainfall for 47 years (1951-1997) at Coimbatore was done to find out the occurance of normal, abnormal and drought months. Monthly probability analysis was also made to compute R/PE ratio. For Coimbatore a growing period of 75 days may be planned for annual cropping from last week of September to first week of December without any greater risk.

KEY WORDS: Rainfall data, Probability analysis, R/PE ratio, Crop growing period

Rainfall is the prime factor that dictates agricultural planning especially for rainfed/dry farming regions. The study on temporal and spatial variations in rainfall would help to design a viable cropping pattern for a particular area. In this context, monthly rainfall analysis may be useful for planning a viable cropping pattern and related component technologies. Therefore an attempt was made to analyse Coimbatore rainfall data with a purpose of identification of viable cropping pattern.

MATERIALS AND METHODS

Monthly rainfall data for a period of 47 years (1951-1997) were collected for Coimbtore (11°N latitude, 77°E longitude) from the Department of Agricultural Meterology, TNAU, Coimbatore and analysed for normal, abnormal and drought months as indicated by Sharma et al. (1979) and the following criteria were taken into consideration.

Drought month	:	Any month receiving rainfall less than 50 per cent of the average monthly rainfall.
Abnormal month	:	Any month receiving rainfall more than twice of average monthly rainfall.
Normal month	:	Any month receiving rainfall between 50 and 200 per cent of the average monthly rainfall.

Drought year	:	Any year receiving rainfall less than or equal to $\overline{X}$-SD, in which $\overline{X}$ is the mean and S.D. is the standard deviation of annual rainfall.
Abnormal year	:	Any year receiving rainfall more than or equal to $\overline{X}$ + SD
Normal year	:	Any year receiving rainfall in the range of $\overline{X} \pm SD$.

The probability rainfall for 30, 50, 75 and 90 per cent for both monthwise and year wise was worked out. The monthly PET values were calculated by modified Blaney - Criddle method (1950). The ratio between the mean monthly rainfall (R) and the monthly potential evapotranspiration (PE) was also worked out to arrive at a valid conclusion.

RESULTS AND DISCUSSION

The data on percent distribution of months of study period under different categories are

Table 1. The percentage distribution of months of study period under different categories.

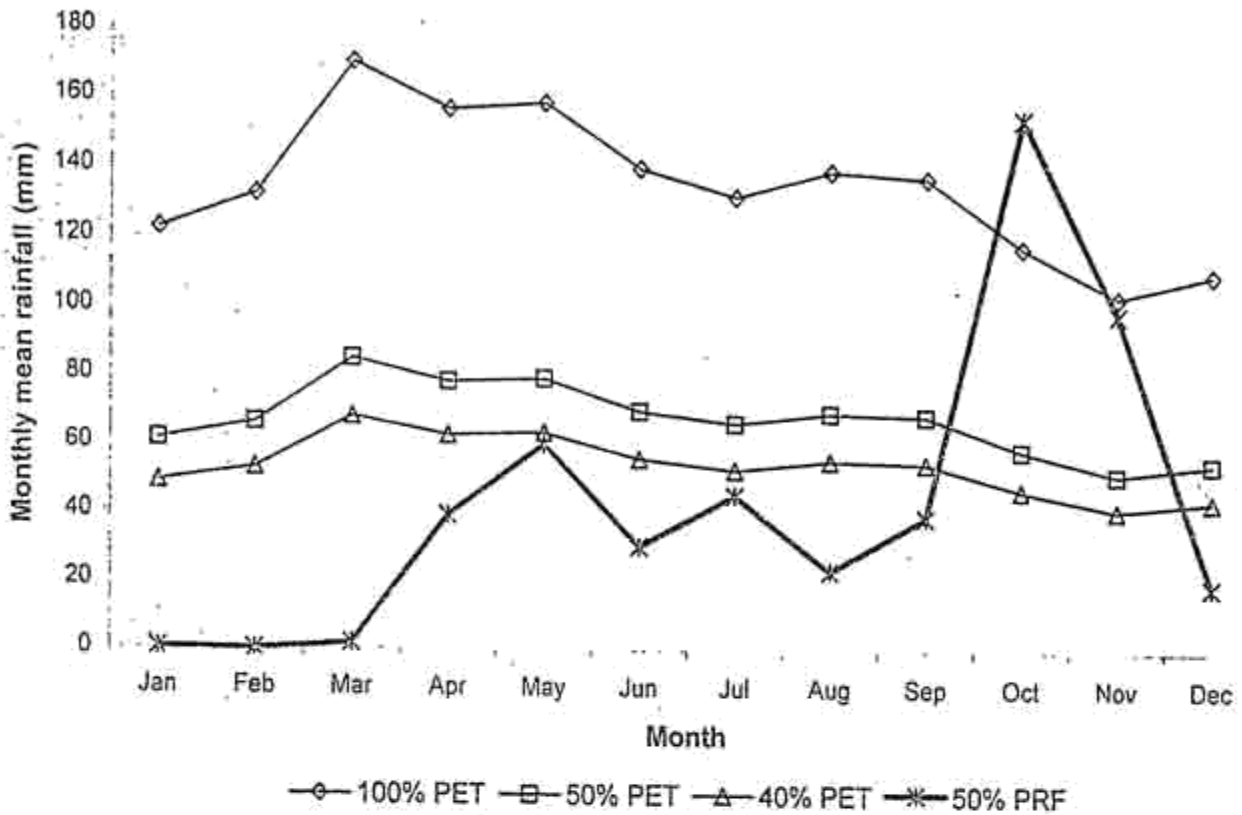| Category	Number of months	Percent
Abnormal	65	11.52
Normal	278	49.29
Drought	221	39.18
Total	564	100.0

