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Research Paper

ANALYSIS OF RAINFALL DATA FOR DROUGHT INVESTIGATION AT BRAHMAPURI (MS)

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Rainfall data of 10 years of Brahmapuri were analyzed for drought investigation, which may be used for long term planning of irrigation system in the area. During 10 years period, one drought year was experienced which occurred in 1972 in which the total rainfall was 801.9 mm. A comprehensive knowledge of the trend and persistence in rainfall of the area is of great importance because of economic implications of the rain sensitive operations and since it plays vital role of any agricultural and non agricultural programme. If proper and comprehensive study of various rainfall data was analyzed, the severity and reoccurrence of drought can be known before hand thus various measures can be taken to cope up with the problems and drought.

Keywords: Drought month, Drought season, Rainfall, Brahmapuri

INTRODUCTION

Rainfall is the most important natural hydrologic event and is a unique phenomenon varying both in space and time, the rainfall distribution is very uneven and it not only varied considerably from place to place but also fluctuates from year to year. The rainfall is one of the most important and governing factor in the planning and operation strategies of any agricultural programme for any given area. As such, proper and specific information about the rainfall distribution pattern over a period for a particular place is quintessential for proper and optimal planning of requisite irrigation system and cropping pattern. Indian subcontinent gets around 75% of the annual rainfall during monsoon period, which lasts from June to September i.e. four months. The major share of conjunctive water-need of the country during entire calendar year is met by the rainfall, which occurs in the monsoon period. There is large variation in distribution of rainfall from year to year. In our country swallowing floods and thirstily droughts are the results of spectacular extremities of the rainfall distribution.

DROUGHT PRONE AREAS OF THE COUNTRY

The Irrigation Commission, 1972 has identified 67 drought prone districts comprising of 326 Talukas located in 8 states having an area of

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49.73 M.ha. Subsequently, the National Commission on Agriculture, 1976, identified a few more drought prone areas with slightly different criteria.

The erstwhile Drought Area Study and Investigation Organization of C.W.C. set up in 1978 started with 99 districts after considering the list of districts identified by the Irrigation Commission and also by the National Commission on Agriculture for carrying out further studies.

For the studies, C.W.C. adopted the same criteria as followed by the Irrigation commission, 1972, i.e., drought is a situation occurring in an area:

1. When the annual rainfall is less than 75% of the normal in 20% of the years examined.
2. Less than 30% of the cultivated area is irrigated.

CWC adopted a smaller unit viz. Talukas for drought identification studies instead of districts and therefore, number of drought affected Talukas were identified as 315 out of a total of 725 Talukas in 99 districts. Accordingly out of 108 M. ha. area of 99 districts, only 51.12 M.ha. spread over 74 districts have been considered as drought districts. Thus, in comparison to total geographical area of the country (329 M.ha) about $1/6^{th}$ is drought prone.

Irrigation has proved to be the most effective drought proofing mechanism and single biggest factor in bringing about a large measure of stability in agricultural production.

It would be occurred that the total geographical area of the drought districts is 108 M.ha, out of which 81 M.ha. is culturable (75%), gross sown area is 61.9 M.ha. (57.4%) and the gross irrigated area is 4.3 M.ha. About 23.23% of the total cropped area is irrigated in the drought districts as against in all India average of 30.15%.

MATERIALS AND METHODS

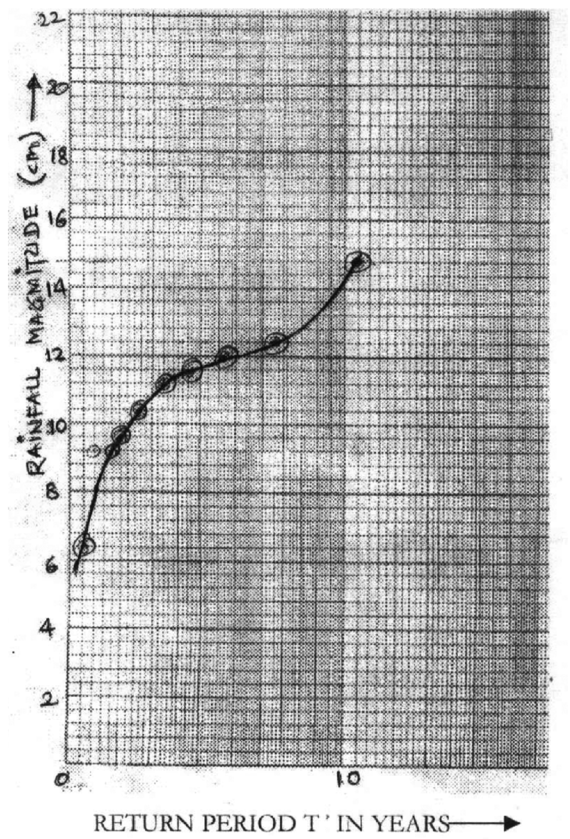
Because of the variety of needs of water, it is not practicable to define a drought specifically. A period of only few weeks without precipitation may be a serious matter for agricultural operations particularly if the weather is hot and the humidity is low such as what prevails in our country. On the other hand, an irrigation project with adequate storage may operate several months without rain. Because of our inability to define a drought in terms, which are generally applicable to all problems, there exists no general consensus for the quantitative definition of droughts under varying field conditions. However, in general drought implies of a deficiency of precipitation of sufficient magnitude over a significantly prolonged duration. Drought as such, is a “non-event” as opposed to a distinct event such as flood. Drought requires an extended period of time to develop. Extreme rainfalls or floods can occur several times in one year, whereas two or three years of subnormal runoff may be required to develop a serious drought problem for basins having large volumes of storage. The information on drought is a viable tool for multi objective water resources planning problems and is implicitly of great value for the incumbent planners for designing of storage capacity reservoirs to store the water for contemporaneous irrigation requirement during such drought periods. The main cause of drought of drought experienced in all places is the insufficient non-linear rainfall. Although precipitation for a few years may be abnormal, there is usually a tendency to return to the mean pattern. Hence, a period of abnormally heavy precipitation is sooner or later balanced by a dry period so that the mean over a long interval does not change appreciably. Such variations in precipitation are of rather irregular occurrence. The interactive factors such as duration, aerial extent, intensity and probability of occurrence are also involved unto a certain extent. While it is feasible to estimate the maximum possible storm which can occur in a given basin on the basis of meteorological theory, it is not possible to estimate the worst possible drought condition which might develop in a given area because to the long period involved in droughts and the great number of weather sequences which might lead to protracted dry periods. The only alternative, then, is to deal with the most severe dry period of record.

