Yield gap of soybean crop estimated with AquaCrop model in central region Córdoba, Argentina

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Revista Argentina de Agrometeorología RADA, v. IX (2018): 1-19

Summary

The difference between potential and actual yield establishes the yield gap (Br) of a crop, an indicator used to evaluate the constraints that the environment imposes on its productivity. Under genetic, edaphical and management conditions constant over time, the main responsible for Br results from the climatic action that, in a sub-humid domain, is mainly linked to the variation of water supply and demand. From the information monitored in 2014-2015 in a soybean plot located south of Córdoba city, Argentina, AquaCrop model was calibrated to estimate Br and assess the climatic risk in this region. To assess the climatic influence retrospectively, a procedure was developed and verified that estimates the reference evapotranspiration (ET_o from the daily values of maximum and minimum temperature. These ET_o values together with the rainfall records, allowed to extend the evaluation between 1960 and 2012. According to the experimental results, the water productivity used to estimate the production of soybean biomass at a potential rate was 13.1 g m^{-2}. The observed values of crop coverage, aerial biomass and soil water in different sectors of the plot were similar to those estimated by AquaCrop, especially when considering particular surface water runoff conditions for each site. Making successive runs with AquaCrop for the sowing date of the calibration on November 22, around 42% of the crop seasons have Br less than 750 kg ha^{-1}, which increases as the relationship between supply and demand of water deteriorates. When analyzing the effect of different sowing opportunities, the results show that in 51% (27/53) of the years, the decision has relatively little influence on the productive outcome. The change of the planting opportunity in the remaining 49% increases the dispersion of Br, which allows discarding the earliest decisions (October 15 and expecting a 50 mm rainfall accumulation from September 20) because they present significantly ($P< 0.10$) higher values.

Key words: evapotranspiration; crop coverage; biomass; soil water; climate risk