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Remote sensing-based Information for crop monitoring: contribution of SAR and Moderate resolution optical data on Asian rice production

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Updated information on crop typology and status are strongly required to support suitable action to better manage agriculture production and reduce food insecurity. In this field, remote sensing has been demonstrated to be a suitable tool to monitor crop condition however rarely the tested system became really operative. The ones today available, such as the European Commission MARS, are mainly based on the analysis of NDVI time series and required ancillary external information like crop mask to interpret the seasonal signal. This condition is not always guarantied worldwide reducing the potentiality of the remote sensing monitoring. Moreover in tropical countries cloud contamination strongly reduce the possibility of using optical remote sensing data for crop monitoring.
In this framework we focused our analysis on the rice production monitoring in Asian tropical area. Rice is in fact the staple food for half of the world population (FAO 2004), in Asia almost 90% of the world's rice is produced and consumed and Rice and poverty often coincide. In this contest the production of reliable rice production information is of extreme interest.
We tried to address two important issue in terms of required geospatial information for crop monitoring: rice crop detection (rice map) and seasonal dynamics analysis (phenology). We use both SAR and Optical data in order to exploit the potential complementarity of this system. Multi-temporal ASAR Wide Swath data are in fact the best option to deal with cloud contamination. SAR can easily penetrate the clouds providing information on the surface target. Temporal analysis of archive ASAR data allowed to derived accurate map, at 100m spatial resolution, of permanent rice cultivated areas. On the other and high frequency revisiting optical data, in this case MODIS, have been used to extract seasonal information for the year under analysis. MOD09A1 Surface Reflectance 8-Day L3 Global 500m have been exploited to derive time series of Vegetation Index. A temporal smoothing procedure based on Savitzky–Golay polynomial filter function was applied to the original 8-day composite VI data (EVI and NDVI) in order to eliminate spurious data which affect the time series and to produce an interpolated VI temporal profile. Finally within the area previously identify as rice by SAR analysis phenological estimation have been conducted. Crop growth minima and maxima, respectively indicator of rice transplanting and heading, have been identify from the derivative analysis time series.
This procedure was tested in Bangladesh for the year 2011. Results showed that the combined use of both data typology represents the more suitable multisource framework to provide reliable information on rice crop growth. Preliminary maps analysis reveals how SAR rice detection was in agreement with local information and phenology extracted by MODIS data provided spatially distributed data comparable with local knowledge of crop calendar.