Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

HTT29-P01 Room:Convention Hall Time:May 24 18:15-19:30

Preliminary study on detection limits of abandoned farmlands using NDVI and NDWI time-series data

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Increase of abandoned farmlands is gaining attention in Japan as a problem causing difficulties such as: expansion of breeding habitat potentially preferred by vermin; increase of small parcels where illegal dumping occurs; and deterioration of rural landscapes. To address this problem, it is important to periodically survey the extent and distribution of abandoned farmlands over a broad spatial range. However, conventional surveying methods are labor intensive and time-consuming, requiring surveyors to cover every parcel often situated in hostile locations.

Remote sensing provides us with a low cost, repeatable alternative means for broad-scale mapping of abandoned farmlands. A previous study suggested that Normalized Difference Vegetation Index (NDVI) derived from remotely-sensed data could have potential to discriminate an abandoned paddy from a paddy area since the difference in NDVI becomes significant at the periods of one month after planting and two months after harvesting. Normalized Difference Water Index (NDWI) was also applied successfully to detecting changes in agricultural activity in a paddy area. However, the success of previous studies depends on acquiring data not affected by cloud contamination at the suitable timing in terms of crop calendar.

The objective of this study is to assess the detection limit of an abandoned paddy using the time-series data derived from MODIS surface-reflectance products. Firstly we refined the time-series reflectance data by removing the effects of cloud contamination based on the Savitzky-Golay filter. Secondly a simple linear mixture model was adopted to estimate temporal signatures of underlying end-member landcover types and simulate mixed signatures at different end-member compositions. Thirdly we calculated NDVI and NDWI time series using the simulated signatures and explored the minimum fraction of abandoned paddy potentially including the signal relevant to cessation of agricultural activity. Preliminary results showed that successful detection is limited to the pixel dominated by abandoned paddy areas.

Keywords: abandoned farmland, spatial resolution, temporal resolution, time-series analysis, mixed pixel

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Evaluation of land cover classification methods targeting unmanaged farmland

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In order to reveal the impact of evacuation on biota, National Institute for Environmental Studies is monitoring biota in areas evacuated as a result of nuclear disaster, and the surrounding areas in Fukushima Prefecture, Japan. It includes the monitoring of ”land cover” in the study area. This involves regular observation of areas that contain ”residential area” and ”arable land”, where humans have historically performed regular maintenance. These are fundamental elements to discuss the change of local ecosystems due to abandonment. Areas of arable land in the study area are much greater than the residential areas. For this reason, priority should be given to the analysis of arable land. Environmental change in unattended farmland associated with evacuation is relatively quick. And the physical environment of arable land typified by moisture condition is different for each paddy and upland field plot. Therefore, it is necessary to monitor field plots with distinguishable spatial resolution in short cycles. This study evaluated land cover classification methods for arable land considering these requirements. Spaceborne satellite imagery was used with revisit time and spatial resolution matched to these conditions. Arable land in the study area was first defined by aerial photo interpretation. Then, using multi-temporal, multispectral imagery (RapidEye, spatial resolution = 5 m) and single polarization of L-band SAR imagery (PALSAR-2, spatial resolution = 3 m), land cover was categorized based on the machine learning classification methods with training data. Comparison of multiple methods and datasets revealed a classification technique that combines SAR data and multispectral imagery provided improved classification accuracy.

Keywords: unmanaged farmland, land cover, remote sensing, machine learning, SAR

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Monitoring and Analysis of Land use/cover change in Kashigar region Based on Landsat and Spot vegetation Data

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The spatio-temporal changes of land use / cover (LUCC)and its driving forces in Kashigar region, Xinjiang Province were analysed by satellite remote singing data. Main goal of this paper was to quantify drivers of LUCC using long term Landsat and Spot Vegetation data from 1972 to 2014. First ,we produced LUCC map by using Landsat images in 1972,1990,2000and 2014. Land use information from Landsat data was collected using maximum likelihood classification method.A hierarchical classification system of 16 land cover subclasses was applied to the Landsat data.The 16 subclasses of land cover were further grouped into 6 aggregated classes of land cover: urban,cropland, water,grass,bare land and glacier.Land use change was studied based on the change detection method of land use types.Second, Normalised Difference Snow Index(NDSI) values was calculated by Spot Vegetation data from 1999 to 2014. According to the snow index confirmed snow conditions of study area which is used to screen the LUCC and climate changes after snow cover map drawn.Third, driving forces were analysed according to climate changes and socioeconomic development.The climate data was obtained from CRU TS 3.21 about temperature and precipitation data. According to these data climate changes were compared with NDSI value,while the socioeconomic data was from the Xinjiang Statistical Yearbook(1984-2014). The study indicates that the increase of land use benefits was given more attention.The study suggests that the land use should be based on the sustainable protection of arid environment on the Kashigar region.

Keywords: Land use /cover change, driving force, snow index, Kashigar region

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The Relationship between the Food production and Water Resources of Xinjiang Provence

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In this study, To identify the relevance of snow cover and food production which is the main snow-ice malted water resources for an arid and semi-arid region of Xinjiang province, by Spot Vegetation data(1999-2012years).First,calculated Normalised Difference Snow Index(NDSI) by Spot Vegetation data. Second, according to the NDSI value snow cover map of study area drown. Third, examined and analyzed spatiotemporal changes of snow cover area of study area. In addition from the Xinjiang statistical yearbook extracted cultivated land area and effective irrigation area data further digitized by GIS making map and analyzed spatial variations of food production stouts in Xinjiang province.

The result of the spatiotemporal changes of snow cover area was that the snow caver area is increased from 9636.5000km to 13957.2000km from 1999 to 2012. it has been increasing approximately by 4320.5000km in the recent 14 years.Remarkable increasing has happened that the snow cover area at

Kulun mountains side of North Xinjiang. Tianshan Mountain‘s snow cover areas also has increased but shows fluctuated trend.It was confirmed that Xinjiang statistic yearbook shows that cultivated land area and effective irrigation areas are increased same results that snow cover area are increased especially in fan-like area around at Kunlun Moutian side of North Xinjiang.

Keywords: Xinjiang uyghur autonomous region, Food production, Snow area, Water, SPOT/VEGETATION, NDSI