ID 110

GIS-based classification of the land use of man-made reservoirs and ponds for agricultural use

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Abstract
Irrigated agriculture in Sri Lanka is mainly sourced from reservoirs and ponds spread across the country. These reservoirs and ponds, however, cannot be efficiently used due to the issues such as imprecise mapping, in accurate classification and lack of scheduled maintenance. The objective of the study was to develop a classification model to monitor the land-use of reservoirs and ponds that can be used for agricultural purposes in North Central Province using Remote Sensing (RS) and Geographic Information Systems (GIS) in conjunction with supervised classification. The study applies supervised classification and index-based approaches to identify reservoirs and ponds and major forms of Land Use Land Cover (LULC) in the study area. This study analyses the Landsat 8 bands from 2016 to 2021. The Maximum Likelihood Classification (MLC) and Interactive Supervised Classification (ISC) have shown promising results. In addition, Normalized Difference Vegetation Index (NDVI), Normalized Difference Water Index (NDWI), Modified Normalized Difference Water Index (MNDWI), and Automated Water Extraction Indices (AWEI-1 and AWEI-2) can be used to verify our findings. Our approach uses resultant raster layers to establish the ground. Maximum Likelihood Classification records the highest overall prediction accuracy with 70%. AWEI-I and MNDWI indices were able to identify water at accuracies of 93% and 87%, respectively. This makes the AEWI-I index to be the most promising index to identify water bodies. Extracted tank layer classifies irrigation tanks into large, medium, and small categories. This includes 13 large-scale reservoirs, 41 medium-scale reservoirs and 3519 small-scale. In summary, the model classifies 3572 tanks in the study area. It can map 1036 tanks with the existing physical labels. However, model predicts 2536 tanks without labels.

Keywords: Automated water extraction index, Classification model, Geographic information systems Irrigated agriculture, Remote sensing

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