

## ABSTRACT

Drought has different meanings to different persons depending upon the area of interest. Very few studies are conducted in India on characterisation aspects of drought and practically no study on characterisation of agricultural drought. The specific objectives of study were to develop a methodology for characterisation of meteorological and agricultural drought and develop drought frequency curves. Annual, seasonal and weekly rainfall data for a period of 80 years were analysed from deficit point of view. Annual and seasonal rainfall follow log normal and normal distribution. Weekly rainfall is more variable at the beginning and at the end of the season considered (between 22nd and 43rd meteorological week. In a deficit year, evapotranspiration at 80% level can be met only between the 29th to 37th week. Onset date of effective monsoon and other rainfall related parameters are identified; date of onset of monsoon is normally distributed with 18 June as mean date and a standard deviation of 8 days. Date of termination of effective monsoon as well as maximum dry spell duration follow extreme value distribution. With the changing date of onset of effective monsoon the seasonal rainfall, duration of rainy season and total dry spells days do not show much variation. Meteorological drought is investigated as per various workers and a methodology is proposed based on the normality of seasonal and deficit years rainfall (mean and standard deviation). Years were classified as incipient, large,

severe, disastrous and extreme drought and the corresponding drought index developed. Multiyear drought characteristics reveals that as drought duration increases the mean severity for 1 to 6 years drought increases with increasing variability but the mean drought intensity increases gradually with decreasing standard deviation. Agricultural drought is defined as lack of soil moisture below a critical soil moisture content in the crop root zone. Long duration soil moisture data essential for frequency analysis is not available. Based on soil moisture variation a critical soil moisture content (SMc), a threshold value marking the initiation of agricultural drought is determined and agricultural drought is modelled following hydrologic water balance approach. Agricultural drought with respect to its characteristics parameters such as duration and severity is characterised taking upland rice as the reference crop in a rainfed set up at Hazaribagh (Bihar). SMc value was experimentally determined and agricultural drought series of duration and severity were analysed. Agricultural drought of 1 to 3 weeks and 4 to 6 weeks duration follow normal and extreme value distribution. Frequency analysis were carried out and drought duration for 2 to 6 weeks and their exceedance probability were plotted on a probability paper. Occurrence of drought of 5 and 6 weeks duration are very less with very less probability. Initial drought severity is higher than the intermediate and terminal stage except for 6 week duration. Intermediate drought is always lesser than initial and terminal drought for all durations. Terminal drought follow a cyclic pattern. Intermediate drought has occurred more

requently in the last 25 years compared to first and second 25 years period. From the results it can be concluded that there is shifting change in the rainfall related parameters making it unfavourable for rainfed farmers in this region.

KEYWORDS : AGRICULTURAL DROUGHT, INITIAL DROUGHT, INTERMEDIATE DROUGHT, TERMINAL DROUGHT, UPLAND RICE AND DROUGHT FREQUENCY CURVE