

# Research Background: Comparing Bioenergy Crop Biomass



*The experimental bioenergy crop farm has multiple plots of each crop planted in a grid.*

In the middle of Wisconsin's lush farmland, there are sixty quarter-acre plots neatly laid out separated by grassy lanes. Poplar saplings grow in one plot. Corn in another. A third one contains a mix of prairie grasses. A patch of miscanthus grass, taller than a person, stands between a plot of switchgrass and a patch of "weeds." What is going on here?

The answer is a farming experiment that was started in 2008. Each plot grows a crop that can be used to produce biofuels, a renewable replacement for the fossil fuels that power our cars, trucks, trains and planes. At the Great Lakes Bioenergy Research Center (GLBRC), scientists and engineers are attempting to figure out how to produce biofuels from plant material such as corn stalks and cobs (stover), grass and wood. Dr. Gregg Sanford, the lead scientist conducting this farm experiment, wants to find out how much plant material, also called biomass, can be harvested from different crops like corn, grasses, weeds and trees.

Dr. Sanford and his team know that corn is one of the best crops for producing a lot of biomass. But there are also drawbacks to using corn. Corn is an annual, which means farmers have to plant it every year. This takes more time, energy and money. To grow corn, farmers also have to use a lot of chemical fertilizers and pesticides which harm the environment. Many people also think that corn should be used for food instead of biofuels.

To avoid these problems associated with an annual food crop like corn, Dr. Sanford is growing and studying perennial crops, like switchgrass, prairie, poplar trees, and miscanthus grass. These perennials grow back year after year without replanting. The crops can grow in areas not suitable for food crops and require much less chemical fertilizers and pesticides. Perennial crops could be a more efficient and sustainable option for producing biofuels, but Dr. Sanford doesn't know if they can compete with corn in terms of biomass production.

To answer this question, they grew multiple plots of six different biofuel crops on experimental farms in Wisconsin and Michigan. By conducting the same experiment in the two states, they were able to get more information about how well different crops grow in different soils and climates. The soils in Wisconsin were more fertile but the climate colder, while the soils at the Michigan site were less fertile but the climate warmer. At each farm, they grew plots of corn to be compared to five perennial crops: switchgrass, miscanthus grass, poplar saplings, prairie and weedy fields. Every fall the scientists harvested, dried and then weighed the biomass from each plot. They continued taking measurements for five years and then calculated the average biomass production per year for each crop at each site.



*Switchgrass harvest: Researchers harvest the crops in the fall. Then they dry, weigh, and compare the biomass.*