Comparison of Biofuel Systems: COBS

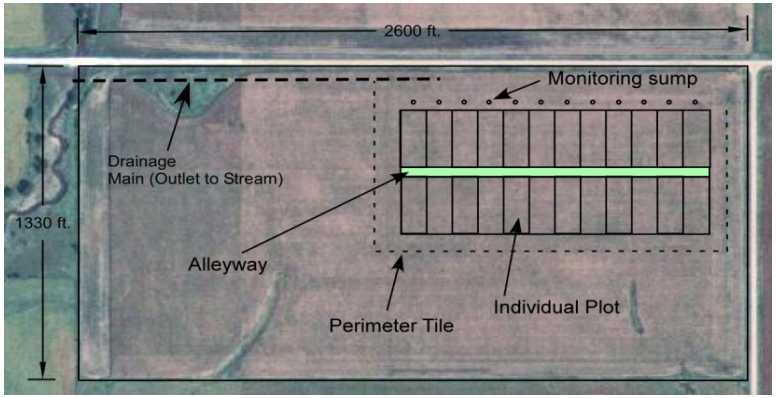
Project Investigators: Matt Liebman, Robert Horton, Rick Cruse, Michael Thompson, Matt Helmers, Robert Ewing, Kendall Lamkey, Robert Anex, and Meghann Jarchow

Funding: Conoco Phillips and ISU College of Agriculture and Life Sciences

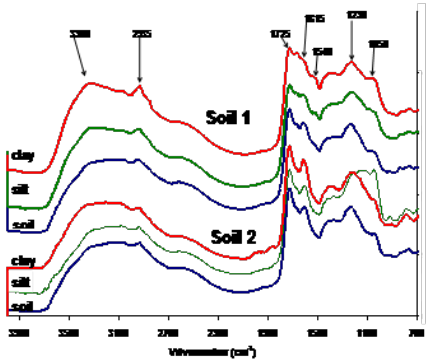
This project seeks to identify and develop cropping systems that produce large quantities of biofuel feedstocks while protecting soil and water resources and increasing biodiversity on the Iowa landscape. *Treatments* in the COBS experiment include a conventional corn-soybean cash grain system; continuous corn grown for grain and stover, with and without a winter cover crop; a mixture of perennial prairie plants fertilized for high biomass production; and a highly diverse, unfertilized mixture of prairie plants, which serves as a benchmark for understanding the functional characteristics of a native plant community.

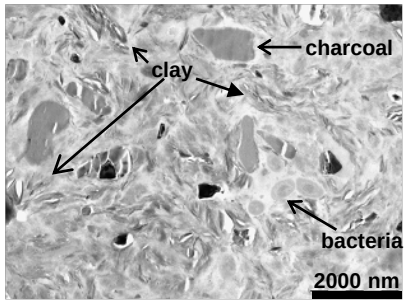
Our *central premise* is that cropping systems designed to produce large amounts of biomass, with high net energy return, can simultaneously create significant environmental benefits. Our *working hypotheses* are that (1) cover crops can reduce nutrient losses from corn production systems, (2) diverse mixtures of perennial plants can produce nearly as much biomass as conventionally managed corn, but with greater economic and energetic efficiency; and (3) diverse plant mixtures used for feedstock production can emit fewer pollutants to drainage water, sequester more carbon, and reduce greenhouse gas emissions relative to corn- and soybean-based cropping systems.

We will compare systems by measuring *plant productivity, resource use efficiency, nutrient dynamics, soil organic matter maintenance and production, carbon sequestration, CO_2 emissions, and drainage water quantity and quality*. Direct comparisons within a spectrum of cropping systems will lead to informed analyses of the advantages and disadvantages of each system.



Layout of the experimental site, ISU South Reynoldson Farm, Madrid, IA





Along with other techniques, we will use Fourier transform infrared spectroscopy and transmission electron microscopy to compare cropping systems' regulation of organic carbon storage in soil.