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DROUGHTS IN DISTRICTS OF INDIA DURING THE RECENT ALL INDIA NORMAL MONSOON YEARS AND ITS PROBABILITY OF OCCURRENCE

1. In spite of good performance of southwest monsoon over the country as a whole in a particular year, smaller regions may suffer drought conditions. Drought, which may lead to famine is indeed one of the worst natural disasters. Its onset is slow, the affected area is quite widespread and the adverse impacts are ruinous. The usual concomitants are malnutrition of human beings and cattle, soil degradation, loss of crops, loss of many other economic activities, spread of diseases etc. In this study we have considered the meteorological drought which is defined by the India Meteorological Department as the seasonal rainfall deficiency exceeding 25% of the long term average value of the rainfall. A drought is considered to be "moderate" if the rainfall deficiency is in between 26% and 50% of the long term average and "severe" if it is more than 50% of the long term average (IMD, 1971). The rainfall of the country is highly variable and there are many studies on its inter-annual variability. The country received normal monsoon rainfall in 2001 for the consecutive 14 years in succession since 1988. In spite of the country receiving normal monsoon several parts of the country suffered drought. There are studies pertaining to the occurrence of drought on the subdivision scale (Appa Rao, 1986; Sinha Ray & Shewale, 2001) but the spatial variability of rainfall on the district scale during the years of all India normal monsoon have not been studied so far. The present study examines the drought conditions in the districts of India during such years. There were many districts in the country, which experienced drought during the above mentioned fourteen all India normal monsoon years even when the concerned subdivision received normal monsoon rainfall. Drought became severe in some of those districts as it occurred during consecutive two years or more.

2. In the present study we have considered the rainfall data for the period 1988-2001 for 424 districts covering all the meteorological subdivisions. From March 2002, total number of subdivisions have been increased from 35 to 36, but we have considered 35 subdivisions in the study as the period of study is 1988-2001. Total 2655 stations are used to represent the 424 districts. Normal based on the data for the period 1901-1970 are used for computing the percentage departure. It may be mentioned that districtwise rainfall data are available in India Meteorological Department under Districtwise Rainfall Monitoring Scheme since 1987.

3. Table 1 gives the sub-divisionwise percentage of number of districts affected by moderate to severe drought during the all India normal monsoon years. The first row of the table gives the all India monsoon rainfall in percentage of long period average. In the year 1988 the country received excess monsoon rainfall, whereas during the period 1989-2001 country received normal monsoon rainfall. Table 1 also indicates that the year 1999 and 2000 were worst as consecutive occurrence of drought in successive two years. Out of 35 sub-divisions, in 4 subdivisions, more than 50% of the districts were affected by drought in successive two years 1999 and 2000. In 1999, all the districts of the sub-divisions Andaman & Nicobar Island and Saurashtra & Kutch were affected by the drought. In the same year more than 50% of the districts of four other subdivisions were also affected by moderated to severe drought. Table 1 also presents the sub-divisionwise percentage of number of districts affected by severe drought during the all India normal monsoon years. In the year 1999 maximum districts (63% of the total districts) for the sub-division Saurashtra and Kutch were affected by the severe drought. Otherwise also in Saurashtra and Kutch average number of districts affected by severe drought per year is maximum.

Drought becomes more severe when it occurs during consecutive years in the same place. Out of 35 subdivisions there were only thirteen subdivisions where not a single district suffered drought in consecutive three years or more. These subdivisions are Andaman & Nicobar Island, Arunachal Pradesh, Assam & Meghalaya, Jharkhand, west Rajasthan, Konkan & Goa, Madhya Maharashtra, Vidharbha, coastal Andhra Pradesh, Rayalaseema, coastal Karnataka and south interior Karnataka. Maximum numbers of districts in a subdivision of such consecutive occurrence of drought for more than three years or more is four, which are from east Rajasthan and Gujarat region. But most affected district during the period 1988-2001 is Rai Bareilly of east U.P. It experienced consecutive six years of moderate to severe drought from 1992 to 1997 and again three years from 1999 to 2001. The district Ladakh of Jammu & Kashmir and Wynad of Kerala experienced moderate to severe drought for the 5 consecutive years since 1997. Of them Ladakh suffered from severe drought in 2001 for the fourth consecutive year since 1998. In the year 2001, in addition to Ladakh, Wynad of Kerala and Hanumannagar of west Rajasthan also experienced severe drought. The recent three consecutive years *i.e.* 1999, 2000 and 2001 were maximum affected by drought. 20 districts out of total 428 districts experienced moderate or severe drought in the year 2001 for the third consecutive year.

