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Using seasonal climate forecasts in dynamic crop model to predict rice yield

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Skillful seasonal climate predictions paired with a dynamical crop model can assist with agricultural management and help farmers minimize risk. However, until now, the potential benefits of this approach have not been assessed. The goal of this study was to link seasonal forecasts with the Cropping System Model (CSM)-CERES-Rice crop model of the Decision Support System for Agrotechnology Transfer (DSSAT) for predicting rice yield for Nepal's Terai. The predictive skill of the coupled forecast system model version 2 (CFSv2) hindcasts initialized at different lead times was examined against ERA-Interim reanalysis, weather station data and other observational data sets. Prior to running the hindcasts the CSM-CERES-Rice crop model was calibrated using the varietal trial data from the Hardinath station of the Nepal Agricultural Research Council and evaluated using the district yield data from the Ministry of Agriculture. Rice growth, development and yield, was simulated using weather station data, other observational datasets and daily hindcasts from CFSv2 at different lead times. The hindcasts simulation with the CSM-CERES-Rice model using station meteorological data shows that climatic variability, especially rainfall, can only explain a small part of the interannual variability of rice yield. This predictability is further reduced when using the forecasts. The results from our study indicate that the potential application of seasonal climate forecasts to the dynamical crop model, in the particular case here considered, is limited by the skill of the daily seasonal forecasts. Before generalizing, further comparisons should be made, including a similar analysis for an area where quality meteorological and agricultural data are available and where the seasonal forecasts exhibit better skill.

Keywords: CFSv2, DSSAT, CSM-CERES-Rice, climate variability