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Field Forecasting Tool®: a web application based on a mechanistic crop modeling to support soybean growers' pro-active decision making

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iTK collaborates with Winfield United® to develop a web-based application, Field Forecasting Tool® (FFT), to support and improve decision making of corn, soybean and wheat for retailers and their growers. FFT provides relevant insights to growers to help them optimize their return on Investment by pro-actively adapting their input practices throughout the growing season. Regarding the soybean model, it includes the simulation of growth stages, leaf growth, production of biomass, uptake of Water, Nitrogen, Potassium and allocation among the organs. The plant model is coupled with a weather model and a soil model that predicts the amounts of available Nitrogen, Potassium and Water in the root zone. Our model is the first one to combine the effects of Nitrogen, Potassium and Water stresses on soybean growth and development. Plant growth is simulated daily under potential conditions (no water, nitrogen or potassium stresses), then yield loss (yield that cannot be recovered because of past stresses) and yield gap (yield that can be reached if no more stress occurs until the harvest) are computed to allow the growers to adjust their in-season input practices. Throughout the growing season, the model is adjusted by measured Nitrogen and Potassium leaf contents of a petiole tissue sample and by user inputted observed dates of growth stages to improve predictions. The major challenge of developing such a crop model for operational use is to have good predictions and robustness while asking growers for limited data entry. Our model has been calibrated and evaluated over 431 locations in the US, covering maturity groups 1 to 5. In the calibration and evaluation datasets, the RRMSE is equal to 20% proving the robustness of our model. Today, genotypic variability is considered through the effect of the maturity group on phenology, leaf growth and biomass production. We look to build on the robustness of the model by refining its hybrid-specificity with the latest advances on QTL mapping.