In each of the 424 districts of the country we have listed the years of occurrence of moderate or

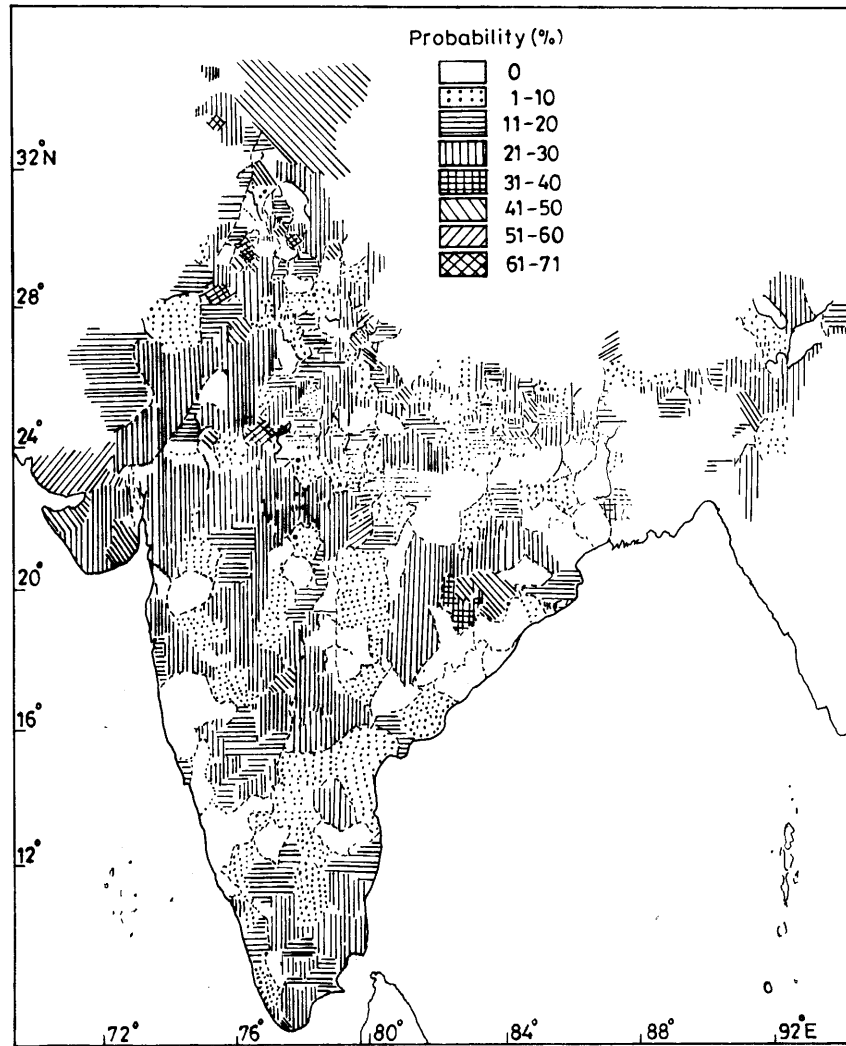


Fig. 1. Probability of occurrence of drought in districts of India

severe drought. Fig. 1 shows the probability of occurrence of drought during the good monsoon years 1988-2001. It is found that the probability of occurrence of drought is maximum in Rai Bareilly district of east U.P. and Sangrur district of Punjab (71% for both the districts) followed by the district Kota in east Rajasthan and Hanumangarh in west Rajasthan (67% for both the districts), Sirmur in Himachal Pradesh with 64%.

4. The study shows that the subdivision Saurashtra and Kutch was maximum affected during the last 14 years of consecutive good monsoon, where on an average 37.5% of the districts were affected by drought per year. Some of the districts, which suffered heavily from drought almost each year, are Rai Bareilly of east U.P., Sangrur of Punjab, Chamba of Himachal Pradesh and Wynad of

Kerala. Districts of the subdivisions Bihar and plains of west Uttar Pradesh were affected by drought every year where as those of the subdivisions coastal Karnataka and Lakshadweep were never affected by drought during these 14 years. The years 1991, 1992 and 1999, 2000 were worse compared to other years, as the numbers of districts affected by drought were nearly 25% of the total number of districts.

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India Meteorological Department, 1971, "Rainfall and droughts in India"

Sinha Ray K. C. and Shewale, M. P. , 2001, "Probability of occurrence of drought in various sub-divisions of India", *Mausam*, **52**, 3, 541-546.

References

Appa Rao, G., 1986, "Drought Climatology", *Jal Vigyan Sameeksha*, National Institute of Hydrology, Roorkee, India, **1**, 43-50.

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