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Impact of climate warming on growth and production of irrigated and rainfed wheat and olive orchard in Tunisia and Morocco

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Crop models are valuable tools to assess the impacts of climate change on crop productivity and food security. Temperature and precipitation changes are likely to impact water availability, vegetation growth and length of the cultivation period and potential yields. In the Mediterranean regions, these changes may lead to a larger water demand and to water scarcity if the irrigation areas increase at the same rate as the current expansion. Therefore, it is important to quantify climate warming impacts in order to develop adaption strategies.

The impact of climate warming on crop yield was studied using 2 different crop models: the ORCHIDEE land surface model (Krinner et al., 2005), component of the IPSL climate model, and the WOFOST model (van Diepen et al., 1988, Boogaard et al., 1998) which is a crop model developed at ALTERRA. The 2 models were implemented and compared on instrumented sites in Morocco and Tunisia, cultivated in wheat and olive trees in both pluvial and irrigated conditions. This evaluation allows to demonstrate the ability of both models to simulate growth and yield of these two cultivations and their interannual variability.

In a second step, ORCHIDEE and WOFOST models were forced with present and future climate generated in the framework of the MedCordex project, the climate simulations were provided by 3 regional climate models (RCM) and 2 RCP scenarios (4.5 and 8.5). The multiple atmospheric forcings were first analyzed to assess the uncertainties in climate model predictions (temperature and precipitation). The crop model simulations are then discussed to estimate the impact of climate change on crop growth and yield, water demand and irrigation requirements to maintain present crop production. The tradeoff between wheat and olive trees cultivation is particularly studied.

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