From Space to Plot: Assessment of Land Degradation Pattern in Kenya and its Implication for Sustainable Land Management

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ABSTRACT

Land degradation occurs at varied temporal and spatial scales making its quantification a great challenge. Land degradation can be assessed at different scales (hierarchy theory): plot, farm, landscape, and national/continental and global levels. The benefit of the hierarchical approach is that the findings from one scale can be used to verify the interpretation of information from other scales. Despite this recognition, most studies on land degradation have stopped at their respective scales of assessment with little if any scaling up or out of the results to explore implication at the next scales. This study assessed long term spatial and temporal patterns of land degradation in Kenya using multi-scale satellite data sets and detailed field observations and measurements. At national level, the study determined areas at risk of degradation using Normalize Difference Vegetation Index (NDVI) as a proxy. Systematic site characterization and soil sampling was then undertaken at identified benchmark sites following the Land Degradation Sampling Framework (LDSF). The assessment at national level revealed clear patterns of NDVI change and hence potential for degradation or improvement. The degrading areas span across the different agroecological zones humid (Kakamega, Kisii) to arid (Kitui, Narok, Turkana, Garissa) lands suggesting that there are various drivers of degradation in these respective regions. Areas around Lake Turkana and the Eastern province showed greatest risk of degradation. Positive and significant changes in the NDVI slope were observed for some selected locations such as Wajir and Baringo that are located in the dryland areas implying that vegetation cover was increasing over the years. The assessment of land degradation at selected benchmark sites in Western Kenya was able to show in a much finer and clearer way patterns of land degradation often masked when national, continental and global assessments are performed. Over 55% of the farms sampled lacked any form of soil and water conservation (SWC) technologies. Sheet erosion was the most dominant form of soil loss having been observed in over 70% of the farms sampled. Agriculture (crop cultivation) was identified as the main activity with highest impact on the habitat. Major soil chemical properties were found to be below the critical thresholds needed to support meaningful crop production. Of particular concern was the high proportion (90%) of farms having slightly acidic to very strongly acidic soils (pH 4.9- 6.9) soils. The findings of this study provide a solid visual and quantitative basis of land degradation assessment for decision makers and land users in regard to designing and implementing programs for rehabilitation and restoration.

Keywords: Hierarchy theory, Land degradation, Normalize Difference Vegetation Index (NDVI), Remote sensing, Soil and water conservation (SWC)