

Agroecosystem Model Simulations Reveal Spatial Variability in Relative Productivity in Biomass Sorghum and Maize in Iowa, USA

Background/Objective

- Biomass sorghum has emerged as a candidate bioenergy crop that has not been widely grown in the U.S.
- Corn has been produced at large scale in the U.S. for biofuels, with the state of Iowa leading both corn and ethanol production.
- This study aims to compare the bioenergy potential of bioenergy sorghum to that of corn.

Approach

Researchers collected biophysical data on biomass sorghum grown in Iowa for two growing seasons (2019, 2020), which were used to develop a biomass sorghum module in the Agro-IBIS agroecosystem model. This model was used to predict the potential performance of biomass sorghum across Iowa in comparison to corn.

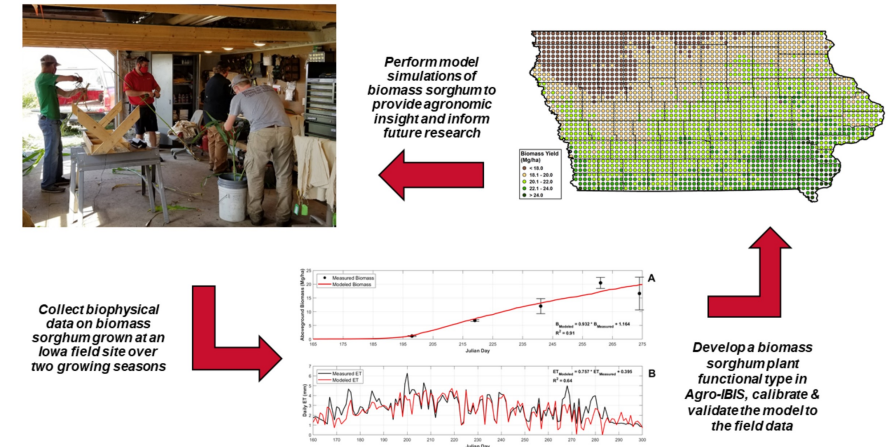
Results

Average biomass yield for sorghum was lower (17.20 Mg/ha) than for corn (22.02 Mg/ha). Calibration of the Agro-IBIS model with measured values yielded close agreement between model output and measured values. Comparison of model outputs for sorghum with that for corn showed that only 3.4% of the state had biomass sorghum yield significantly greater than corn and only 0.3% had greater energy ethanol yield for sorghum than for corn.

Significance/Impacts

This work indicates that biomass sorghum must be improved in order to be competitive with corn as an annual biofuel crop in Iowa and serves as a baseline against which future improvements in stress tolerance and biomass yield may be measured.

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The flow of data and activities used to generate, calibrate, evaluate and extrapolate the Agro-IBIS sorghum module and simulations.