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PATTERN OF RAINFALL FLUCTUATIONS IN KODAIKANAL REGION OF THE WESTERN GHATS OF INDIA

1. Precipitation is one of the primary components in the hydrological cycle. In a region where agriculture is rainfed and rainfall is seasonal, consideration in the seasonal component of rainfall may be more useful in planning (Adejuwon *et al.* 1990). The crop, the rhythm of which fits into the rainfall rhythm, should be grown instead of any other crop. The cropping pattern itself is determined by the rainfall pattern of the region. The year-to-year variability of the annual rainfall causes considerable modifications in the pattern of agricultural activities, water management etc., of a particular region. Keeping this in view, rainfall data of over 25 years of the Kodaikanal region of the Western Ghats were studied to evaluate the annual and seasonal patterns of rainfall fluctuations.

2. Rainfall data for 25 years (1965-89) were collected from the meteorological observatory in St. Joseph's Agricultural Farm, Kodaikanal of the Western Ghat. The data were statistically analysed for monthly, seasonal and annual mean precipitation ($\bar{P}$), standard deviation ($\pm\sigma$), coefficient of variation (CV) and the percentage departure from the normal. From these data, fluctuation in rainfall was studied.

TABLE 2

Seasonal and annual rainfall (mm)

Year	Winter	Summer	South-west monsoon	North-east monsoon	Annual
(1)	(2)	(3)	(4)	(5)	(6)
1965	8.0	317	536	478	1340
1966	0.2	157	757	784	1698
1967	24.0	280	409	651	1364
1968	24.0	269	578	622	1493
1969	19.0	290	508	700	1516
1970	67.0	462	430	445	1424
1971	86.0	371	690	617	1764
1972	0.3	600	505	624	1729
1973	0.1	242	656	558	1455
1974	0.3	340	775	5	1114
1975	143.0	317	507	787	1755
1976	0.1	634	406	56	1094
1977	84.0	581	496	951	2115
1978	18.0	401	413	858	1692
1979	18.0	388	566	1045	2018
1980	0.2	572	356	509	1436
1981	17.0	389	641	427	1471
1982	0.7	311	307	411	1029
1983	2.0	339	548	733	1618
1984	232.0	522	434	440	1626
1985	151.0	271	524	563	1509
1986	155.0	243	297	378	1073
1987	11.0	270	515	912	1706
1988	0.1	522	616	198	1335
1989	1.5	392	817	601	1811
Mean	40.9	379	531	585	1537
S.D.	63.0	125.7	135.5	257.4	277

TABLE 1

Monthly rainfall of Kodaikanal (Mean of 25 years 1965-1989)

Month	Rainfall (mm)	Departure from the annual mean	% of departure from the annual mean	% of the annual rainfall	Rainy days	C.V. (%) for the annual rainfall
January	17.5	−110.9	−86.4	1.14	1.1	197
February	23.3	−105.1	−81.9	1.57	1.2	161
March	61.4	− 67.0	−52.2	3.99	3.2	107
April	145.0	+ 16.6	+12.9	9.41	6.5	58
May	174.6	+ 46.2	+36.0	11.33	7.5	55
June	73.1	− 53.3	−43.1	4.75	4.5	62
July	126.3	− 2.1	− 1.6	8.20	6.2	62
August	126.6	− 1.8	− 1.4	8.20	6.2	59
September	205.0	+ 76.6	+59.7	13.31	9.2	48
October	252.1	+123.7	+96.4	16.36	10.9	45
November	186.7	58.3	+45.4	12.12	8.6	80
December	148.9	20.5	+16.0	9.67	5.5	88
Mean	128.4	—				
S.D.	72.8	—				
C.V. (Mean)	56.7					

