How do we maintain a sustainable balance? Maintain our soil, water and air resources!

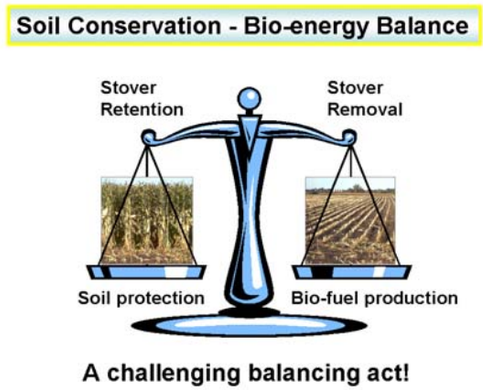
Anticipated Outcome

Soil surface cover following grain harvest alone (right) compared to grain and stover removal (left).

A sustainable biofuel and bio-product industry must be based on management practices that maintain soil cover, reduce the risk of erosion and that maintain soil organic matter; thereby sustaining soil productivity.

Interesting Facts

- It takes ~4000 gallons of water to grow one bushel of corn.
- It takes 3 to 4 gallons of water at the bio-refinery to produce a gallon of ethanol from corn grain.
- If soil erodes at an average "T" level of (5 ton ac^{-1}) raising 175 bu corn grain for ethanol; a gallon of ethanol "costs" ~21 lbs of soil.
- The sun delivers as much energy to Earth in one hour as humans use annually, but very little is used directly to power human activities.



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REAP contributes to the goals and objectives of ARS National Program Soil Resource Management (NP 202), Global Change (NP 204) and Bio-energy and Energy Alternative (NP 307).

http://www.ars.usda.gov/research/projects/ projects.htm?NP_CODE=202

ARS Mission

The Agricultural Research Service conducts research to develop and transfer solutions to agricultural problems of high national priority and provides information access and dissemination to

- ensure high-quality, safe food and other agricultural products,
- assess the nutritional needs of Americans,
- sustain a competitive agricultural economy,
- enhance the natural resource base and the environment, and
- provide economic opportunities for rural citizens, communities, and society as a whole.

May 20, 2008

Renewable Energy Assessment Project

REAP

A multi-location research project to ensure the soil resource indefinitely meets the demands for food, feed, fiber and fuel.

USDA Agricultural Research Service

United States Department of Agriculture

Problem

Harvesting biomass (e.g., corn stover, perennial grasses) for bioenergy feedstock can accelerate soil erosion and loss of soil organic matter; thereby, causing environmental degradation, and loss of soil quality and soil productivity. Thus, limiting the ability of soil to produce food, feed, fiber and fuel.

Hypothesis

Biomass feedstock harvest rates and management strategies can be designed that ensure that the soil resource meets the demands for food, feed, fiber and fuel.

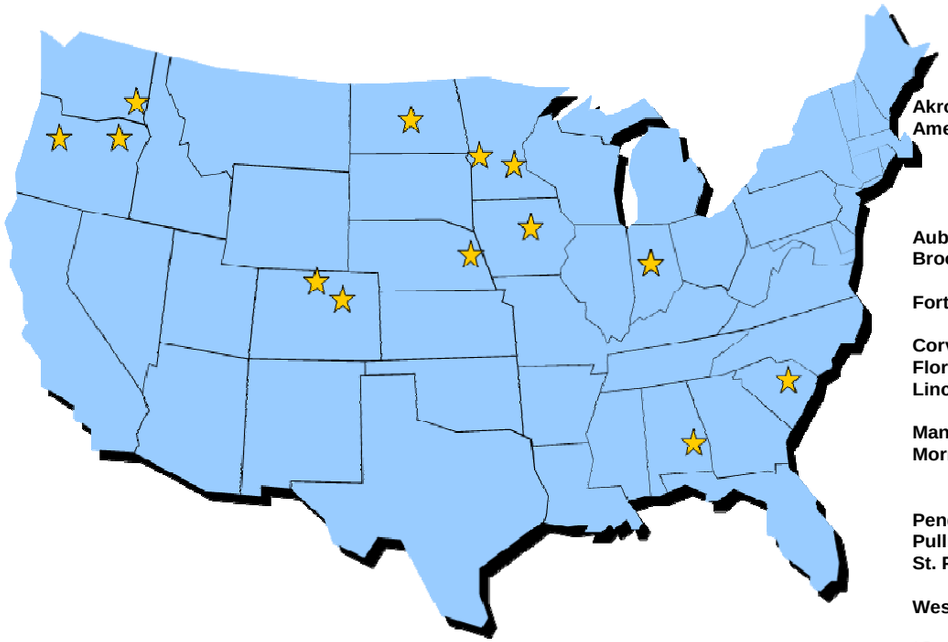
REAP Goals

1. To determine the amount of crop residue needed to protect the soil resource.
2. To compare short- and long-term economic value of biomass as a bio-energy feedstock and as a soil carbon source.
3. To provide recommendations and guidelines for sustainable biomass harvest to the Department of Energy, producers and other cooperators.

