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Comparison of Biofuel Systems: COBS—A New Long-Term Study

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Abstract
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.

Keywords
Agronomy, Agricultural and Biosystems Engineering

Disciplines
Agricultural Science | Agriculture | Agronomy and Crop Sciences | Bioresource and Agricultural Engineering

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Project Overview

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.

New Long-Term Study

To compare the performance of these various systems, a new study site is being established at the South Reynoldson Farm located approximately seven miles south of Ames. The plots are being established, drainage installation is occurring, and monitoring equipment is being installed during the spring and summer of 2008 (Figure 1). A total of 24 plots are being established which allows four replications per treatment (Figure 2). The drain spacing is 45 ft with the center tile line in each plot being monitored for water quality and quantity (figures 3 and 4). The infrastructure at the site for water sampling builds on systems in place at other ISU drainage research facilities.

Figure 1. Picture of tile installation in Spring 2008.

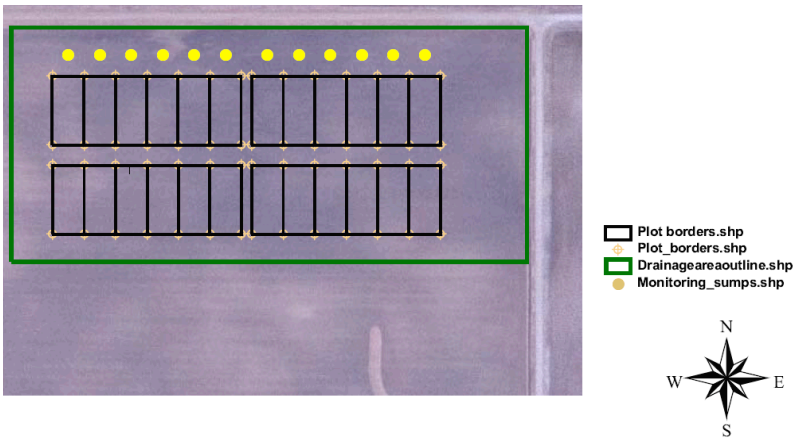

Figure 2. Layout of plots at the South Reynoldson Farm.

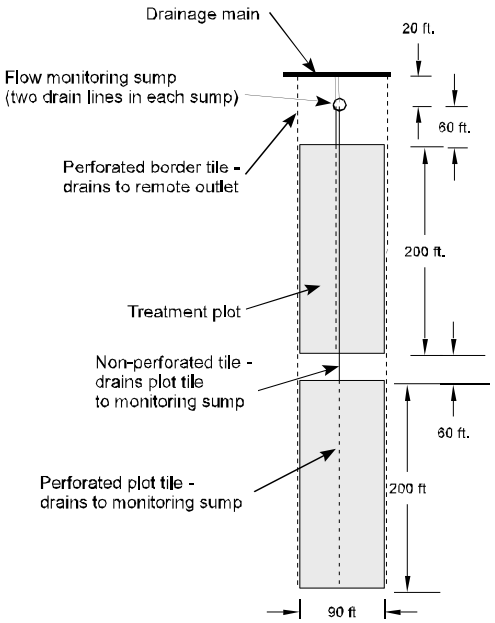

Figure 3. Example plot layout for two plots.

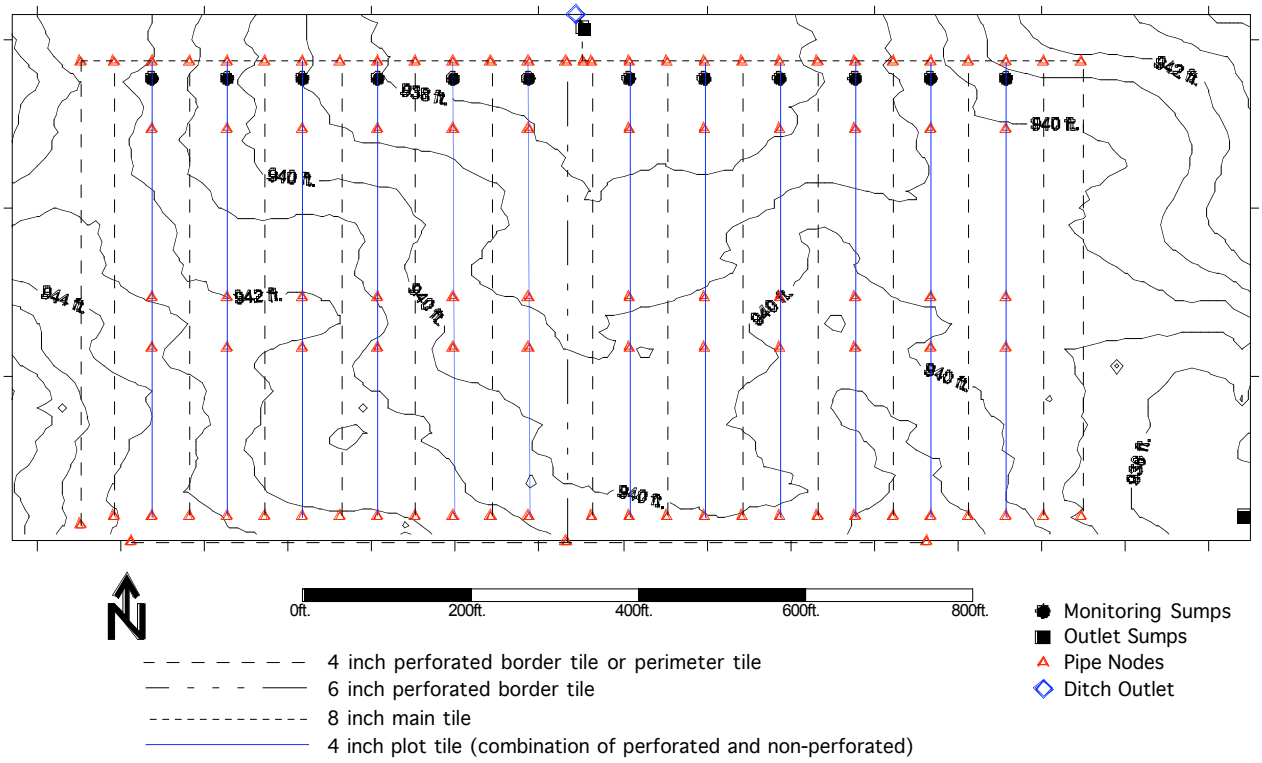

Figure 4. Drainage system layout.