Crop and Ethanol Yield and Nitrogen Use Efficiency of High-Biomass Sorghum

High-biomass sorghum could potentially produce high yields in the U.S. Midwest with minimal fertilizer inputs. However, little is known about its yield response, N uptake, nitrogen use efficiency (NUE), and nitrogen recovery efficiency (NRE) at varying N fertilization rates when grown for lignocellulosic ethanol.

In a recent study reported in Agronomy Journal, researchers at the University of Missouri applied five rates of N urea fertilizer (0–224 kg N ha\(^{-1}\)) to two varieties of high-biomass sorghum in two years. They were interested in not only determining biomass yields, but also theoretical ethanol yield, N recovery efficiency (NRE), and N use efficiency (NUE).

No biomass yield differences were observed between the two varieties in either year, but yields and N-related measures differed with the distinct weather conditions between the two years. One year, marked by adverse weather events, they found no differences in yield or other N-related measures in response to N rate—including no N fertilizer. In the other year, they found no difference in yield among N-fertilized treatments, but yields were greater than when no N was applied. The NRE was greatest at 56 kg N ha\(^{-1}\), 60% greater than at the highest N rates (168 and 224 kg N ha\(^{-1}\)). Nitrogen use efficiency remained high across all N rates.

Given the typically variable weather in this region and the lack of differences in yield and N-related measures, the data suggest that these sorghum varieties can be grown with limited N inputs and are suitable for marginal lands.