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Agricultural crop mapping and classification by Landsat images to evaluate water use in the Lake Urmia basin, North-west Iran

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Lake Urmia, once one of the largest hypersaline lakes in the world has lost more than 90% of its surface body mainly due to the intensive expansion of agriculture, using more than 90% of all water in the region. Access to accurate and up-to-date information on the extent and distribution of individual crop types, associated with land use changes and practices, has significant value in intensively agricultural regions. Explicit information of croplands can be useful for sustainable water resources, land and agriculture planning and management. Remote sensing, has been proven to be a more cost-effective alternative to the traditional statistically-based ground surveys for crop coverage areas that are costly and provide insufficient information. Satellite images along with ground surveys can provide the necessary information of spatial coverage and spectral responses of croplands for sustainable agricultural management. This study strives to differentiate different crop types and agricultural practices to achieve a higher detailed crop map of the Lake Urmia basin. The mapping approach consists of a two-stage supervised classification of multi-temporal multi-spectral high resolution images obtained from Landsat imagery archive. Irrigated and non-irrigated croplands and orchards were separated from other major land covers (urban, ranges, bare-lands, and water) in the region by means of maximum Likelihood supervised classification method. The field data collected during 2015 and land use maps generated in 2007 and Google Earth comparisons were used to form a training data set to perform the supervised classification. In the second stage, non-agricultural lands were masked and the supervised classification was applied on the Landsat images stack to identify seven major croplands in the region (wheat and barley, beetroot, corn, sunflower, alfalfa, vineyards, and apple orchards). The obtained results can be of significant value to the Urmia Lake restoration efforts which suffer from incomplete knowledge of the root causes of the lake‘s drying, including the extent of upstream water uses for agriculture.