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Classifying land cover from an object-oriented approach – applied to LANDSAT 8 at the regional scale of the Lake Tana Basin (Ethiopia)

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Object-oriented image classification has been gaining prominence in the field of remote sensing and provides a valid alternative to the 'traditional' pixel based methods. Recent studies have proven the superiority of the object-based approach. So far, object-oriented land cover classifications have been applied either at limited spatial coverages (ranging 2 to 1091 km2) or by using very high resolution (0.5-16 m) imageries. The main aim of this study is to drive land cover information for large area from Landsat 8 OLI surface reflectance using the Estimation of Scale Parameter (ESP) tool and the object oriented software eCognition. The available land cover map of Lake Tana Basin (Ethiopia) is about 20 years old with a courser spatial scale (1:250,000) and has limited use for environmental modelling and monitoring studies. Up-to-date and basin wide land cover maps are essential to overcome haphazard natural resources management, land degradation and reduced agricultural production. Indeed, object-oriented approach involves image segmentation prior to classification, i.e. adjacent similar pixels are aggregated into segments as long as the heterogeneity in the spectral and spatial domains is minimized. For each segmented object, different attributes (spectral, textural and shape) were calculated and used for in subsequent classification analysis. Moreover, the commonly used error matrix is employed to determine the quality of the land cover map. As a result, the multiresolution segmentation (with parameters of scale=30, shape=0.3 and Compactness=0.7) produces highly homogeneous image objects as it is observed in different sample locations in google earth. Out of the 15,089 km2 area of the basin, cultivated land is dominant (69%) followed by water bodies (21%), grassland (4.8%), forest (3.7%) and shrubs (1.1%). Wetlands, artificial surfaces and bare land cover only about 1% of the basin. The overall classification accuracy is 80% with a Kappa coefficient of 0.75. With regard to individual classes, the classification show higher Producer's and User's accuracy (above 84%) for cultivated land, water bodies and forest, but lower (less than 70%) for shrubs, bare land and grassland.

Key words: accuracy assessment, eCognition, Estimation of Scale Parameter, land cover, Landsat 8, remote sensing