Rice Crop Monitoring by using Multiple Satellite Sensors

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Rapid population and economic growth, and the increase in extreme weather events, are destabilizing global food security. In Asia, rice is a staple cereal crop, and the continent accounts for about 90% of global rice production and consumption. The Group on Earth Observations (GEO) Global Agricultural Monitoring (GLAM) was launched in 2011 to utilize remote sensing tools to enhance crop production projections in order to promote food security and foster sustainable economic growth. Asia-Rice Crop Estimation & Monitoring (Asia-RiCE) is a component of GEOGLAM, and aims to use remote sensing tools to develop rice-related information such as maps of paddy fields, rice growing conditions, yield, and production. 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; however, the revisit frequency of a single SAR satellite is limited, making it difficult to capture the complicated rice crop calendar in Asia. In this research, SAR data (ALOS-2 PALSAR-2 etc.), and optical global imager data (MODIS) were utilized to monitor rice crops in Asia. Rice crop growth can be estimated from backscattering coefficient measured by ALOS-2 or vegetation index such as NDVI or EVI by MODIS. In addition, microwave radiometer (AMSR2) was also used to identify surface water condition because AMSR2 36.5GHz data has high sensitivity to water, and it can penetrate cloud and capture surface water condition on a 2-3 days basis with 10 km spatial resolution. The integrated use of these satellite data enables us to capture rice growing and surface water condition during whole rice cropping cycle consists of planting, vegetative, reproductive, ripening, harvesting, and fallow seasons. These information can improve our ability to estimate rice crop yield/production and quantify the carbon or water balance in paddy fields and the methane emission from paddy fields.

Keywords: rice paddy, SAR, Microwave radiometer, Optical sensor

