Short Abstract

Poster title:

High-resolution rice forecasting system based on earth observation and crop modelling

Authors:

[1]Guarneri T., [1]Pagani V., [1]Orlando F., [2]Ranghetti L., [2]Busetto L., [4]Campos-Taberner M., [1]Confalonieri R., [2]Boschetti M., [3]Holecz F., [4]Garcia-Haro F.J., [5]Romano F., [6]Katsantonis D., [7]Stavrakoudis D., [8]Granell C., [1]Bocchi S.

[1]University of Milan (DiSAA – Department of Agricultural and Environment Sciences, Production, Landscape, Agroenergy, Milan, Italy),
[2]National Research Council (IREA, Milan, Italy),
[3]SARMAP SA (Purasca,Switzerland),
[4]University of Valencia (Valencia, Spain),
[5]National Research Council (IMAA, Potenza, Italy),
[6]Hellenic Agricultural Organization (Ellinikis Georgikis Scholis, Greece),
[7]Aristotle University of Thessaloniki (Thessaloniki,Greece),
[8]Geospatial Technologies Research Group, Universitat Jaume I De Castellon (Castellon, Spain)

The agricultural sector, all over the world, is facing global challenges due to the pressures for food demand, a stronger commitment to resources conservation, and the increase of price-competition and volatility. In the same time, weather anomalies contribute to unexpected yield fluctuations. In this context, timely yield forecasts for rice (*Oryza sativa* L.), a crop with a key role for the food security in many countries, are strategic for a variety of private and institutional stakeholders.

The research aimed at implementing a rice forecasting system based on the integration between Earth Observation and crop modelling, able to provide at regional scale reliable and spatially-distributed information on rice distribution, seasonal growth dynamics, early yield forecasts and final estimation of yield at harvest.

The crop simulation model WARM, specific for rice, was parametrized with field data for specific varieties and used to carry out regional yield assessments in three Mediterranean countries responsible for 85% of total European rice production: Italy (51.9%), Spain (25.4%) and Greece (7.0%). For the main rice districts of the study areas (i.e. Piedmont/Lombardy, Valencian and Thessaloniki/Serres districts, respectively) input weather data (i.e., daily rainfall, global solar radiation, maximum and minimum air temperature) were obtained from the ECMWF reanalysis datasets downscaled using data from ground weather stations, in order to obtain a spatial resolution of 2 km × 2 km. Moreover, data about sowing date and leaf area index (LAI) were retrieved with the same spatial resolution from remote sensing (MODIS). Sowing dates were used to initialize the model, whereas LAI values were assimilated into the model to reduce the uncertainty and improve forecasts reliability.

WARM provided spatially-distributed simulations (2 km × 2 km) on potential and actual yield, the latter limited by pest damages (i.e., blast disease) and cold-shocks (inducing spikelet sterility). Data simulated at each elementary simulation units were aggregated at country scale and compared with those observed from official national statistics (2003-2014). Resulting values of R^2 (ranging from 0.19 to 0.93) and RRMSE (2.06 to 7.27) allowed defining results as fully satisfactory.

e-mail contact: tommaso.guarneri@unimi.it