

Land cover classification using multi-temporal satellite images in a subtropical area

Mitsunori Ishihara^{1*}, Hitoshi Hasegawa², Shigeki Yasumura³, Seiji Hayashi¹, Hiroya Yamano¹

¹NIES, ²Kokushikan University, ³WWF Japan

In Okinawa, red soil runoff has been a serious problem because of many land improvement projects. The red soil runoff causes water pollution of rivers and environmental degradation in coral area. To countermeasure these issues, it is important to understand the spatial change of agricultural areas, which are the source of red soil, and estimate the amount of the red soil outflow quantitatively. Many land cover classifications have been performed based on ground survey and aerial photographs so far, but it has been difficult to elucidate seasonal and annual changes (timing of harvesting that cause exposure of bare soil, etc.) in agricultural areas. Because high spatial resolution satellite images are available to observe large areas with high frequency, it would be possible to classify land cover based on seasonal land cover change patterns. In this study, we developed a land cover classification method using multi-temporal satellite images. This method was evaluated in the Todoroki River watershed, Ishigaki Island, Okinawa, Japan.

Six satellite images, including winter and summer from 2006 to 2008, were used. This data set included several satellite data, ALOS/AVNIR2 (spatial resolution: 10 m), SPOT/HRV and HRG (20 and 10 m) and FORMOSAT-2 (8 m). Four land-cover maps made by ground survey in 2004 and 2005 were used for ground verification of the classification results. The land cover classification was performed using the decision tree method considering the crop calendar and the time-series NDVI (Normalized Difference Vegetation Index) that was calculated from the satellite data. The main crops in this study site were sugar cane, pineapple, rice and grassland. Because crop calendars of these crops show specific patterns, the crops were classified successfully by time-series NDVI values, considering the cultivation periods.

Our method showed better classification accuracy than that based on other traditional method (ISODATA). The land cover classification method proposed in the present study can be applied in other tropical and subtropical areas that have similar crops.