Balancing Feedstock Production and Soil Resource Protection

REAP - Renewable Energy Assessment Project

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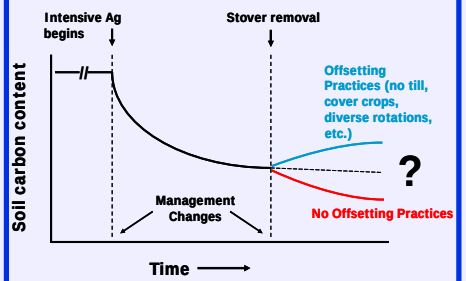
Anticipated outcome of REAP

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.

Introduction

- Soil and water conservation benefits must be included in any biomass assessment to prevent long-term environmental damage as the nation addresses short-term energy problems.
- Therefore, to develop an environmentally and economically sound bioenergy economy, the tradeoff between managing crop residues protect soil from erosion and to sustain soil organic carbon/matter (SOC/SOM) stores and building a biomass economy must be carefully assessed.



- Soils have lost soil carbon, harvesting non-grain biomass (stover) without offsetting practices could result in further soil degradation.
- Soil degradation leads to reduced yield potential. Displacement of soil into air and water by erosion also reduces air and water quality. Protecting soils improves environmental quality and sustains productivity.

REAP Goals

- Determine the amount of crop residue needed to protect the soil resource.
- Compare short- and long-term economic value of biomass as a bio-energy feedstock and as a soil carbon source.
- Provide recommendations and guidelines for sustainable biomass harvest to the Department of Energy, producers and other cooperators.

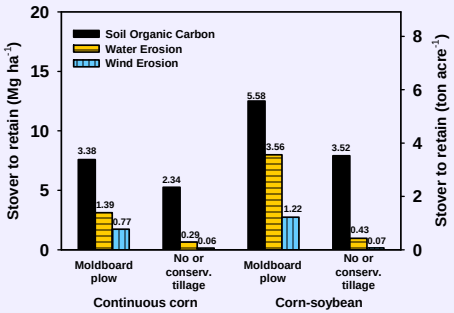
REAP anticipated products

- Soil and crop management guidelines.
- Predictive equations to determine sustainable rates for their system.
- Management support tools and guidelines for comparing economic trade-offs of harvesting crop non-grain biomass and retaining them for soil conservation.
- Crop and soil management strategies to enable the soil resource to indefinitely meet the demands for food, feed, fiber and fuel.

RESULTS

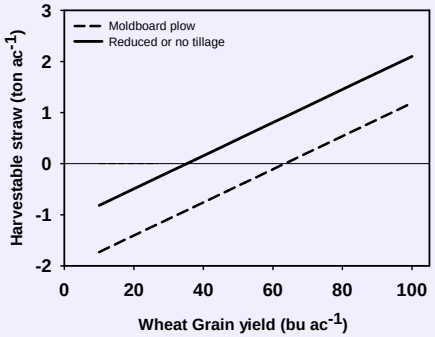
Initial sustainable harvest rates have been estimated using existing published data and models.

Amount of corn stover needed to maintain SOC, limit water or wind erosion to T

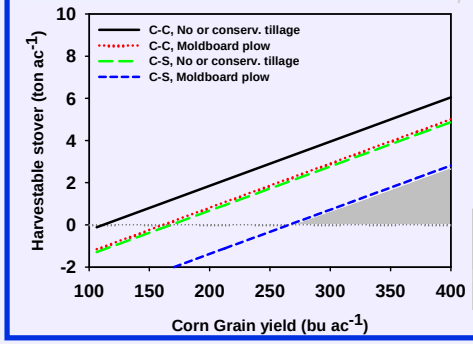


More stover or straw is required for maintaining SOC than is needed for limiting water or wind erosion. Therefore, managing for SOC, also controls erosion. Stover should **not** be harvested from highly erodible lands. (Wilhelm et al., 2008 AJ)

Estimates of harvestable dry straw from wheat (13% moisture)



Estimates of harvestable dry stover based at different corn yield (15% moisture)



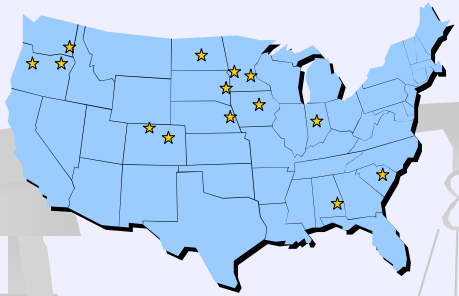
Demonstration

One bale = 1200 lbs

One ton = 2000 lbs

High yielding corn has 4.2 tons stover per acre = 7 bales

REAP Location and Team Members



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  - Mike Reese/Joel Tallaksen UMN-WCROC.
  - Jim Frederick (Clemson),
  - John Lamb (UM-St. Paul),
  - Tom Richard/Greg Roth (PSU).
- USDA- NRCS
- Idaho National Lab
- US-Department of Energy.
- Monsanto