Monitoring rice fallows in India using MODIS time series data

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Abstract: Cereals and grain legumes are the most important part of human diet and nutrition. The rural population of low income groups in dry land areas of India depends on these staples. Expansion of grain legumes with improved productivity to cater the growing population's nutritional security is of prime importance and need of the hour. Rice-fallows are best niche areas with residual moisture to grow short duration legumes there by achieving intensification. Identifying suitable areas for grain legumes and cereal grains is important in this region. In this context, the goal of this study was to map fallow lands followed by rainy season (*kharif*) rice cultivation or post rainy (*rabi*) fallows in rice growing environments for 2000-01 and 2010-11 using temporal moderate-resolution imaging Spectroradiometer (MODIS) data applying Spectral matching techniques. This study was conducted in India where different rice eco-systems exist. MODIS 16days normalized difference vegetation index (NDVI) at 250m spatial resolution and season wise intensive ground survey data were used to map rice systems and the fallows thereafter (*rabi*-fallows) in India. The rice maps were validated with independent ground survey data and compared with available sub-national level statistics. Overall accuracy and kappa coefficient estimated for rice classes were 81.5% and 0.79 respectively with ground survey data. The derived physical rice area and irrigated areas were highly correlated with the sub-national statistics with R^2 values of 84% at the district level for the year 2000-01 and 2010-11. Results clearly show that rice-fallows areas increased from 2000 when compared 2010. The results show spatial distribution of rice-fallows in India which are identified as target domains for sustainable intensification of short duration grain legumes, fixing the soil nitrogen and increasing incomes of small holder farmers.

Keywords: Seasonal rice mapping, Rice-fallows, MODIS 250m, NDVI, Spectral Matching techniques, Ground survey data, Grain legumes, Potential areas