Keeping the above points in view the rainfall data for a period of 10 years has been analyzed in the presented paper so as to study the magnitude and drought frequency in terms of rainfall deficiency for Brahmapuri region of MS. The rainfall data for period of 10 years of Bramhapuri were collected from Irrigation Department. Nagpur. The 0 days average and that of monthly and yearly rainfall were consummately analyzed in the study. The above-analyzed data were than compared to mean monthly, mean seasonal and mean yearly rainfall. On the basis of above comparison various droughts were calculated (i.e. drought month, drought season and drought year). Figure 1 shows the systematic return periods (T) in years for the given data.

The following definition of terms drought have been used for the analysis:

Drought Month: Any month receiving rainfall less than or equal to 50% of the average monthly rainfall (Sharma *et al.*, 1979).

FIGURE 1: RETURN PERIOD



Drought Season: If actual rainfall is deficient by more than twice the mean deviation of the season (Ramdas, 1960).

Drought year: If actual rainfall is deficient by 20 to 50 percent (deficient drought year) and it deficient by more than 60 percent (scanty drought year) (Dhar *et al.*, 1979).

RESULTS AND DISCUSSION

Table 1 shows that minimum number of drought have occurred one time in 24th week while the maximum number of drought were observed 6 times in 34th week during the 10 years record.

Table 2 shows that about 40% of rainfall occurs during the monsoon period. The average rainfall for the post-monsoon season, summer and

Table 1: Bramhapuri (10 Years) Analysis for Drought at Interval of 10 Days (July-october)

Month	Average Rainfall (mm)	Half of Average Rainfall (mm)	Number of Droughts
July			
1	156.24	78.12	2
2	107.37	53.69	1
3	101.44	50.72	2
August			
1	94.08	47.04	2
2	115.51	57.76	2
3	123.95	61.98	3
September			
1	90.68	45.34	2
2	48.88	24.44	2
3	43.50	21.75	2
October			
1	29.15	14.58	5
2	19.02	9.51	5
3	28.71	14.36	6

Table 2: Analysis of Monthly, Seasonal, Yearly Rainfall For 10 Years

Month / Season	Average Rainfall (mm)	Half of Average Rainfall (mm)	Number of Droughts
January	8.83	4.41	5
February	11.00	5.50	5
March	21.77	10.88	7
April	10.48	5.24	4
May	11.73	5.89	5
June	200.40	100.20	3
July	397.17	198.58	1
August	341.54	170.77	1
September	182.66	91.33	2
October	76.93	38.46	6
November	36.78	18.39	7
December	1.99	1.00	8

Table 2 (Cont.)			
Month / Season	Average Rainfall (mm)	Half of Average Rainfall (mm)	Number of Droughts
Season			
Post Monsoon	58.60	29.30	4
Summer	244.43	122.22	3
Monsoon	998.30	499.15	-
Year	1301.33	1041.06 (80%)	1 (1972)
		520.53 40%	

monsoon season is 56.60 mm, 244.43 mm and 998.30 mm, respectively. The drought was observed during post monsoon season in 4 out of 10 years. It implies that there is need for irrigation for Rabi crops. While summer season has drought in 3 out of 10 years, irrigation is also needed for summer crops to some extent. Furthermore, no drought was observed during the monsoon season. Table 2 also shows that average yearly rainfall of Brahmapuri is 1301.23mm. Brahmapuri experienced drought in 1972 (i.e., the only year). The monsoon season of the drought year is shown in Table 3. As there is only one drought year, there can be no such systematic interval between two successive drought years.

Table 3: Drought Years

S. No.	Drought Year	Rainfall		% of Monsoon to Yearly R.F.	Timer interval between years
		Year	Monsoon		
1	1972	801.90	653.50	81.49	–

CONCLUSION

If proper and detailed study of various rainfall data is analyzed, the severity and reoccurrence of droughts can be known beforehand. Thus various measures can be taken to cope up with the problems of drought.

In a present study of Brahmapuri drought analysis based on 10 years was observed. The observed data shows that in the months of April and May maximum frequency of drought was observed and a maximum frequency of drought occurred in July while season wise it was maximum in summer and minimum in monsoon. Therefore investigation must be assured for sowing of rabi crops and for also all crop period. During 10 years, there were 6 years when drought was expedited at Brahmapuri. The severity of drought was optimum in the year 1972. There were chances of drought occurrence once in every two year.

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