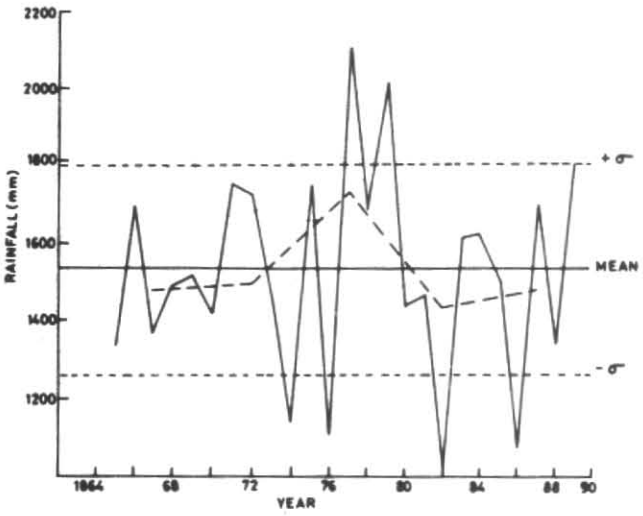

Fig. 1. Annual rainfall fluctuations

3. The mean monthly rainfall data of 25 years, from 1965 to 1989, are presented in Table 1. The mean annual precipitation ($\bar{P}$) standard deviation ($\pm\sigma$) and coefficient of variation (CV) for the monthly mean precipitation for the period 1965-89 (25 years) are 128.4 mm, 72.88 mm and 56.7 mm respectively. In Kodaikanal region of the Western Ghats the extreme rainfall months, that is more than $\pm\sigma$, are January, February (months over annual mean) and September and October (excess months over annual mean). The rainfall deficit from the month of January gradually diminishes till April during which period the increase sets in which continues up to May. It also coincides with the onset rainfall month (the first month of the year in which the mean cumulative rainfall is equal to or greater than 8% according to the definition of Adejuwon, *et al.* 1990). It is again a deficit period during June; it continues with a decreasing trend till August and exceeds its normal level during September and reaches its peak rainfall period (rainfall of the month with the highest mean monthly rainfall) and recorded +96.4 per cent excess of the normal. During successive months, though in excess of the normal, it is within the standard deviation showing a decreasing trend (+45.4 and +16.0 per cent departure from the annual mean). The above trend is due to the northeast monsoon during September-November. The lowest rainfall of −86.4 per cent departure from the annual mean was recorded during January.

3.1. The annual rainfall of the region (Table 2) varied from 1029 mm during 1982 (−33% of the mean) to 2115 mm during 1977 (+137.6% of the mean) with mean annual rainfall of 1537 mm distributed over an average of 89 rainy days. The standard deviation was 277 mm. For the period 1965-89, the rainfall deviations are shown in Table 2 and Fig. 1. It is seen that the annual rainfall exhibits considerable year-to-year variation. The annual rainfall was normal (within $\pm\sigma$) during 76 per cent of the evaluation period. The coefficient of variation was 18.0. However it did not show any definite trend.

TABLE 3

Five year running mean of seasonal and annual rainfall

Year	Winter	Summer	South-west mon-soon	North-east mon-soon	Annual
1965-69	15.0	262.6	557.6	647.0	1482.2
1970-74	30.7	403.0	611.2	449.8	1497.2
1975-79	52.6	464.2	478.0	739.4	1734.8
1980-84	50.4	426.6	456.2	504.4	1436.0
1985-89	63.6	339.6	553.8	530.4	1486.8
Mean	42.5	379.2	531.4	574.1	1527.4
S.D.	19.4	79.4	63.4	117.2	118.3

3.2. Five year running means have also been plotted in Fig. 1. It is seen from the figure and Table 3 that during 1965-1989, the 5-year's running means have fluctuated along the mean rainfall and have remained almost within the +/— one standard deviation. This suggests that the rainfall variability during the period has not exceeded the natural variability of the climate except during 1975-1979.

3.3. The mean seasonal rainfall was 40.9 mm, 379 mm, 531 mm and 585 mm during winter, summer, southwest and northeast monsoons respectively. The coefficient of variation was 154.4, 33.2, 25.6 and 44.1 per cent respectively indicating that the seasonal rainfall pattern is most reliable in southwest monsoon.

Reference

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