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Research Article

Investigating Land Use and Land Cover Dynamics: Past Trends and Future Implications for Ecosystem Functioning in the Upper Awash Subbasin, Ethiopia

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ABSTRACT

Land use/land cover (LULC) changes have substantial impacts on humans and the environment globally. In Ethiopia, these dynamics have led to significant socio-ecological consequences. However, most existing studies focus on historical patterns and provide limited spatially explicit future projections. This study quantified the spatiotemporal dynamics and future projections of LULC in the Upper Awash Subbasin (UASB), Ethiopia. Landsat satellite imagery was classified using the Random Forest algorithm in Google Earth Engine. While future LULC for 2040 and 2060 were simulated using the MOLUSCE with a Cellular Automata – Artificial Neural Network. Results indicate that cropland dominated the landscape, accounting for approximately 57% during 1980 and projected to reach 77.5% by 2060. Settlement areas expanded by 132% between 1980 and 2020 and are projected to expand by 205% by 2060. The forest declined by 79.5% from 1980 to 2000, followed by an increase of 121% between 2000 and 2020, although it remained below the extent recorded in 1980. On the contrary, grasslands declined by 86.4% between 1980 and 2060. Overall, settlement and croplands have expanded at the expense of forests, grasslands, and shrublands. With current trajectories, grasslands may become ecologically insignificant, suggesting the urgent need for ecosystem restoration and land-use planning strategies.

KEYWORDS:

Deforestation ecosystem degradation land conversion prediction