IMPROVEMENT OF LAND COVER CLASSIFICATION USING MULTI-BAND IMAGE COMPOSITION ANCILLARY GEOGRAPHIC INFORMATION

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ABSTRACT: Remote sensing data and various classifier methods are applied to obtain more accurate information on land cover (LC). However, the topographic effect, seasonal vegetation condition, heterogeneous land practice, and similar reflectance among different land objects are still challenges for image classification. This research will compare the classification accuracies by applying different indicator selection subsets (ISS) to explore whether LC classification can be improved when additional image-derived indexes and ancillary geographic information are incorporated. Specifically, twenty-three indicators, including Landsat spectral bands, vegetation indexes, geomorphological topography data, distance to the road, and road density, are used in image classification practice. All data were grouped into three different ISS. The first group (ISS1) only considers six spectral bands of Landsat data, the second group (ISS2) includes ISS1 and six more vegetation indexes, and the third group (ISS3) covers ISS1, ISS2, and added eleven ancillary geographic indicators. The random forest classifier is applied for LC classification in the Northern part of Taiwan. Subsequently, the land cover map in 1995 north of Taiwan with eight land cover types (bare land, waterbody, build-up area, cropland, grass, forest, riverbed, and cloud) are classified with different accuracies. Overall accuracy values are 87.8%, 88.8%, and 97.5% for ISS1, ISS2, and ISS3, respectively. The misclassification of the riverbed, cropland, grass, build-up, and bare land is much improved with ISS3. Additionally, the contribution analysis reveals the effect of each indicator in the classification performance that is also figured out in this work based on the function of the random forest method. This study concludes that a more accurate LC map can be obtained when incorporating multi-band image composition and ancillary geographic data in the classification scheme and therefore provide reliable data for land use planning and land management.

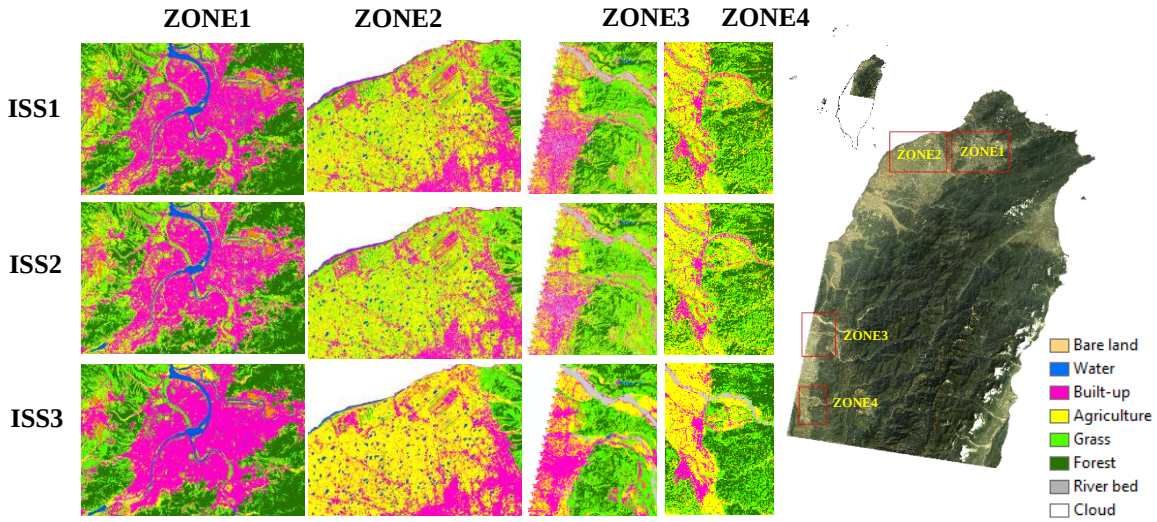

Figure. Land cover classification results are based on different indicator selection subsets (ISS). The right image is clipped from a scene of Landsat-5 acquired 25/11/1995

Table. Accuracy assessment

		Bare land	Waterbody	Build up	Cropland	Grass	Forest	River-bed	Cloud	Overall Accuracy
ISS1	*Producer' acc*	0.710	0.919	0.695	0.921	0.524	0.994	0.692	0.928	Acc : 0.878
	User' acc	0.996	0.897	0.849	0.619	0.388	0.944	0.967	0.999	Kappa: 0.831
ISS2	*Producer' acc*	0.739	0.999	0.680	0.921	0.818	0.997	0.661	0.902	Acc : 0.888
	User'acc	0.992	0.897	0.939	0.655	0.458	0.939	0.954	0.999	Kappa: 0.844
ISS3	*Producer' acc*	0.739	0.999	0.680	0.921	0.818	0.997	0.661	0.902	Acc : 0.975
	User'acc	0.992	0.897	0.939	0.655	0.458	0.939	0.954	0.999	Kappa: 0.966

(note: Acc means Accuracy)

KEYWORDS: land cover, image classification, multi-band image composition, ancillary geographic information, random forest classifier.