

Life cycle analysis of corn stover to ethanol—Iowa Case Study

John Sheehan

National Renewable Energy Laboratory, 1617 Cole Blvd., Golden, CO 80401

Fax: 303-384-6877; jsheehan@.nrel.gov

The U.S. Department of Energy's Biofuels Program sees the use of corn stover—the residue left in the field after grain harvest—as the cornerstone of its effort to commercially demonstrate a biorefinery capable of producing bioethanol in large volumes, along with other sugar and lignin-derived products.

In the U.S., corn stover, if collected responsibly, could represent enough biomass to fuel a multi-billion gallon bioethanol industry. The catch is understanding how, and if, stover can be collected sustainably. Issues of soil erosion and soil health—as measured by soil organic carbon—for example, must be understood before our Nation's corn producers embark on large scale collection of stover.

The purpose of this study is to assess the sustainability of bioethanol production from stover by considering the effects of stover collection on soil health along with all of the other life cycle energy and environmental flows associated with stover collection, transport, fuel production and use. By including carbon flows to and from the soil, we have been able to quantify net greenhouse gas emissions in a more comprehensive manner than has ever been reported before. We show that stover-derived bioethanol can net greenhouse gas emissions from a vehicle by 50% (versus gasoline) even after accounting for the reduced input of carbon from the residue to the soil.

We also discuss how this life cycle study is being used to engage farmers, processors, regulators and environmentalists in a dialogue about making responsible trade-offs that lead to overall increased sustainability in the transportation sector.