

Trend analysis of GIMMS and MODIS NDVI time series for establishing a land degradation neutrality national baseline

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Land degradation is a key global environment and development problem that is recognized as a priority by the international development community. The Sustainable Development Goals (SDGs) were adopted by the global community in 2015, and include a goal related to land degradation and the accompanying target to achieve a land degradation-neutral (LDN) world by 2030. The LDN concept encompasses two joint actions of reducing the rate of degradation and increasing the rate of restoration. Using Kenya as the study area, this study aims to develop and test a spatially explicit methodology for assessing and monitoring the operationalization of a land degradation neutrality scheme at the national level. Time series analysis is applied to Normalized Difference Vegetation Index (NDVI) satellite data records, based on the hypothesis that the resulting NDVI residual trend would enable successful detection of changes in vegetation photosynthetic capacity and thus serve as a proxy for land degradation and regeneration processes. Two NDVI data sets are used to identify the spatial and temporal distribution of degraded and regenerated areas: the long term coarse resolution (8km, 1982–2015) third generation Global Inventory Modeling and Mapping Studies (GIMMS) NDVI3g data record; and the shorter-term finer resolution (250m, 2001–2015) Moderate Resolution Imaging Spectroradiometer (MODIS) derived NDVI data record. Climate data (rainfall, temperature and soil moisture) are used to separate areas of human-induced vegetation productivity decline from those driven by climate dynamics. Further, weekly vegetation health (VH) indexes (4km, 1982–2015) developed by National Oceanic and Atmospheric Administration (NOAA), are assessed as indicators for early detection and monitoring of land degradation by estimating vegetation stress (moisture, thermal and combined conditions).