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Modelling the impacts of climate change on wheat yield and field water balance over the Murray-Darling Basin in Australia

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Abstract: The study used a modelling approach to assess the potential impacts of likely climate change and increase in CO_2 concentration on wheat growth and water balance in Murray-Darling Basin (MDB) in Australia. Impacts of individual changes in temperature, rainfall or CO_2 concentration as well as 2050 and 2070 climate change scenarios were analysed. Along the E-W transects, wheat yield at warmer and drier western sites were simulated to be more sensitive to temperature increase than cooler and wetter eastern sites; along the S-N transects, there were no significant difference in wheat yield response within 1-3ºC temperature increase. Along the E-W and S-N transects, wheat at drier sites would benefit more than wetter sites from elevated [CO_2], but more sensitive to the decline in rainfall than in wetter sites. The increase in temperature only did not have much impact on water balance. Elevated [CO_2] increased the drainage in all the sites, especially at drier sites. Rainfall reduction decreased evapotranspiration, runoff and drainage, especially at drier sites.

In 2050, the most obvious increase of wheat yields under all climate change scenarios would occur at cooler and wetter sites (Yass and Young), ranging from 11.03% to 18.01%. The biggest loss occurred at the driest sites (Griffith and Swan hill) under A1FI and B2 scenarios, ranging from -6.34% to -16.76%. In 2070, there would be an increasing risk of yield loss in general, except for the cool and wet sites. Water use efficiency was simulated to increase at most of the study sites under all the climate change scenarios, except for the driest site.

Keywords: *Crop growth rate, Deep drainage, Wheat growth duration, APSIM*

Abstract only