Rice planted area mapping using ALOS-2 ScanSAR data with Machine Learning Algorithm

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Rapid population and economic growth, and the increase in extreme weather events, are destabilizing global food security. Rice is a staple cereal crop in Asia, and the continent accounts for about 90% of global rice production and consumption. Rice is mainly cultivated in the rainy season, and the high density of cloud cover during that season limits the observations that can be made from space using only optical sensors. In contrast, Synthetic Aperture Radar (SAR) is a robust tool because it penetrates cloud cover. And also, machine learning technology has been dramatically developed recent years and this technology was used in a lot of land cover related research and distinct results were reported. In this research, machine learning algorithm was applied to ALOS-2 PALSAR-2 ScanSAR data (dual pol. HH and HV) to identify rice planted area in South Asia. However, crop calendar of rice in the region is complicated because adequate temperature allows to plant rice every time if water resource and labor are available. In order to compensate crop calendar difference, time-series metrics such as min/max/range of HH or HV, correlation coefficient of HH and HV etc. were calculated during the determined cropping cycle. These metrics were used as input data to develop random forest classifier for four countries including Cambodia, Laos PDR, Thailand, and Vietnam. Test accuracies of the model for each country were evaluated using the half of training data and the results showed high accuracy. In addition, the resulted rice-planted are map were compared with existing rice maps developed by other satellite such as Sentinel-, Radarsat-2, Landsat and some differences were observed between the maps, but high consistency was confirmed. Rice planted area is fundamental information for national agricultural related policy, our result would improve our ability to estimate rice crop production, and also quantify the carbon, water balance or methane emission via paddy fields.

Keywords: ALOS-2, Machine Learning, Rice planted area, Lower Mekon River countries