Enrollment Restrictions and the Adoption of Conservation Practices in the U.S. Corn Belt

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Abstract

Using a mixed-mode survey of 568 farmer respondents in the Boone and North Raccoon River watersheds in Iowa, we utilize a discrete choice experiment to examine farmer behavioral response to a new policy design of conservation programs—enrollment restrictions in cost-share programs. Using the results of a random parameters logit, we first show how farmers' perceived preferences for conservation practices change when enrollment restrictions imposed in conservation programs. Our results suggest that eligible farmers are more likely to choose a conservation contract with enrollment restrictions. We next consider three contracts with per-acre payments similar to those offered in Iowa's EQIP program - incentivizing cover crops ($40), no-till ($10), and split N application ($9) for two years - and compare willingness-to-accept for these contracts with and without enrollment restrictions. Mean willingness-to-accept estimates for the cover crops, no-till, and split N application contracts are significantly decreased by 82%, 92% and 93% respectively when enrollment restrictions are introduced. In addition, estimated participation supply curves demonstrate higher enrollment when introducing enrollment restrictions, though this is especially true for low compensation levels and decreases as the proportion of farmers who are ineligible for the conservation contract rises.

Keywords: Environmental policy; Enrollment restrictions; Additionality; Conservation practices; Willingness-to-accept

JEL Codes: Q53, Q15, Q58

Introduction

Agricultural production contributes significantly to non-point source pollution in rivers, streams, and lakes in the United States. It is estimated that agricultural non-point source pollution accounts for 92% of the total nitrogen (N) and 80% of the total phosphorus loading in Iowa waterways (IDALS and CALS, 2017), leading to serious dead zones in the Gulf of Mexico. The Iowa Nutrient Reduction Strategy (INRS), introduced in 2012, establishes a goal of 45% reduction of annual N and phosphorus loads in surface water. However, as of 2017, conservation tillage and cover crops were used on only 27% and 4% of Iowa cropland, respectively (Sawadgo et al., 2021). Thus, there is still an urgent need to further expand the adoption of conservation practices through more effective policy tools.

Agricultural conservation practices are farming land use or management decisions designed with the goal of improving environmental performance with respect to soil health, water quality, air quality, wildlife habitat, and greenhouse gas emissions. Cover crops, conservation tillage, and split N application are three common conservation practices. Cover crops are planted in the fall and able to survive the winter to provide soil cover to cultivated cropland that would otherwise be left bare and susceptible to soil erosion. The live roots of cover crops can absorb excess nutrients from the soil left after the growing season, thus reducing nutrient runoff and leaching into groundwater. Conservation tillage is a tillage practice that covers 30% or more of the soil surface with crop residue after planting to reduce erosion and improve soil structure. No-till/strip-till farming, in which 90% or more of the crop residue is left on the soil surface, leaving the soil undisturbed from harvest to planting, is the most effective soil conservation system. Split N application is a nutrient management strategy that divides total N application into two or more treatments to improve N uptake and nutrient efficiency, promote optimum yields, and reduce nutrient leaching loss. These three conservation practices—cover crops, no-till/strip-till, and split N application—are complementary to each other and can be implemented together to mitigate nutrient loss and enhance soil quality, thereby delivering more environmental benefits.

To improve environmental health and quality, the US federal government has developed multiple voluntary conservation incentive programs that provide farmers with financial and technical assistance for adopting conservation practices. Between 2000 and 2020, the US federal government's annual expenditure on voluntary agricultural conservation programs increased from $3.5 billion to more than $6.5 billion. In Iowa, several federal cost-share programs are available through Natural Resource Conservation Service (NRCS), including the Environmental Quality Incentives Program (EQIP), the Conservation Reserve Program (CRP), Conservation Stewardship Program (CSP), and Regional Conservation Partnership Program (RCPP). In EQIP, for example, farmers can receive a per-acre payment for a period of three years to help smooth transition to new practices. To receive payments, farmers must agree to use the practice for three years on at least a part of their farm.

However, researchers have long been concerned about the effectiveness of conservation payments (Howard, 2020; Bottazzi et al., 2018; Howard et al., 2021). From an environmental externality perspective, when a voluntary incentive contract induces a behavioral change that leads to improved environmental quality, these changes are termed as "additional" (Alberini and Segerson, 2002). If the supported practice, and improvement to environmental quality, would have been realized without the payment, no net environmental gain should be attributed to the payment. In a government conservation program, payments made for non-additional practices expend budget resources but do not contribute to improving environmental quality (Claassen et al., 2014). In an offset credit market, non-additionality credits do not represent pollution abatement on the part of the seller, but will be used by purchasers to increase emissions to a level that would not otherwise be permitted, leading to pollution above the set regulatory limit.

