Impact of Herbicide Resistance on Natural Resources

Judicious use of herbicides support natural resource conservation

- Soil
- Water
- Air
- Plant
- Animals
- Energy Conservation
Herbicide Resistance Impact on Crop Production

- Reduced income
- Fewer herbicide options
- Fewer crop options
- More expensive herbicide options
Potential **Behavior** Changes with Herbicide Resistance

- More Intensive Tillage
- Use Alternative Pesticides
- Reduce or Abandon Economic Crops
- Opportunity to Improve***
Herbicide Resistance Impacts

The negative impact to crop production and economics

The negative impact to conservation efforts
If we use more intensive tillage to address herbicide resistant weeds...
Weed Resistance - Negative Impacts to Conservation Efforts

- Wind Erosion
- Water Erosion
- Water Quality
- Air Quality
- Wildlife
- Plant Communities
Herbicide Resistance Impact on Conservation

Herbicides facilitate conservation tillage

No-till  Strip-till  Ridge-till  Mulch-till

Conservation tillage is dependent upon herbicides for weed control

Photos courtesy of: University of Minnesota (2) and USDA (2)
Locations Evaluated for Soil Loss Comparisons
Effect of Tillage on Water Erosion

Erosion by Tillage Type and Location
Corn and Soybean Rotation

Primary Change will be less No Till

Erosion Rate
Tons/Ac/Yr

Locations

ND NE TN GA IA PA

0 5 10 15 20 25 30

NT C and SB
MT C and SB
Plow C and SB

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Effect of Tillage on Water Erosion

Erosion by Tillage and Location
Corn and Cotton Rotation

<table>
<thead>
<tr>
<th>Locations</th>
<th>NT C and Ctn</th>
<th>MT C and Ctn</th>
<th>Plow C and CTN</th>
</tr>
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<tr>
<td>OK</td>
<td>11</td>
<td>18</td>
<td>1.6</td>
</tr>
<tr>
<td>TN</td>
<td>22</td>
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Erosion Tons/Ac/Yr

United States Department of Agriculture
Natural Resources Conservation Service

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Soil erosion

Tons per acre per year

Source: NRI, NRCS
Water Erosion - 54% occurred in just 2 of the 10 farm production regions—the Corn Belt and the Northern Plains.

Wind Erosion - 93% occurred in 4 of the 10 farm production regions—the Northern Plains, Southern Plains, Mountain, and Lake States.
Erosion on Cropland, by Year
(Billions of Tons)

1982: 3.06
- Sheet & Rill Erosion: 1.68
- Wind Erosion: 1.38

1987: 2.79
- Sheet & Rill Erosion: 1.49
- Wind Erosion: 1.30

1992: 2.17
- Sheet & Rill Erosion: 1.18
- Wind Erosion: 0.99

1997: 1.89
- Sheet & Rill Erosion: 1.04
- Wind Erosion: 0.85

2002: 1.81
- Sheet & Rill Erosion: 1.01
- Wind Erosion: 0.80

2007: 1.73
- Sheet & Rill Erosion: 0.96
- Wind Erosion: 0.77

Cropland includes cultivated and non-cultivated cropland.
Conservation Effect of Water Erosion

Per 2007 NRI we have 304.9 M acres of cultivated cropland in the US.

For each 1 ton/ac/yr. increase in water erosion this equals:
- 1.4 B Tons N/Yr.
- 228 M Tons P/Yr.
- 365 B Ton Sediment/Yr.
- 24 B Tons Carbon/Yr.
We Cannot Go Backwards on Conservation

- Water Erosion/Water Quality/Productivity
- Wind Erosion/Air and Water Quality/Productivity
Opportunity to Improve

• What got us into this problem?
  – Tillage choices – can change
  – Crop choices – can change
  – Rotation choices – can change
  – Herbicide choices – can change
  – Weed adaptability – we can influence

If we keep doing things the same way – things will not get better
Future Technical Solutions to Address Herbicide Resistance must be:

- Environmentally sound
- Economically sound
- Socially acceptable

This must be reflected at the farm level, local, state, and national levels.
Changes involve more than just...

- Changing herbicide mode of action
- Rotation
- Tillage
Change will require...

- Understanding the science/biology of the problem
- Behavior change by producers, industry, and government
- Farmers, industry, and government working together at all levels
- Environmentally sound, Economically sound, Socially acceptable
Understanding the science/biology of the problem

Needed to develop…

- Cultural/Biological methods (rotations, types of crops, timings, tillage or lack of tillage)
- Chemical methods (pesticides, modes of action, timing, etc.)
- Behavior Change
Behavior change by producers, industry, and government

- Production practices
- Marketing strategies
- Government Policy to facilitate change

Willingness to change…
Farmers, industry, and government working together at all levels

Information and Education at the...

- Local level
- State/Regional Level
- National Level

Everyone must be on the same page
Some Examples of Good Things Happening

NRCS and other Conservation Org’s – Technical and Financial Assistance

Land Grant Universities – Research and Education

ARS and ERS – Research

Industry – Commodity Org’s and Farmers
NRCS Technical Assistance to Facilitate Information and Education

Partner with industry, commodity groups, extension, crop consultants, etc.

- National Level
- State Level
- Local Level
We need more....

- New technology
- Better Understanding the biology and science of the problem
- More long and short-term economic scenarios to change behavior.

- Need more information and education for producers

- Need a “consistent message” from industry and government
Summary

There are negative conservation implications of using more tillage to address herbicide/pesticide resistance.

Environmental, Economic, and Social solutions are possible and will present an opportunity to improve.

A coordinated effort at levels by producers, industry, and government is needed.