Protecting Water Resources in Feed Stock Production

Rick Cruse & Wally Wilhelm
Protecting Water Resources in Feed Stock Production

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Wally Wilhelm; USDA/ARS; Lincoln
Vision

- Replace approximately 30% of liquid fuels by 2030
- Derived dominantly from plant biomass – a renewable resource


Cellulose to Fill the Gap

- Goal (billion gal ethanol)
- Year
- October 2007 capacity* (6.9 billion gal)
- 25 x ‘25
- 30 x ‘30
- Gap for cellulose ethanol to fill
- Energy Policy Act
- Ethanol from corn (NCGA**)

* RFA, http://www.ethanolrfa.org/industry/statistics/#C
Billion Ton Report
(1.366 billion tons/year)

Estimated biomass (million tons/year) contribution by 2030

- Crop residues: 428
- Grain: 87
- Ag wastes: 87
- Perennial energy crops: 377
- Forestry: 368

Perlack et al., 2005; http://bioenergy.ornl.gov
Sustainability

Meeting **current needs** in a manner that **does not jeopardize** the capacity of **future generations** have their needs met.
Future Bioeconomy and Its Impacts on Soil and Water Resources

- Plant residues, feedstock for liquid fuels, are renewable
- Plant residue production dependent on soil and water resources
- Soil resources are not renewable; water is only conditionally renewable
- Plant residues required for bioindustry – Plant residues required for soil and water conservation
Future Bioeconomy and Its Impacts on Soil and Water Resources

- Do we have the scientific knowledge to identify acceptable removal rates?
- Can we balance energy needs, financial interests, and soil/water conservation in the bioenergy industry?
## RUSLE Annual ‘C’ Factor As Affected By Residue Removal

<table>
<thead>
<tr>
<th>Cropping System</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perennial Grass or polyculture</td>
<td>.02</td>
</tr>
<tr>
<td>Continuous Corn Grain only removed</td>
<td>.04</td>
</tr>
<tr>
<td>Continuous Corn – 75% residue removed</td>
<td>.16</td>
</tr>
<tr>
<td>Continuous Corn – 95% residue removed</td>
<td>.55</td>
</tr>
</tbody>
</table>

*I-FARM © 2003-2007  Ed Van Ouwerkerk*
NO3-N Concentration in the Raccoon River at Des Moines

Data provided by Chris Jones
Des Moines Water Works
Trends in Precipitation

Change in annual average precipitation from 1960–1990 to 2070–2100 from HadCM2 IS92a

Units: millimetres per day

Mean: 0.2 Min: –3.7 Max: 8.9

Hadley Centre for Climate Prediction and Research, The Met. Office
Challenge to Transition

- Land ownership profile
- Are soil and water “resources” or are they a form of capital to be exploited for short term profit?
- 2006: 39% of Iowa farm land purchases were by investors – not farmers
Farmland Ownership – Major Obstacle

- HARVESTED FARMLAND - % Rented
  - Iowa – 56% (Cash rent %: 49, 54, 69% - 1982, 1992, 2002 respectively)
  - Illinois – 62%
  - Indiana – 58%

- “Nothing accelerates faster, stops quicker, or corners harder than a rented car”


Soil and Water Goals - Possible

- Common market for wide range of crops
- Multiple purpose, multiple function
Multiple biomass
Many technologies
Conservation
Reduced expectations
Asking, and answering, the right question