Fitting Annual Winter Cereals and Red Clover into the Corn Production System to Stimulate Biofuel Biomass Production

CORN MARKETING PROGRAM
CMPM
OF MICHIGAN

2013 - 2014 Research Report

Project Leads:

Dr. Kurt, Thelen, Kaitlyn Hard, and Dale R. Mutch

Michigan State University

Cellulosic ethanol production is now being conducted on a commercial scale, with two production facilities using corn stover as feedstock operating in Iowa. Incorporating cover crops into the corn production system could enhance corn growers' profitability by producing a second cellulosic feedstock or by serving as a carbon source to replace soil carbon removed with corn stover.

Winter annual cereal cover crops such as cereal rye, wheat or triticale could provide a corn grower significant spring biomass for cellulosic ethanol. Cover crop research at MSU/KBS has indicated that 0.5 to 1 ton of cereal rye biomass could be chopped as early as mid-April for ethanol production, thus fitting the corn planting requirements. If a perennial legume could be incorporated into a corn system without detrimental yield consequences, continuous biomass could be achieved without the need to plant a cover crop every year.

This project looked at corn systems that included cover crops to increase the total cellulosic biomass without detrimental environmental or corn yield effects.

Results included:

- Establishing the experimental sites provides the proof of concept that a corn silage + winter annual cover crop cropping system is plausible under Michigan growing conditions.
- The inclusion of the winter annual cover crop significantly de-risked the cropping system with regard to total biomass yield. In the 2012-13 crop cycle, the cereal rye and triticale cover crops increased cropping system biomass yield by 44% relative to the no-cover control.
- Corn silage biomass has higher conversion efficiency to ethanol relative to cover crops due to the grain component present in the corn silage biomass. Similar to objective #1, the inclusion of the winter annual cover crop significantly de-risks the cropping system with regard to ethanol yield on a land area basis. In the 2012-13 crop cycle, the cereal rye and triticale cover crops increased cropping system ethanol yield by 28% relative to the no-cover control.
- A corn silage plus cover crop bioenergy cropping system generates a very favorable net ecosystem carbon balance.
- A corn silage plus cover crop bioenergy cropping system generates a very favorable net energy balance.
- In a typical Michigan winter-spring cycle such as that experienced in 2012-13, cover crops will provide sufficient biomass to result in a profitable harvest as a biofuel feedstock. However, following a harsh winter such as that experienced in the 2013-14 cycle, cover crop yields may be compromised to the point where harvest may not be justified.

Click here to access the full research report for this project.

Corn Marketing Program of Michigan
13750 S. Sedona Parkway, Suite 5
Lansing, MI 48906
888.323.6601
corninfo@micorn.org