Fig. 1. Coimbatore monthly rainfall distribution at 50% probability, (50% RPF) as compared with PET (1951-1997)
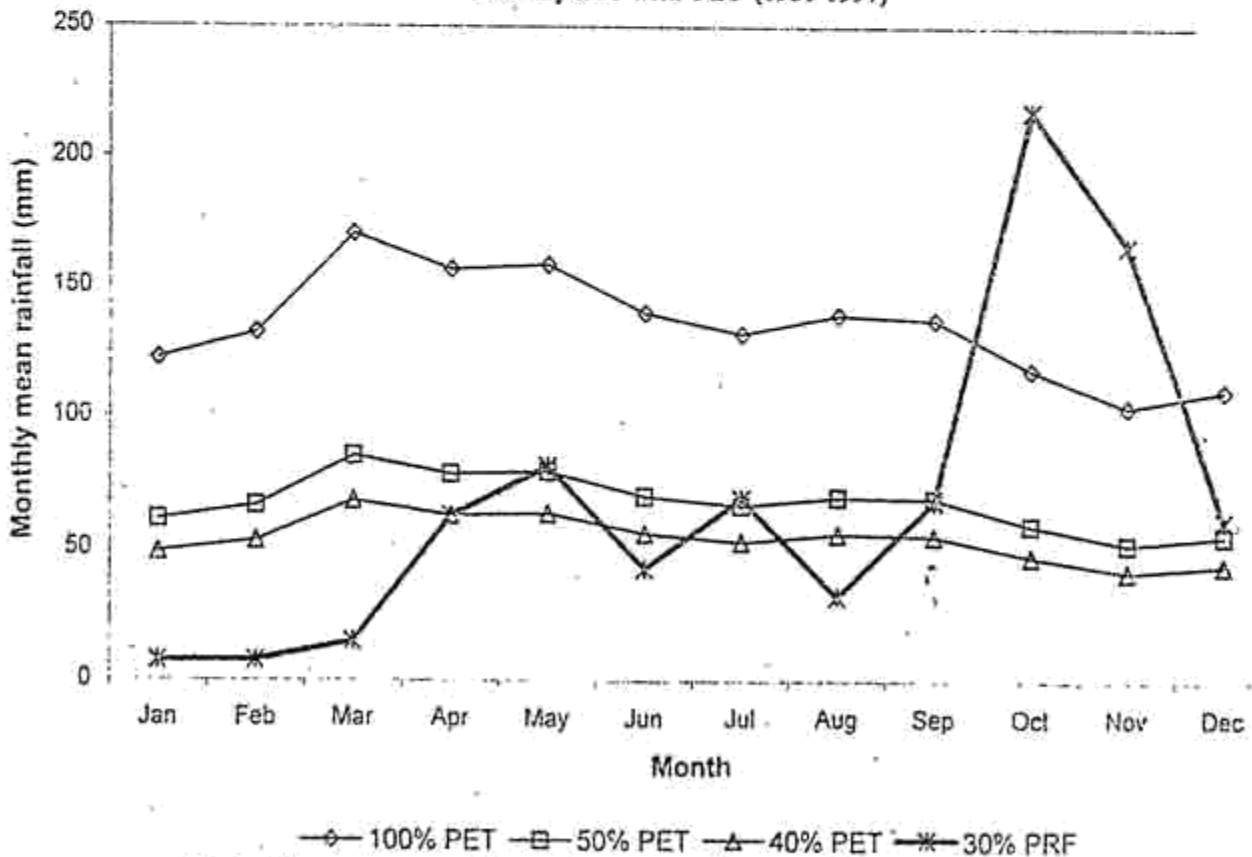

