Article title	Assessing water management effects on spring wheat yield in the Canadian Prairies using DSSAT wheat models
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Abstract	Canada is one of the top wheat grain exporters, with a share of more than 10% in the world wheat market. The majority of Canadian wheat production takes place in the Prairies where 6.2 million ha of the area is seeded to spring wheat. The climate is semiarid with an estimated precipitation deficit of about 300 mm during the crop growing season, indicating that water is the primary limiting factor for crop production. In this study, three DSSAT-Wheat models (CSM-CERES, -CROPSIM, -NWHEAT) were used to quantify the impacts of water management practices on crop water stress and wheat yields. The models were evaluated individually and as an ensemble against observed wheat performance using three field experiments conducted to investigate irrigation, rainfed, and summer fallow impacts on wheat yields. The results showed that all three wheat models well simulated grain yield gains with irrigation and summer fallow that conserved additional soil water. Statistically, the multimodel ensemble improved the accuracy in simulating grain yields and biomass of spring wheat under both irrigated and rainfed conditions. The improvements could not be linked to eco-physiological processes in crop systems, and the increased simulation accuracy was likely due to the offsetting effects of simulation bias and errors from the individual models. Water input (precipitation + irrigation) of 400 mm was sufficient to reach the highest yield of spring wheat cultivars in the Canadian Prairies. Irrigation of 200 mm was able to alleviate most of the crop water stress in the study region. Further simulation scenarios showed that irrigating spring wheat when soil moisture was below 50% of available water capacity (AWC) for plants led to high yield, low irrigation rates, and reduced evaporation for different soil textures. Combined with improved drought tolerance varieties, this irrigation regime provides good prospects for increasing wheat yield and water use efficiency.
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