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Statistical Analysis of the Adoption of Conservation Practices in Midwest and Great Plains Agriculture

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Statistical Analysis of the Adoption of Conservation Practices in Midwest and Great Plains Agriculture
Regan Gilmore with Faculty Karina Schoengold

Background
Improving conservation in conventional agriculture is crucial for the sustainability of agricultural economies. Midwest and Great Plains agriculture currently faces two key challenges:

- Unpredictable weather events due to climate change
- Natural resource degradation due to conventional practices

These can lead to:

- Decreased water availability
- Vulnerability of farmland and yields
- Erosion
- Loss of soil structure and moisture
- Nitrogen runoff

Implementing conservation practices increases resiliency towards these threats. The aim of this study is to identify factors correlated with agricultural producers adopting conservation practices on their land.

States and Counties Represented by Sample

Survey responses: Nebraska - 428 | South Dakota - 110 | Iowa - 554

Research Questions
What are the primary weather-related concerns of Midwestern and Great Plains agricultural producers? Which factors are associated with producer adoption of conservation practices on their land?

Methods

The data used was drawn from original survey data administered in 2014 by the University of Nebraska-Lincoln to agricultural producers in Nebraska, Iowa, and South Dakota. R programming software was the primary application used to analyze the data. Statistical regression methods used include ordinary least squares (OLS) and discrete choice using multivariate logit.

Likelihood of Using No-till Conditional on Most Important Reasons for Management Decisions

<table>
<thead>
<tr>
<th>Reason</th>
<th>NE</th>
<th>IA</th>
<th>SD</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment costs and needs</td>
<td>-10.6</td>
<td>-2.0</td>
<td>7.2</td>
<td>-4.0</td>
</tr>
<tr>
<td>Input costs</td>
<td>-6.6</td>
<td>8.5</td>
<td>-1.3</td>
<td>1.0</td>
</tr>
<tr>
<td>Cost-share programs</td>
<td>-32.6</td>
<td>-35.7*</td>
<td>8.6</td>
<td>-25.6</td>
</tr>
<tr>
<td>Soil management</td>
<td>5.5</td>
<td>-9.8*</td>
<td>21.5*</td>
<td>1.0</td>
</tr>
<tr>
<td>Weed/insect/disease management</td>
<td>-29.3*</td>
<td>-15.5*</td>
<td>-13.5</td>
<td>-21.2*</td>
</tr>
<tr>
<td>Mgmt. of drought or excess moisture</td>
<td>9.8</td>
<td>12.5</td>
<td>12.4</td>
<td>16.9*</td>
</tr>
<tr>
<td>Spring soil warm-up</td>
<td>-31.3*</td>
<td>-17.9*</td>
<td>-37.9*</td>
<td>-27.2*</td>
</tr>
<tr>
<td>Other</td>
<td>-26.1</td>
<td>4.1</td>
<td>-13.6</td>
<td>-6.7</td>
</tr>
</tbody>
</table>

Note: Statistically significant differences marked with an asterisk (*).

Interpretation example: There is less than a 1% chance that Nebraska and Iowa producers are equally concerned about increased flooding.

References

I would like to thank UCARE for providing funding, and my advisor, Karina Schoengold, for her support and guidance throughout this project.

Results and Implications

Producers tend to choose their tillage and cropping systems based on soil management and yield/productivity concerns. Key management reasons associated with use of no-till:

- Soil management (+)
- Drought or excess moisture mgmt. (++)
- Weed/insect/disease management (-)
- Spring soil warm-up (+)

Reasons and concerns for using no-till vary by state. For example, producers in Iowa choosing their tillage system based on yield/productivity concerns are 9.8% less likely to use no till, while producers in South Dakota with the same concerns are 21.5% more likely to use no-till.