World Academy of Science, Engineering and Technology
International Journal of Environmental and Ecological Engineering
Vol:18, No:03, 2024

Land Cover Mapping Using Sentinel-2, Landsat-8 Satellite Images, and Google Earth Engine: A Study Case of the Beterou Catchment

Authors : Ella Sèdé Maforikan

Abstract : Accurate land cover mapping is essential for effective environmental monitoring and natural resources management. This study focuses on assessing the classification performance of two satellite datasets and evaluating the impact of different input feature combinations on classification accuracy in the Beterou catchment, situated in the northern part of Benin. Landsat-8 and Sentinel-2 images from June 1, 2020, to March 31, 2021, were utilized. Employing the Random Forest (RF) algorithm on Google Earth Engine (GEE), a supervised classification categorized the land into five classes: forest, savannas, cropland, settlement, and water bodies. GEE was chosen due to its high-performance computing capabilities, mitigating computational burdens associated with traditional land cover classification methods. By eliminating the need for individual satellite image downloads and providing access to an extensive archive of remote sensing data, GEE facilitated efficient model training on remote sensing data. The study achieved commendable overall accuracy (OA), ranging from 84% to 85%, even without incorporating spectral indices and terrain metrics into the model. Notably, the inclusion of additional input sources, specifically terrain features like slope and elevation, enhanced classification accuracy. The highest accuracy was achieved with Sentinel-2 (OA = 91%, Kappa = 0.88), slightly surpassing Landsat-8 (OA = 90%, Kappa = 0.87). This underscores the significance of combining diverse input sources for optimal accuracy in land cover mapping. The methodology presented herein not only enables the creation of precise, expeditious land cover maps but also demonstrates the prowess of cloud computing through GEE for large-scale land cover mapping with remarkable accuracy. The study emphasizes the synergy of different input sources to achieve superior accuracy. As a future recommendation, the application of Light Detection and Ranging (LiDAR) technology is proposed to enhance vegetation type differentiation in the Beterou catchment. Additionally, a cross-comparison between Sentinel-2 and Landsat-8 for assessing long-term land cover changes is suggested.

Keywords : land cover mapping, Google Earth Engine, random forest, Beterou catchment
Conference Title : ICLUPGRSOM 2024 : International Conference on Land Use Planning, GIS, Remote Sensing and Ocean Mapping
Conference Location : Madrid, Spain
Conference Dates : March 18-19, 2024