A-02

Diversifying soybean production risk by managing planting date and maturity group

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Soybean (*Glycine max* (L.) Merr.) planting date (PD) and maturity group (MG) decisions can be used to manage production risk and profitability. Using data from a 3-yr PD study across nine locations or 91 site x year x PD combinations with MG 3 to 6 cultivars, DSSAT-CROPGRO, a biophysical crop simulation program, was calibrated and validated to offer prediction of yield, seed oil and protein concentration, irrigation needs as well as harvest date. Simulations using weather histories and soil parameters relevant for the study sites demonstrated an overall robust model performance for capturing MG x environment x management interactions. Hence, a database of model outcomes was generated that included 13 locations, 30-yr of historical weather data, eight cultivars from early MG 3 to late MG 6, 14 weekly PD, and two representative soils (silt loam and clay) for a total of 87,360 scenarios. A spreadsheet-based decision support software, SOYRISK, was then developed to allow producer web-based access to developing environment-specific simulated soybean performance expectations that would vary by MG and PD using that database. Users specify irrigation costs details (depth to water, furrow/flood/center pivot/diesel/electric), non-irrigation related production costs that do not vary by MG or PD, and their soybean price expectation (including an option for seasonal and soybean oil/protein based quality premiums or discounts). Using portfolio theory, SOYRISK then compares the user-specified initial MG x PD choices (e.g. 50% MG 3 planted early & 50% MG 5 planted late) to management alternatives optimized to achieve: i) maximum profit at equal or lesser production risk; ii) minimum risk at equal or greater profit; and iii) a user-specified irrigation constraint. The user can further constrain the solutions to planting windows from March to May, April to June, May to June or June only.