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Utilizing Google Earth Engine for Estimation of Soil Loss with RUSLE Model in Sub Region of Lower Krishna Basin

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ABSTRACT

It is imperative to delve into the study area of the Sub Region of Lower Krishna River Basin to accurately gauge soil loss and address issues related to soil erodability. To facilitate this endeavor, Google Earth Engine (GEE) provides access to high-performance processing power through cloud-based technologies and extensive datasets stored in cloud-based databases. The data within GEE's databases are sourced from diverse channels, encompassing satellite imagery, geospatial datasets, meteorological information, land cover/land use maps, topographic data, and even social and economic data. The primary objective of this research is to assess soil erosion in the Sub Region of the lower Krishna river basin. The specific goals of the study are as (i) To calculate Annual Soil loss using the Revised Universal Soil Loss Equation (RUSLE) and leveraging Remote Sensing through the Google Earth Engine (GEE) cloud-based platform and (ii) To generate spatial maps for the Sub Region of Lower Krishna River basin. The analysis of quantitative and spatial soil loss information, derived from RUSLE parameters, involves the utilization of Remote Sensing and Google Earth Engine techniques. The integration of the RUSLE model with remote sensing outputs within Google Earth Engine emerged as the most straightforward method for calculating soil loss in the sub-region of the Lower Krishna River Basin for the years 2015 to 2020. The annual soil loss map proves valuable for implementing soil conservation measures and adopting protective agricultural practices to ensure sustainable natural resource management. Key conclusions drawn from the study include: In the years 2015, 2016, 2017, 2018, 2019, and 2020, the average soil loss in the sub-region of the Lower Krishna River Basin was 9.3, 13.4, 14.7, 15.8, 16.0, and 26.1 t/ha/yr, respectively. The average R-Factor in the sub-region of the Lower Krishna River Basin for the same years was 397.9, 452.4, 447.8, 492.4, 482.7, and 651.5 MJ-mm/ha/hr/year, respectively. The K-Factor in the sub-region of the Lower Krishna River Basin for the years 2015 to 2020 was

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0.032, 0.022, 0.0311, 0.0315, 0.0311, and 0.305 t-ha-hr/MJ/mm, respectively. The LS Factor for the corresponding years in the sub-region of the Lower Krishna River Basin was 5.356, 10.725, 5.746, 8.207, 11.457, and 10.9, respectively. The C-Factor in the sub-region of the Lower Krishna River Basin for the years 2015 to 2020 was 0.239, 0.351, 0.367, 0.367, 0.371, and 0.424, respectively. The P-Factor in the sub-region of the Lower Krishna River Basin for the same years was 0.621, 0.594, 0.652, 0.616, 0.623, and 0.583, respectively. Vegetation and precipitation are identified as the main factors influencing soil erosion dynamics, with changes in precipitation being the direct cause of alterations in soil erosion. Poor vegetation contributes to increased soil loss, and conversely, improved vegetation leads to reduced soil erosion. Working with Google Earth Engine provides the advantage of effectively managing and processing large datasets, enabling the generation of predictions.

Keywords: USLE, GEE, Krishna River basin

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