Understanding the Diversity in Nutrient Management Practice Use in Midwestern Agriculture

Hanna Bates and J. Gordon Arbuckle Jr.

Iowa Water Conference
March 23, 2016
Iowa agriculture economy
Intensive agriculture is an ecologically leaky system
Gulf of Mexico Hypoxia and local water impairments
In May 2013, Iowa released a Nutrient Reduction Strategy
Goal for agriculture:
  • 41% reduction in N loss
  • 29% reduction in P loss
Achieving goals will require the adoption of diverse conservation practices (Drinkwater and Sapp 2015, ISU 2012, Castellano and Helmers 2015, McLellan 2015)
Previous research on nutrient management adoption

Research Shortcomings

• Social network variables have been found to be associated to conservation practice use in relation to similar practices (Prokopy et al 2008)

• Conservation practices likely to be implemented when receiving recommendations from a consultant (Weber and McCann 2015)

• Extension services – when used and had adequate resources - tend to have a positive relationship with conservation practice adoption (Tamini 2011, Osmond et al 2014)

• Farmers view university recommendations with uncertainty, often opt to use private recommendations (Osmond et al 2014)

• Efforts to improve conservation adoption are technology and farmer specific (Tamini 2011, Weber and McCann 2015)
“What is the relationship between social networks and the diversity in nutrient management practices used by farmers?”
Annual survey of Iowa farmers

- Annual survey of Iowa farmers since 1982
- Poll focus: agriculture policies, farm practices, and quality of life in rural Iowa
- 2012 Farm poll surveyed approximately 1,300 farmers
- 2012 poll asked questions on nutrient management
- 996 Corn and Soybean farmers included in study

Methods

Iowa Strategy to Reduce Nutrient Loss: Nitrogen Practices

<table>
<thead>
<tr>
<th>Practice</th>
<th>Comments</th>
<th>% Nitrate-N Reduction*</th>
<th>% Corn Yield Charge**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moving from fall to spring pre-plant application</td>
<td>6 (25)</td>
<td>4 (16)</td>
<td></td>
</tr>
<tr>
<td>Spring pre-plant/sidedress 40-60 split Compared to fall-applied</td>
<td>5 (28)</td>
<td>10 (7)</td>
<td></td>
</tr>
<tr>
<td>Sidedress – Compared to pre-plant application</td>
<td>7 (37)</td>
<td>0 (1)</td>
<td></td>
</tr>
<tr>
<td>Sidedress – Soil test based compared to pre-plant</td>
<td>4 (20)</td>
<td>13 (22)**</td>
<td></td>
</tr>
<tr>
<td>Liquid swine manure compared to spring-applied fertilizer</td>
<td>4 (11)</td>
<td>0 (1)</td>
<td></td>
</tr>
<tr>
<td>Poultry manure compared to spring-applied fertilizer</td>
<td>-3 (20)</td>
<td>-2 (14)</td>
<td></td>
</tr>
<tr>
<td>Nitrogen rate at the MRTN (0.10 N:corn price ratio) compared to current estimated application rate. (ISU Corn Nitrogen Rate Calculator – <a href="http://extension.agron.iastate.edu/soilfertility/nratr.aspx">http://extension.agron.iastate.edu/soilfertility/nratr.aspx</a> can be used to estimate MRTN but this would change Nitrate-N concentration reduction)</td>
<td>10</td>
<td>-1</td>
<td></td>
</tr>
<tr>
<td>Nitrapyrin in fall – Compared to fall-applied without Nitrapyrin</td>
<td>9 (19)</td>
<td>6 (12)</td>
<td></td>
</tr>
<tr>
<td>Rye</td>
<td>31 (29)</td>
<td>-6.7</td>
<td></td>
</tr>
<tr>
<td>Oat</td>
<td>28 (2)</td>
<td>-5.1</td>
<td></td>
</tr>
<tr>
<td>e.g. Kura clover – Nitrate-N reduction from one site</td>
<td>41 (16)</td>
<td>-9 (32)</td>
<td></td>
</tr>
</tbody>
</table>
OLS Regression

