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Improving crop simulation models to cope with crop responses to drought

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One of the most common risks to crop production is drought. Many National and International efforts are devoted to early forecast and management of drought. However, crop simulation models used to assess the impact of soil water deficit on crop growth, development, and yield many times are not sufficiently accurate. We modified CERES-Maize, one of the maize simulation models in DSSAT v4.5, to incorporate the anthesis-silking interval (ASI). Under stressful conditions, especially under drought, the emergence of silks in maize is delayed respect to pollen shed, resulting in reduced pollinated female flowers and therefore, decreased grain yield. To simulate the ASI component, two new cultivar-specific parameters are required controlling the non-stress ASI response, and the genotype sensitivity to drought. The new model was tested against field data collected under stress and non-stress conditions in Argentina and Zimbabwe, yielding good results. We compared the results of rainfed maize simulations using the CERES-Maize model equipped with and without the ASI component showing major differences in some drought-prone areas. The new model will be a useful tool to better assess the impact of drought on maize production, and the potential gains from drought-tolerant cultivars.