

Drought and Vegetation Monitoring Using Geographic Information System and Remote Sensing in Rajasthan, India

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Rainfall of Rajasthan is variable, seasonal, and unevenly distributed resulting frequent occurrence of droughts, aridity and degradation of vegetation growth. Frequent occurrences of droughts in Rajasthan have resulted in significant economical losses, ecological degradation and environmental deterioration. The objectives of the study are to assess potential of long-term time series of vegetation index from Advanced Very High Resolution Radiometer (*AVHRR*) as descriptor of drought, to study the spatial and temporal pattern of drought and to analyze vegetation trends using long-term *NDVI* from *AVHRR* for drought and desertification monitoring. The *NOAA-AVHRR* 15 days composites of *GIMMS NDVI* for 28 years (from 1983), monthly rainfall data for the same 28-years period over 102 rain gage stations and the crop statistics were used in this study. To monitor the drought and vegetation greenness variability annual, seasonal and monthly *NDVI* and its mean, standard deviation, and *NDVI* Anomaly Index (*NAI*), integral *NDVI* (*iNDVI*) and rainfall ratio were computed in pixel level. To study the spatial and temporal pattern of meteorological drought condition, standardized precipitation index (*SPI*) were computed at different time scale for all 102 rain gauge stations and then *SPI* results were interpolated. The spatial pattern *SPI* during drought years are having higher negative anomaly from July to September in greater part of Rajasthan. In 2000 drought, an extreme value of *SPI* reaches up to -3.69 in September and -2.84 in August, which exhibits the severity of drought condition. The trend and linear association between *NAI* and *SPI* showed that there is a significantly strong high positive correlation in October in all agro-ecological zones in Rajasthan. The correlation between *iNDVI* (biomass) and rainfall reveal that, the relationship is relatively strong (>0.5) in the hyper arid and arid districts (i.e Jaisalmer, Bikaner, Churu), The trends of integral *NDVI/RF* ratio results suggest that about 35 % of study area has experienced decreasing trends of vegetation growth, ongoing degradation, and desertification process.

Key words: *AVHRR, NDVI, Vegetation, NAI, Drought, SPI*