One form of policy design that has been posited to reduce the occurrence of funding non-additional practices is the implementation of enrollment restrictions. These enrollment restrictions can take several forms. For example, the government can design a policy with a focus on additionality and exclude those with prior environmental conservation from payments (Pfaff and Sánchez-Azofeifa, 2004; Wünscher et al., 2008; Alpizar et al., 2013). Alpizar et al. (2013) design three payment selection rules based on environmental benefit, additionality, and reward, respectively, and only find significant increased contributions for an additionality rule that offers incentive to those with relatively low contributions. Vegh and Murray (2020) describe how the additionality principle functions in an environmental credit market in which crediting occurs when additional pollution reductions are achieved below some baseline level. This introduces a potential solution to issues of temporal constraints on credit issuance and discounting credits to account for additionality problems. Ideally, enrollment restrictions disqualify potential applicants whose enrollment would be costly to the funder but would not generate additional benefits. It is an open question, however, whether the implementation of enrollment restrictions would impact the preferences of prospective enrollees whose eligibility is not impacted by the restrictions. In our study, we seek to address this question by investigating farmers' behavioral responses to an additionality-based program with restricted enrollment in the context of cost-share programs aimed at reducing N loads. We expect such policy to incentivize new pro-environmental behavior more effectively.

Using a mixed-mode mail and online survey of 568 farmer respondents residing in the Boone and North Raccoon River watersheds in Iowa, we administer a discrete choice experiment where farmers choose among a set of voluntary conservation contracts. We include a between-subjects treatment where some contracts stipulate enrollment restriction while others do not. We then estimate a mixed logit model that provides a framework to test whether enrollment restrictions influence farmer behavioral responses. We further use parameter estimates to assess the efficiency implications of introducing enrollment restrictions in conservation contracts.

Our results show that farmers generally dislike adding conservation practices on their field. But, more importantly, the coefficient on the status-quo alternative-specific constant

(ASC) is positive for unrestricted contracts (i.e., contracts without enrollment restrictions) and significantly negative for enrollment-restricted contracts. This implies that eligible farmers are much more likely to select a contract when they were told the contract contains enrollment restrictions. We then conduct 6 different policy simulations comparing willingness-to-accept (WTA) and participation supply curves of an unrestricted program to an enrollment-restricted program. We find that enrollment-restricted contracts reduce estimated WTAs substantially. Similarly, predicted participation rates are significantly higher in enrollment-restricted contracts, despite the fact that a portion of farmers are ineligible to enroll. This suggests that, under the right circumstances, enrollment restrictions can be effective tools to increase program participation rates for a target population.

This article makes several contributions to the literature on non-market valuation of ecosystem services and agri-environmental policy design. First, this is the first study that designs a discrete choice experiment to investigate farmer behavioral response to program enrollment restrictions. Second, our findings highlight the importance of evaluating impacts on a farmer's WTA and participation when introducing new conservation policy designs. In particular, we find that a farmer's WTA is remarkably reduced when we introduce enrollment restrictions, and the participation rate is significantly increased. Third, our study contributes to the growing literature on additionality and demonstrates the possibility and feasibility of enrollment restrictions in environmental policy design. The additionality concept is emphasized in the private carbon credit market, and several forms of practical restrictions and regulations are implemented to account for additionality problems.

Data and Survey Design

Survey Design

Following Dillman's Tailored Survey Design framework (Dillman et al., 2014), we designed a mixed-mode online and paper survey of Iowa farmers' conservation practice choices. We sent questionnaires to a sample of 2,400 Iowa farmers who reside in the Boone and North Raccoon HUC-8 watersheds, two primary agricultural watersheds in Iowa with substantial crop acreage. Specifically, we drew 1,083 farmers from the Boone River watershed and 1,317 farmers from the North Raccoon River watershed. The sample was screened to include crop farmers who operate at least 100 acres of land.

We conducted one online focus group interview with 14 farmers, as well as an online pilot survey with 20 randomly selected farmers from the Boone and North Raccoon River watersheds. These focus group discussions and pilot survey responses were instrumental in identifying key elements of the choice experiment, especially the three in-field conservation practices we focus on in our study (cover crops, no-till/strip-till,[1] and split N application).

We administered the survey in two rounds from March 2019 to December 2019. In the first round, we began by sending an invitation letter, which included a $2 cash incentive, with a link to an online survey to 1,800 sampled farmers. In April, we sent a follow-up to non-responders with a survey packet that included a cover letter, paper survey, and a postage-paid return envelope. Finally, we mailed a reminder card to non-responders several weeks after the survey packet. In the second round in December 2019, we sent the survey to a separate sample of 600 farmers residing in the same watersheds and followed a similar survey protocol to the first round. Of the 2,400 sampled farmers, we classified 420 farmers as ineligible as most reported that they did not or do not intend to operate a

[1] Strip-till, a reduced-tillage system that combines no-till and narrow 6–12-inch tilled strips, is commonly regarded by focus group participants as comparable to no-till, thus we used "No-Till or Strip-Till (leaving more than 90% residue)" as one of the conservation contract requirements.

farm in the years that were the focus of our survey. Finally, we received 568 completed surveys out of the 1,980 eligible respondents, generating a response rate of 28.7%.

