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Predicting land use/cover changes and its association to agricultural production on the slopes of Mount Kilimanjaro, Tanzania

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Abstract

Increasing demand for food production results in Land use and land cover (LULC) changes, which afflicts the provision of ecosystem services in high mountain areas. This work used time-series LULC and selected spatial metrics to predict the LULC changes for Kikafu-Weruwere-Karanga (KWK) watershed (on the southern slopes of Mt. Kilimanjaro) for the next decade. LULC maps were generated by classifying time-series satellite images. We further predicted the implications for selected staple crop production over the next decade. The simulated LULC shows expansion in built-up (by 32.55%/27.04 km²) and agriculture (by 39.52%/52.0 km²) areas from 2018 to 2030. These results suggest that urbanization is likely the next biggest threat to water availability and food production. Grasslands and wetlands are expected to decrease by 57.24% and 39.29%, respectively. The forest area is likely to shrink by 6.37%, about 9.82 km², and 1.26 km² being converted to agriculture and built-up areas, respectively. However, expansion in agricultural land shows very little increase in staple food crop production records, suggesting that farm size plays a minor role in increasing crop production. Predicting the near future LULC around KWK is useful for evaluating the likelihood of achieving development and conservation targets that are set locally, nationally and internationally.

Keywords

Land use/cover; Change and distribution; Anthropogenic activities; Remote sensing; Mount Kilimanjaro