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Producing a High-Resolution Land Cover Map for Southwest Ethiopia Using Sentinel-2 Images and Google Earth Engine

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Accurate knowledge of local land cover and land use and their changes is crucial for many different applications such as natural resources management, environmental studies, ecological and biodiversity change evaluations, and food security. Global landcover maps can be useful datasets as a reference source and starting points, however, they usually show areas of geographical disagreements when compared to one another. Moreover, the global land cover products mostly generalize different land cover types which may not fit exactly to the specific needs of different projects and user communities. For instance, different types of forests are mostly considered as one category as they are not easy to be differentiated. In this study, we used high-resolution time-series images of Sentinel-2 to produce a local land cover for southwest Ethiopia with focusing on 8 major land cover classes: Forests, Plantations of exotic trees, Woodlands, Home Gardens, Annual crop fields, Grazing Wetlands, Urban areas, and Open water bodies. We also utilized high-resolution google map satellite imagery and the local expert knowledge on the study area to produce an observational dataset for training and validating steps. Different machine learning algorithms, land cover combinations, and seasonal scenarios were also used to produce the best local land cover map for the study area. For this purpose, a two-step approach was implemented to produce the final high-resolution land cover map. Firstly, we produced the best individual maps for each landcover class based on the highest producer accuracy among different scenarios. Then to produce the final land cover map for all land cover classes, all individual maps were combined by using the consumer accuracy index. For this, we found the most accurate land cover class for each pixel based on the highest consumer accuracy across all individually produced maps in the first step. In the end, we evaluated the results by the validation dataset and using different confusion indices. The final high-resolution land cover map produced in this study showed us the combination of remote sensing and local field-based knowledge in cloud computing platforms like google earth engine (GEE) improves the mapping of different land cover classes across southwest Ethiopia.

Keywords: Land cover map; Sentinel-2; High resolution; Machine Learning; Google Earth Engine;

Ethiopia