Anticipated Products

1. Guidelines for soil and crop management that will ensure sustainable harvest of crop biomass.
2. Predictive equations to help producers and others determine the amount of crop residue that can be harvested.
3. Management support tools and guidelines describing the economic trade-off between harvesting crop residues and leaving them to maintain/build soil carbon.
4. Crop and soil management strategies enable the soil resources to indefinitely meet the demands for food, feed, fiber and fuel.

REAP Locations and Team Members



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	Tyson Ochsner
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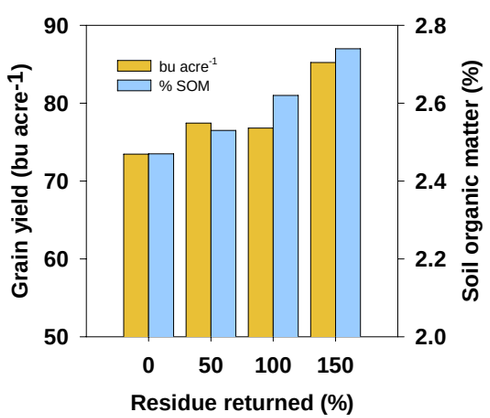
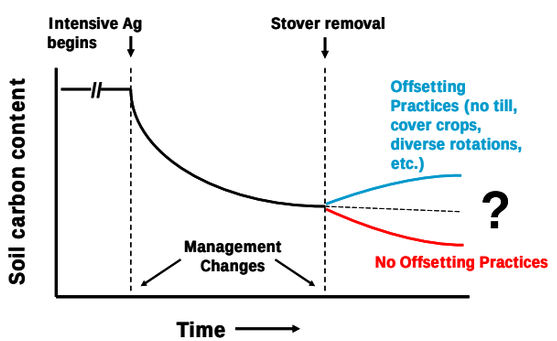
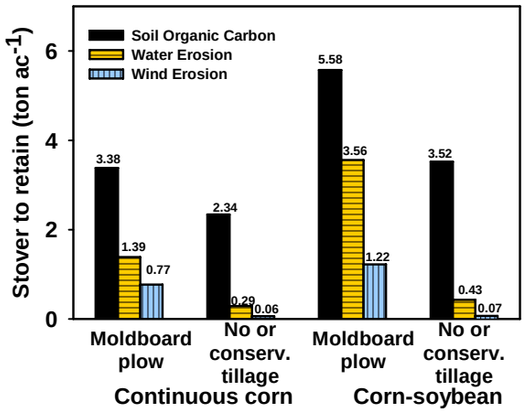
Residue removal impact on grain yield and soil organic matter



Returning crop residue to the field has a positive impact on yield and soil organic matter.

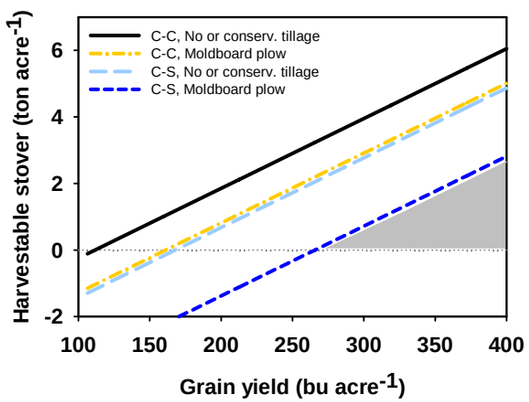
Soil C change with management





Estimated amount of corn stover needed to maintain soil organic carbon (SOC) content; to limit water erosion within the accepted tolerance, T; or to limit wind erosion.

Generally, it takes more stover to manage for SOC than for water or wind erosion. Stover should not be harvested from highly erodible lands.



Estimated amount of harvestable corn stover limited by the need to maintain SOC. For example, stover in the shaded area would be sustainably harvestable under moldboard plow tillage in a corn-soybean rotation (blue dashed line).

These examples assume all soybean straw remains on the field.