Fig.2. Coimbatore monthly rainfall distribution at 30% probability (30% RPF) as compared with PET (1951-1997).

presented in Table 1. Irrespective of the specific month, out of 564 total months of study period 49.29 per cent fell under normal while it was 39.18 per cent for drought months. Comparatively lesser per cent was observed for abnormal months. The results indicated that there was every opportunity
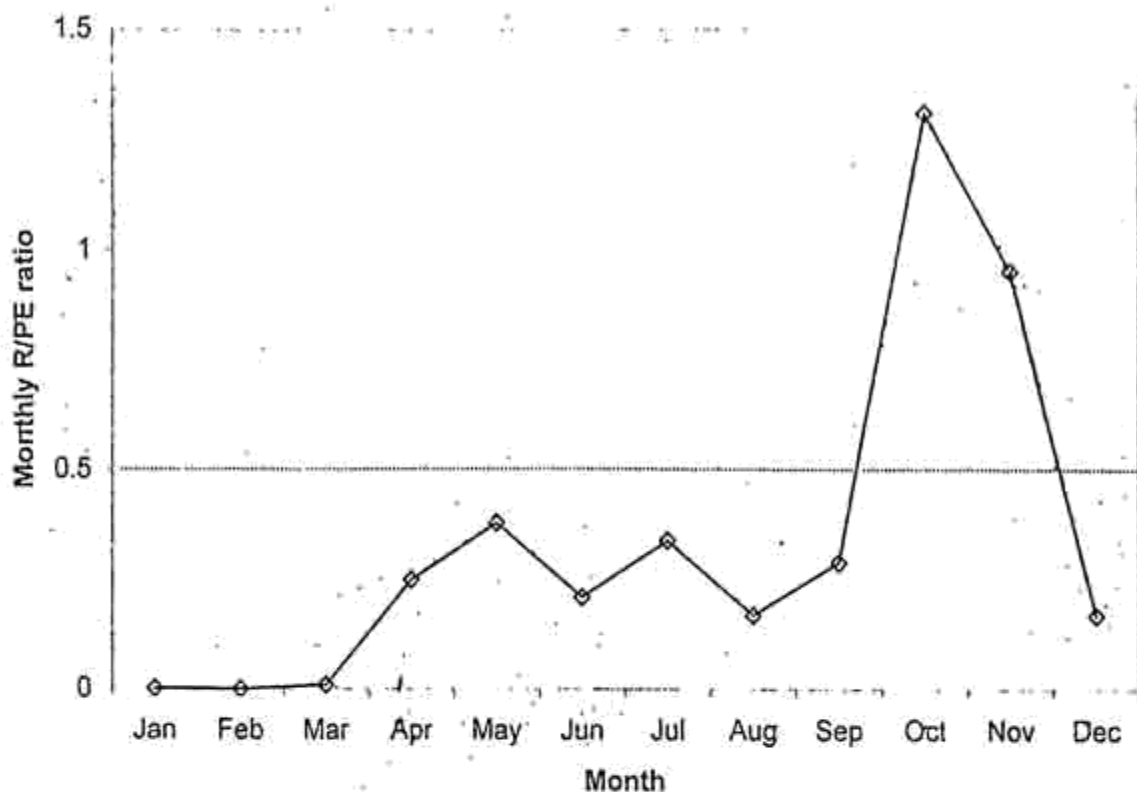
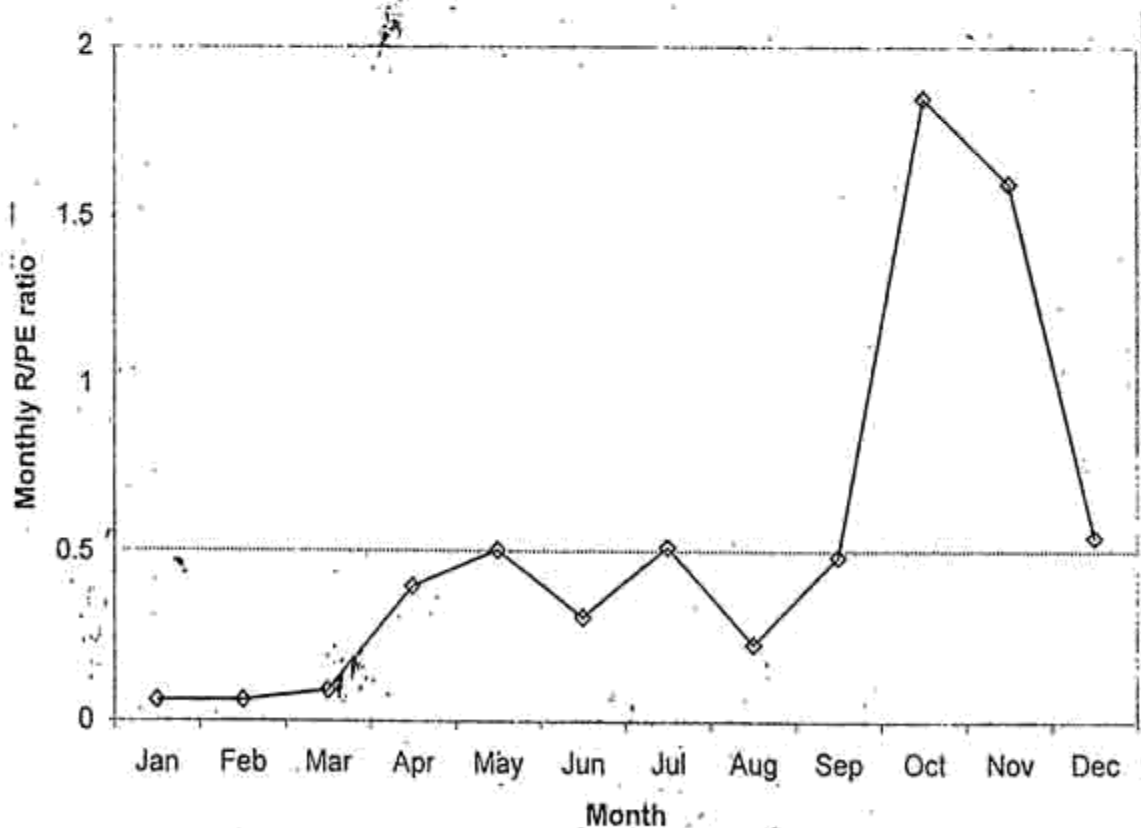Fig. 3. Coimbatore - Monthly R/PE ratio based on 50% probability rainfall (1951-1997)

