Adoption and intensification of in-field conservation practices under risk

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INTRODUCTION

- Many conservation-based programs have promoted adoption by offering financial incentives.
- The introduction and intensification of conservation on-farm introduces potential risks to the farm operation due to adoption of new practices; impacts on dynamics of cropping systems; contract or practice limitations; and changes in production costs.
- When outcomes are uncertain, given their stochastic nature or their dependence on stochastic events (i.e., weather), farmers may be more hesitant to adopt a practice, requiring additional compensation to adopt or intensify a practice.
- With greater understanding of how farmers go about making decisions when establishing a conservation system on their farm, policymakers can better design conservation programs that are tailored to farmers’ preferences, as well as limitations.

OBJECTIVES

- The purpose of this study is to examine farmers’ willingness to adopt and intensify in-field conservation practices under risk using a stated preference approach.
- To elicit farmers’ decision for conservation practices adoption and intensification under risk.
- To evaluate farmers’ preferences for conservation payments mechanisms (government programs versus market-based mechanisms).

DATA and METHODS

The survey:

- A choice experiment was administered during a series of workshops held across 10 locations spanning the state of Kansas from December 2013 to March 2014.
- Farms were mailed letters to attend face-to-face workshops, response to the letters resulted in 248 farmers attending the workshops.

Farmers’ Willingness to Pay (WTP)

Willingness to pay estimates for the contract attributes (calculated per acre) are reported in Table 3. The WTP estimates for the conservation practices (No-Till, cover, crop rotation and VRAs of inputs) represent the amount by which net returns would have to increase in order for farmers to adopt these practices. VRA and cover crops are the practices least adopted in the state, farmers require a larger incentive to induce adoption. When compared to when conservation bundles with high environmental performance, conservation bundles with lower incentive have a larger incentive - increase in net returns. The WTP estimate for carbon credit incentive programs indicates the additional amount of net returns farmers would have to receive to enroll in a conservation program which incentive is determined by an open market.

RESULTS and CONCLUSIONS

Model estimation results are reported in Table 2. The results indicate that farmers are more likely to enter into a contract with higher incentive payments and higher increases in net returns.

The model was based on the random utility framework where farmer’s utility for contract j (or Option, Status Quo) can be denoted by:

\[ U_j = V(Practices, Payment, Program, NR, VarNR, EnvImpact, Pr) + e_j \]

where Practices is the bundle of practices to adopt under each; Payment, is the annual incentive payment per acre; Program, is a federal program or a carbon credit payment through a carbon market; NR, is the expected change in net returns; VarNR, is the risk from adopting conservation practices and is measured as the standard deviation from expected net returns under a particular conservation bundle; EnvImpact is the level of environmental impact - off-farm environmental benefits - from adopting the bundle of conservation practices stipulated in the contract. E is an error component of alternative specific random effects and distributed normally with zero mean and variance \( \sigma^2 \) (Greene, 2007). The model was estimated using an error component model.

The results also suggests that farmers are less likely to adopt contracts with lower environmental benefits. While the variance of returns was positive, it was not statistically significant. A higher variance in net returns - associated with conservation adoption - may increase the likelihood that farmers enter into a contract that pays an incentive (as the incentive could mitigate the risk). The coefficient on carbon credit payment indicating a preference for federal programs.

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Table 2. Model estimation results

<table>
<thead>
<tr>
<th>Contract Attributes</th>
<th>Coefficient</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-0.01608***</td>
<td>(0.224)</td>
</tr>
<tr>
<td>Change in net returns</td>
<td>0.00206***</td>
<td>(0.004)</td>
</tr>
<tr>
<td>Standard Deviation-Net Returns</td>
<td>0.0873 (0.055)</td>
<td>0.0873 (0.055)</td>
</tr>
<tr>
<td>No-Till</td>
<td>0.0581***</td>
<td>(0.030)</td>
</tr>
<tr>
<td>Cover Crops</td>
<td>-0.0588***</td>
<td>(0.093)</td>
</tr>
<tr>
<td>Conservation Crop Rotation</td>
<td>-0.0060***</td>
<td>(0.032)</td>
</tr>
<tr>
<td>Variable rate application</td>
<td>-0.5502***</td>
<td>(0.092)</td>
</tr>
<tr>
<td>Payment</td>
<td>0.0065***</td>
<td>(0.002)</td>
</tr>
<tr>
<td>Low Environmental Impact</td>
<td>-0.2403***</td>
<td>(0.140)</td>
</tr>
<tr>
<td>Carbon Credit Payment</td>
<td>-0.2403***</td>
<td>(0.005)</td>
</tr>
</tbody>
</table>

The model was estimated using an error component model.

CONCLUSIONS

We found that federal conservation programs are preferred over carbon credit payments, this could be due to the risk associated with the potential market fluctuation in carbon credit prices. We also found that the level of change in net return is a significant factor in farmers’ adoption decision. In order to study the role risk plays in the adoption decision, the next step to this research is to model the attribute-specific risk for net returns by embedding risk into the utility specification.