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Monitoring Vegetation Dynamics in the Cauvery Delta Zone (CDZ) Using Satellite-Derived Vegetation Indices with Google Earth Engine

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The Cauvery Delta Zone (CDZ) in southern India, supported by the Cauvery River, is an essential agricultural region renowned for its high production and rich ecological variety. The CDZ, characterized by its dynamic interaction between land and water and its wide range of soil series, supports a highly productive cropping system referred to as the rice bowl of Tamilnadu. The vegetation in CDZ plays a vital role in maintaining ecological equilibrium. Gaining knowledge about the timing of its life cycle and tracking changes are crucial for evaluating the effects of climate change and human actions. The utilization of satellite technology, specifically Sentinel-2, presents unparalleled prospects for ecological research, offering comprehensive worldwide coverage and imagery with exceptional levels of detail. The study combines geographical analysis with satellite-derived vegetation indices (VIs) to get insights into the agricultural dynamics of the region, specifically focusing on rice agriculture, pulse crops, and a variety of perennial crops. This study investigates the Vegetation Indices (VIs) derived from satellite data, specifically the Normalised Difference Vegetation Index (NDVI), Enhanced Vegetation Index (EVI), Biomass Index (BI), Chlorophyll Index (CI), and Differential Vegetation Index (DVI). The analysis focuses on using Sentinel-2 data to examine the spatial and temporal patterns in the CDZ. The research highlights the significance of NDVI in doing qualitative vegetation analysis. Furthermore, the contributions of EVI, BI, and DVI in comprehending vegetation health and land cover changes are investigated on a monthly basis from June 2022 to May 2023. The Google Earth Engine platform is utilized for the procedure involves the acquisition of Sentinel-2 data, the elimination of clouds, pre-processing of the data, computation of various vegetative indices (VIs), analysis of the results, and exporting them. The outcome demonstrates the fluctuations of satellite-derived vegetation indices, with the peak values observed in September and the lowest values in November. The values of NDVI and DVI exhibit a strong positive association, whereas EVI and BI also have a strong positive correlation. Substantial fluctuations in the results are observed on a monthly basis. The findings enhance scientific progress and facilitate informed decision-making for sustainable development, by effectively balancing human activities and environmental conservation.