Fig. 4. Coimbatore - Monthly R/PE ratio based on 30% probability rainfall (1951-1997)

for the occurance of both normal and drought months in the study period.

The data on month-wise distribution of normal; abnormal and drought months are presented in Table 2. The data indicated that the

Table 2. Monthwise distribution of normality, abnormality and drought (1951-1997)

Month	% of total months falling in a given month			% of years having the given month as			Total
	Abnormal	Normal	Drought	Abnormal	Normal	Drought	
January	10.77	2.52	14.93	14.89	14.89	70.21	100.00
February	9.23	3.60	14.03	12.72	21.28	65.96	100.00
March	10.77	3.96	13.12	14.89	23.40	71.70	100.00
April	9.23	9.71	6.33	12.77	57.45	29.79	100.00
May	3.08	12.59	4.52	4.26	74.47	21.78	100.00
June	9.23	8.99	7.24	12.77	53.19	34.04	100.00
July	9.23	11.15	4.52	12.77	65.96	21.28	100.00
August	6.15	9.71	7.24	8.51	57.45	34.04	100.00
September	10.77	9.35	6.33	14.89	55.32	29.79	100.00
October	1.54	13.31	4.07	2.13	78.72	19.15	100.00
November	4.61	11.15	5.88	6.38	65.96	27.66	100.00
December	15.38	3.96	11.76	21.28	23.40	55.32	100.00
Total	100.00	100.00	100.00				

percentage of abnormal months in the study period was greater for December followed by January, March and September. The month October did record a lower percentage of 1.54. This might be due to occurance of freak rainfall during December, January, March and September. In respect of normal with respect to twelve calendar months, the month October did record the highest value of 13.31 per cent followed by May, July and November.