**Dependent Variable**
Nutrient management practice diversity

**Independent Variables**

Information Sources (*Communication preferences, info sources, and involvement*)
- Preference for Face-to-Face formats for nutrient management information from ISU Extension
- Public Resources
- Private Resources
- Involvement in Farm Organizations

**Opinion Leadership**
- Self-designated Opinion Leadership Index

**Farm Size**
Total acres planted in corn and soybeans
Dependent Variable: Nutrient Management Practices: Percent reporting moderate or high use

Source: 2012 Iowa Farm and Rural Life Poll, Farmers who produced corn and/or soybean in previous year
Percentage distribution of Farmers’ preferred ways to receive info and educational programs from Iowa State University Extension.
Percentage distributions for info sources farmers turn to first for nutrient management and fertilizer application Rate

- Fertilizer or Ag Chemical Dealer
- ISU Extension
- Private Crop Consultant
- Seed Dealer
- USDA/NRCS/SWCD Service Center

**Nutrient Management**

**Fertilizer Application Rate**
Percentage Distributions for farmer involvement in Agriculture and Natural Resource Conservation Organization (active to very active involvement)
Percentage Distributions for Opinion Leadership among farmers (percent agree/strongly agree)

- Extension staff, crop advisers, and others involved in agriculture tend to look to me for advice
- I take a leadership role in local agricultural matters
- Other farmers tend to look to me for advice
- I consider myself to be a role model for other farmers
- My opinions matter in the local agricultural community
- Compared to other farmers, I tend to use more innovative management practices and strategies
Hypotheses

1. Farmers who prefer to receive nutrient management information in face-to-face settings...
2. Farmers who indicate that they go to extension/public sources first for nutrient management information...
3. Farmers who indicate that they go to private sector sources first for nutrient management information...
4. Farmers who are more involved in agriculture and natural resource conservation organizations...
5. Farmers who rank themselves high on the opinion leadership index...

... will use more diverse nutrient management practices.
## Results

<table>
<thead>
<tr>
<th>(Predictor Variables)</th>
<th>B</th>
<th>Std. Error</th>
<th>Std. Beta</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Information Sources</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Face2Face</td>
<td>.895</td>
<td>.434</td>
<td>.062</td>
<td>.040*</td>
</tr>
<tr>
<td>PubFirstNM</td>
<td>.610</td>
<td>.747</td>
<td>.050</td>
<td>.415</td>
</tr>
<tr>
<td>PrivSectFirstNM</td>
<td>.019</td>
<td>.678</td>
<td>.002</td>
<td>.978</td>
</tr>
<tr>
<td>AllOrgInvlv</td>
<td>.346</td>
<td>.064</td>
<td>.175</td>
<td>.000*</td>
</tr>
<tr>
<td><strong>Opinion Leadership</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OpLdrScale</td>
<td>.527</td>
<td>.052</td>
<td>.337</td>
<td>.000*</td>
</tr>
<tr>
<td>CornSoyTotalAc</td>
<td>.002</td>
<td>.000</td>
<td>.124</td>
<td>.000*</td>
</tr>
<tr>
<td><strong>Adjusted R Square (cumulative)</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.259</td>
</tr>
<tr>
<td>F</td>
<td></td>
<td></td>
<td></td>
<td>50.913**</td>
</tr>
<tr>
<td>n</td>
<td></td>
<td></td>
<td></td>
<td>856</td>
</tr>
</tbody>
</table>

* p ≤ .05 **p ≤ .001
Findings and Conclusion

• Preference for Face-to-Face formats for information
  – Face-to-face may be preferred because the average farmer in the 2012 IFRLP not born and raised in “the information age”
  – Information formats that are less frequent, but evaluated more credible may have a higher impact on decisions (Tucker and Napier 2002)

• Public/Private Sector Sources
  – Findings were not significant

• Farm Organization Involvement
  – Findings show that organizations may shape efforts towards a common goal

• Opinion Leadership
  – Farmers who consider themselves to be opinion leaders use more diverse practices
Thank you!

Hanna Bates
Watershed Coordinator
Prairie Rivers of Iowa
hbates@prrcd.org
@hannatbates

J. Gordon Arbuckle Jr.
Associate Professor
Iowa State University Sociology Extension
arbuckle@iastate.edu
@iowaFarmPoll