Managing carbon loss

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As the United States continues to develop alternative energy methods and push towards energy independence, cellulosic-based ethanol has emerged as one of the most commercially viable technologies. Corn stover remains the most popular source available, but the loss of soil organic carbon (SOC) associated with the removal of corn fodder as a cellulosic ethanol feedstock is of agricultural and environmental concern.

In the November-December 2008 issue of *Agronomy Journal*, scientists from Michigan State University report on the effectiveness of carbon augmentation practices, including the integration of cover crops, manure, and compost, to supplant carbon loss in corn stover removed cropping systems. The results indicate that corn stover based bioenergy cropping systems can be managed to increase short-term carbon sequestration rates and reduce overall net global warming potential by using no-till planting methods and a manure-based nutrient management system.

The research team measured soil carbon changes as well as nitrous oxide and methane gas emissions from corn stover-ethanol field plots managed under various carbon augmentation practices. In addition to the gas emissions measured in the field, other carbon emissions assessed included estimates for the manufacturing carbon cost of crop inputs; methane emissions from the livestock manure source; methane and nitrous oxides generated during manure storage and application; and the fuel used in crop production and in gathering and land applying the manure.

"These results show that bioenergy cropping systems, particularly those

integrating livestock manure into their management scheme, are a win-win option on both alternative energy and environmental fronts," says Kurt Thelen, member of the research team.

Thelen says this research demonstrates that under proper management, livestock manure can supplant carbon lost from corn stover removal, and actually provide an environmental benefit, both in terms of greenhouse gas (GHG) mitigation, and from the established improved soil properties associated with increasing SOC levels such as increased water retention.

"For every gallon of gasoline burned, the equivalent of 19 lbs of CO_2 is released to the atmosphere which contributes to the environmental GHG problem," says Thelen. "Conversely, this work shows that in the not too distant future, choosing a cellulosic ethanol alternative at the pump may actually result in a net removal of CO_2 from the atmosphere."

View the abstract at agron.scijournals.org/cgi/cont … /abstract/100/6/1703 .

Source: American Society of Agronomy

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