While the other months did exhibit lower values indicating that these months did not fall under normal rainfall. The recorded rainfall in these months was a result of different rainfall processes. Reviewing the drought months across the study period the results also indicated that January, February, March and December would come under this category. The results also further revealed that January and December either fell under abnormal or fell under drought month and hence uncertainity existed.

When a particular month was examined for the abnormality, normality and drought over the study period (Table 2), it was found that except for January, February and March the remaining nine months had come under normal rainfall with higher percentage.

The monthly expected rainfall at different probability levels are presented in Table3. For agricultural planning purposes it is recommended to have either 50 or 75 per cent probability level.

The monthly rainfall distribution at 50 and 30 per cent probability levels were compared with 40,50 and 100 per cent PET as shown in Fig. 1 and Fig.2. The 50 percent probability rainfall was higher than 50 per cent PET from last week of Septamber to first week of December and hence this period of about 75 days may be considered as crop growing period. However at 30 per cent level 2nd week of September to 2nd week of December (90 days) may be taken as crop growing period. Balasubramanian et al. (1996) based on the weekly moisture availability index reported that the standard weeks from 36 to 47 could be taken for raising annual crops for Coimbatore.

The R/PE ratio computed based on 50 and 30 per cent probability level of rainfall are presented in Fig.3 and Fig.4. The R/PE ratio of 50 per cent probability level was above 0.5 from last week of Septamber to first week of December and thus about 75 days duration has been observed as crop growing period. The perusal of R/PE from 30 per cent probability rinfall indicated that the growing period started from 3rd week of September 3rd·

Table 3 Expected monthly rainfall (mm) at Coimbatore with different probability levels

Month	30%	50%	75%	90%	PET (mm)
January	7.6	0.3	0.0	0.0	122.2
February	7.6	0.0	0.0	0.0	132.4
March	15.0	1.8	0.0	0.0	170.4
April	62.5	39.2	24.1	10.7	156.8
May	81.4	60.1	35.2	22.5	158.6
June	42.7	30.4	17.0	6.1	140.0
July	69.2	45.5	33.0	20.0	132.1
August	32.3	23.5	15.5	10.7	139.4
September	67.9	39.2	24.3	8.9	137.5
October	217.9	154.5	92.1	49.3	118.0
November	166.1	98.9	65.1	44.4	103.9
December	61.1	19.1	6.9	3.5	110.4
Annual	757.6	671.1	524.8	447.4	

Table 4. Growing period of Coimbatore by different approaches

Sl.No	Name of Approach	Growing period (months)	Growing period in days
1.	50% probable rainfall with ≥ 0.5 PET	Last week September to first week of December	75
2.	30% probable rainfall with ≥ 0.5 PET	2nd week September to 2nd week December	90
3.	50% probable rainfall R/PE ratio with ≥ 0.5 value	last week of September to first week of December	75
4.	30% prpbable rainfall R/PE ratio with ≥ 0.5 value	3rd week of September to 3rd week of December	90

week of December (90 days) and the data obtained from these probability are presented in Table4.

The result indicated that for viable cropping period a duration of 75 days may be taken without any risk from last week of Septamber to first week of December. It is suggested to have a crop of 90 days duration for this tract since the terminal stage of about 15 days does not require any soil moisture support because the physiological maturity reaches within 75 days sowing. Based on this analysis it is recommended that the above growing period can be entrapped for raising of crops like sorghum, bajra, ragi, sunflower, soybean, green gram, black gram and cowpea successfully.

The derived crop growing periods of October and November months fell under greater per cent of normal months and at 50 per cent probability level also these months received normal rainfall. This again confirmed the accessibility of these months for fitting in growing period.

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