

Mapping Man-Induced Soil Degradation in Armenia's High Mountain Pastures through Remote Sensing Methods: A Case Study

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Abstract : One of major concern to Armenia has been soil degradation emerged as a result of unsustainable management and use of grasslands, this in turn largely impacting environment, agriculture and finally human health. Hence, assessment of soil degradation is an essential and urgent objective set out to measure its possible consequences and develop a potential management strategy. Since recently, an essential tool for assessing pasture degradation has been remote sensing (RS) technologies. This research was done with an intention to measure preciseness of Linear spectral unmixing (LSU) and NDVI-SMA methods to estimate soil surface components related to degradation (fractional vegetation cover-FVC, bare soils fractions, surface rock cover) and determine appropriateness of these methods for mapping man-induced soil degradation in high mountain pastures. Taking into consideration a spatially complex and heterogeneous biogeophysical structure of the studied site, we used high resolution multispectral QuickBird imagery of a pasture site in one of Armenia's rural communities - Nerkin Sasoonashen. The accuracy assessment was done by comparing between the land cover abundance data derived through RS methods and the ground truth land cover abundance data. A significant regression was established between ground truth FVC estimate and both NDVI-LSU and LSU - produced vegetation abundance data ($R^2=0.636$, $R^2=0.625$, respectively). For bare soil fractions linear regression produced a general coefficient of determination $R^2=0.708$. Because of poor spectral resolution of the QuickBird imagery LSU failed with assessment of surface rock abundance ($R^2=0.015$). It has been well documented by this particular research, that reduction in vegetation cover runs in parallel with increase in man-induced soil degradation, whereas in the absence of man-induced soil degradation a bare soil fraction does not exceed a certain level. The outcomes show that the proposed method of man-induced soil degradation assessment through FVC, bare soil fractions and field data adequately reflects the current status of soil degradation throughout the studied pasture site and may be employed as an alternate of more complicated models for soil degradation assessment.

Keywords : Armenia, linear spectral unmixing, remote sensing, soil degradation

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