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The impact of climate change in wheat and barley yields in the Iberian Peninsula

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World food and drink production largely depends on wheat and barley crops, which are the basis of nutrition for both humans and animals. The Iberian Peninsula (IP), and particularly Spain, is responsible for a large percentage of farming areas dedicated to these two crops. Furthermore, the IP is known as a prominent climate change hot spot, with expected rising temperatures and a decrease in mean precipitation (with more extreme events). Thus, it is vital to understand the effects of climate change in wheat and barley yields in the IP.

Multiple linear regression (MLR) models were developed based on the relation between temperature and precipitation and both crop yields, with the aim of projecting these into the future. Three main objectives were pursued: (1) to establish the existence of a relationship between wheat and barley yields and temperature and precipitation, taking advantage of data from the EURO-CORDEX regional climate models (RCMs) forced with ERA-Interim; (2) to calibrate and validate MLR models using a selection of predictors from the same EURO-CORDEX RCMs; and (3) to apply these MLR models to EURO-CORDEX RCMs forced with global climate models (GCMs) for an historical period (1971-2000) and two future periods (2041-2070 and 2071-2100) according to two greenhouse gas emission scenarios (RCP4.5 and RCP8.5). Results show a dichotomic behaviour of wheat and barley future yields depending on the crop's production region. Projections for the southern cluster of the IP show severe yield losses for both cereals, which may be a consequence of the increase in maximum temperatures in spring, particularly for RCP8.5 at the end of the 21st century. Conversely, projections for the northern cluster of the IP show an increase in yield output, which may be a result of the projected warming taking place within the early winter months.

This study reinforces the worth to implementing changes in the society to mitigate losses and to assess production gains/losses due to climate change. These may be implemented locally (different cultivar species), countrywide (implementing sustainable policies), or even globally (alleviate greenhouse gas emissions). This work was supported by project IMPECAF (PTDC/CTA-CLI/28902/2017), LEADING (PTDC/CTA-MET/28914/2017) and by IDL (UIDB/50019/2020).