

Assessment of Impact of Drought on Desert Vegetation through Remote Sensing

Suresh Kumar*, Harish Purohit, Manish Mathur, Gary Bastin** and Margaret Friedel***

ICAR-Central Arid Zone Research Institute, Jodhpur 342 003, India

** PO Box 2886, Alice Springs, N.T., Australia

***CSIRO Land and Water, PO Box 2111, Alice Springs, NT 0871, Australia

Abstract: Arid vegetation shows monsoonal growth. When rains fail in the event of drought, regenerated annuals and perennials turn dry. Since NDVI senses greenness of vegetation, such dry and pale vegetation in the desert needed to be assessed by some other way. We have therefore used another index, PD-54, based on cover of dried vegetation and compared its results with those from NDVI in real time in five grazinglands in Shergarh tehsil of Jodhpur district in Rajasthan. Satellite data of IRS 1C/1D/P6 with LISS 3 sensor for different seasons were acquired for three contrasting wet-dry season events. After calibrating these radiometrically and registering geometrically, index of vegetation cover PD54 as well as NDVI were calculated. PD54 is a perpendicular vegetation index based on the green and red spectral band width. Ground radiometric observations were also used to calculate the PD54 and NDVI and were related to vegetation cover measured on ground in permanent plots. This confirmed superiority of PD54 for estimating cover in arid dry grasslands. Sequential trends in cover of ground vegetation in a protected and nearby unprotected, open grazinglands from a good rainfall year to drought year were related with satellite data. A grass cover of 14.9% by wheel point method in the protected area (compared to zero per cent grass cover in unprotected site) in October drought event could not be detected by NDVI while PD 54 successfully captured it. Total vegetation cover of 17.4% as measured on ground (i.e., total of forbs, grass and woody perennials) in unprotected site after drought in October was assessed more by NDVI though it was much less than that at protected site (39.8%). Reverse was true for PD54. Thus drought impacted vegetation in arid grazinglands could be more accurately assessed through satellite data using PD54. Such estimate on real time scale helps to prepare plans for drought preparedness, pastoralism and transhumance.

Key words: Grazingland, arid zone, spectral reflectance, vegetation index, degradation, NDVI.

Grazing based livestock economy is well known to be the mainstay of desert dwellers in the Indian arid zone. Over the past 50 years, area under grazinglands has shrunk to half while livestock population has increased many fold (Faroda *et al.*, 1997). Availability of grazable material is further accentuated by highly variable rainfall often culminating in droughts. Effective management of drought calls for ensuring availability of adequate grazing resources so as to save precious livestock. Already, the grazing lands are being over used and getting more and more degraded. In fact, nearly 66-70% of these grazing lands are severely degraded, as revealed from ground surveys. Using NDVI for vegetation assessment has been the most common approach in the

Indian desert, first of which was in Central Luni basin. Shankarnaryan and Singh (1982) also reported range biomass in three different soil types of Jodhpur using correlation coefficient with NDVI. Kumar and Saxena (1989) showed amenability of Indian Remote Sensing Satellite (IRS) - IA data to identification and mapping of Sewan grasslands in the western Rajasthan, and showed that NDVI does not often give true results. Potdar *et al.* (1993) used NDVI of NOAA-11, AVHRR data from nine districts of Rajasthan to study effects of monsoon rainfall on the change in the vigour of vegetation. The NDVI value of homogeneous sand background was used to define the threshold for non-vegetated area. Vegetation vigour and senescence were further correlated with the soil moisture level. Hence it was possible to infer vegetation vigour as indicated by the "greenness" deduced from

*E-mail: sk_ecology@yahoo.co.in