



Comparison of Biofuel Systems (COBS) Project: Biomass energy conversion and energy return on investment analyses for 2012 growing season

Abstract: From 2009-2012 the COBS team used a standard method to estimate carbohydrates in the biomass harvested from the biofuel systems in order to determine the cellulosic yields. This project performed the same analysis for 2012 harvested biomass, and further analyzed biomass from 2009-2012 using a method that is less commonly used due to its expense, but is much more accurate.

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Biomass from 2009-2012 was analyzed using a standard method and a very accurate, but expensive method. Results showed that if the goal of the study is to evaluate biomass ethanol conversion potential, the expensive method should be used. If the goal is to compare ethanol yields per unit land area, assuming constant values from literature or utilizing data from the standard method is acceptable.



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What was done and why?

This project was an integral piece of a larger collaborative project studying tradeoffs associated with potential Midwestern biofuel systems titled Comparison of Biofuel Systems, or COBS. The COBS project was established in 2008, and biomass from 2009-2011 had been analyzed for carbohydrate content (which is used to calculate potential cellulosic ethanol yields) using a standard method of estimation. Iowa suffered an extreme drought in 2012, yet data collection and energy calculations for that year were vital for obtaining a robust data set that represents possible extreme weather years. In 2013 investigators proposed to analyze 2012 biomass for theoretical energy yields using the standard method of carbohydrate content estimation. Additionally, because the COBS project is a long-term study, they planned to analyze biomass from 2009-2012 using a more expensive, but very accurate method in order to evaluate the most resource efficient method for future study years.

The project objectives were to address these questions:

1. Does the standard method for estimating carbohydrate contents of biomass accurately capture differences in carbohydrate contents?
2. How does the method of carbohydrate content estimation affect theoretical ethanol yields per unit land area?

What did we learn?

The first generation of cellulosic ethanol plants in Iowa is accepting maize stover as a feedstock. This study indicates prairie biomass (both un- and N-fertilized) exhibits a range of carbohydrate contents comparable to corn stover. Therefore, should a farmer within the harvesting radius of these industries choose to plant prairie plants, it is feasible that these industries could accept prairie biomass as a feedstock with minimal processing changes. This topic requires more research, but the preliminary findings are encouraging.