Geophysical Research Abstracts
Vol. 19, EGU2017-7518-3, 2017
EGU General Assembly 2017

Assessment of 1.5°C and 2°C climate change scenarios impact on wheat production in Tunisia

karim Bergaoui (1,2), Makram Belhaj Fraj (1), Rashyd Zaaboul (1), Myles Allen (3), Dann Mitchell (4), Carl-Friedrich Schleussner (5), Fahad Saeed (5), and Rachael Mc Donnell (1)

(1) International Center for Biosaline Agriculture, Dubai, United Arab Emirates (k.bergaoui@biosaline.org.ae ; m.belhaj@biosaline.org.ae ; r.zaaboul@biosaline.org.ae ; r.mcdonnell@biosaline.org.ae), (2) Institut National de la Meteorologie de Tunis, Tunis, Tunisia (k.bergaoui@biosaline.org.ae), (3) University of Oxford, Oxford, United Kingdom (myles.allen@ouce.ox.ac.uk), (4) University of Bristol, Bristol, United Kingdom (d.m.mitchell@bristol.ac.uk), (5) Climate Analytics, Berlin, Germany (carl.schleussner@climateanalytics.org ; fahad.saeed@climateanalytics.org)

Wheat is the main staple crop in North Africa region and contributes the most to food security. It is almost entirely grown under rainfed conditions and its yield is highly impacted by the climate variability, e. g. dry winters, a late autumn or late spring. Irregular rainfall or drought events particularly at key stages of the growing season, lead to both early and terminal wheat stresses and high inter-year variation in yield.

The goal of this study was to explore the impacts of future climate on wheat production in Tunisia using an ensemble of regional bias corrected climate models outputs for the 1.5°C and 2°C warming above the pre-industrial levels. By examining the outputs on wheat yield levels the study would help answer the question of whether the ambitious climate change mitigation efforts involved in stabilizing temperatures at 1.5°C would bring the cereal yields needed in North Africa. Tunisia was chosen as the focus country because its wheat systems are found across a wide diversity in biophysical and farming conditions so giving insight on more localized effects. Data availability across a wide range of wheat management systems from subsistence farming systems to highly mechanized agribusinesses also supported work here as model results could be readily validated for the historical period.

Two scenarios were obtained using the RCP2.6 as boundary conditions for 1.5 scenario and a weighted combination of RCP2.6 and RCP4.5 for the 2°C scenario using their respective CO_2 levels in the future. We calibrated and validated a dynamical crop model, DSSAT, to simulate the national wheat production and to understand the impact of drought on growth and development that causes yield variation. DSSAT simulations were driven by CHIRPS and ERA-Interim reanalysis data as daily climate forcings. The simulations were validated in a set of farmer fields which were representative of the dominant cropping systems in the country. Then, the model was validated with 10 years' state-level production data. Finally, we forced the crop model with HAPPI bias corrected outputs using ISI-MIP approach where the trend and the long-term mean are well represented and we assessed the impact of each scenario on the wheat production at the national level.

The results highlighted a difference in wheat yield in some biophysical areas and farming systems. This insight is important as countries develop mitigation and adaptation strategies as the impact costs can be included.