Choice Experiment Design

Prior to the choice question, respondents indicated which practices they used on the field in the previous growing season, as well as which practices they intended to use in the next growing season. In the choice experiment section, we presented respondents two stated-preference discrete choice questions. These questions asked the respondent to consider a field where runoff is the greatest concern for them and presented them with hypothetical conservation contracts.

We designed two categories of hypothetical programs, an additionality-based program with stipulated enrollment restrictions and an unrestricted program, and randomly assigned respondents to one group. In the unrestricted group, each choice asked respondents to choose among three options: two conservation contracts and a status-quo option of neither contract (Figure 1). The two programs vary in five attributes: length of the contract in years (two or four years), requirement on no-till or strip-till ("not required" or "must be used throughout the length of the contract"), cover crops ("not required" or "must be used throughout the length of the contract"), split N application ("not required" or "must be used throughout the length of the contract"), and annual per-acre payment. We described the payment attribute as an EQIP-style per-acre cost-share, and the payment levels include $10/acre, $40/acre, $70/acre, $100/acre, and $130/acre.

Choices presented to farmers in the restricted group are identical in their number, attribute makeup, and design. They differ, however, in that the survey stated "the funding is only available to encourage additional, new acres of conservation practices". Restricted programs only support practices that were not already in use by the farmer in the previous year.[2] Each respondent in the restricted program group views the full set of two conserva-

[2]An enrollment restriction that would more precisely exclude non-additional conservation practices

tion contracts in each choice, but is only able to select contracts for which they are eligible (meaning they indicated earlier in the survey that they did not use any of the practices in the contract during the previous growing season). Our experiment design includes 20 different choices selected to maximize D-efficiency (Scarpa and Rose, 2008), which we efficiently grouped into 10 choice blocks of two choices each. Because we could phrase each choice block using language for the enrollment restriction group or the unrestricted group, we constructed a total of 20 (10×2) versions of the questionnaire. In total, our dataset includes 806 choice responses from 568 farmers.[3]

Methodology

Discrete Choice Model

The random utility maximization (RUM) model (McFadden, 1974) is widely used to link the deterministic model with a statistical model of human behavior. The RUM model posits that an individual chooses the alternative that gives the highest utility among alternatives, and modern variants of the model allow preference parameters to vary one individual to another, capturing random taste variation among individuals.

Assume that farmer i faces a choice among J alternatives, $J = \{1, 2, 3\}$, and chooses the alternative that gives the highest utility. The utility, U_{ijt}, that farmer i derives from

would focus on implementing practices in the upcoming year as the basis for enrollment, but this is difficult to do in practice. Our focus on past practices to determine enrollment eligibility is more in line with actual enrollment restrictions that exists in this space.

[3]While every respondent was presented with two choice questions, our sample includes less than two choice responses per respondent. This disparity comes from two sources. First, respondents may have elected to answer only one of the two choice questions. Second and more common, in the enrollment restriction group there are some choices where farmers were ineligible for both conservation contracts. In these cases, farmers were shown all contracts, but since there was only one viable choice (the status-quo alternative), these choices cannot be included in our analysis.

alternative j in choice situation t is:

$$U_{ijt} = V_{ijt} + \epsilon_{ijt} \tag{1}$$

$$= \beta_i' X_{ijt} + \epsilon_{ijt}, \tag{2}$$

where V_{ijt} is the observable indirect utility from observable attributes of option j; X_{ijt} is a vector of contract attributes and alternative-specific constants (ASQ) for alternative j; β_i is a vector of farmer i's latent preference parameters for these attributes; and, ϵ_{ijt} is the error term that captures the unobserved element of the utility with a type 1 extreme value distribution. We adopt a random parameters logit (RPL) framework to model unobserved preference heterogeneity, in which each farmer's preference parameter is a draw from a continuous preference distribution with mean μ and standard deviation σ (to be estimated), denoted as $f(\mu, \sigma)$. Under this framework, the probability that farmer i will select alternative j from a set of J alternatives in choice situation t is given by

$$P_i(j_t) = \frac{e^{V_{ijt}}}{\sum_{j=1}^{J} e^{V_{ijt}}}, \tag{3}$$

In the choice experiment setting, each individual faces T choices. We define the choice sequence that includes farmer i's choice in each time t as $\mathcal{J} = \{j_1, \ldots, j_T\}$. The joint probability of observing farmer i's choice sequence is given by

$$P_i(j_1, \ldots, j_T) = \int_{\beta_i} \prod_{t=1}^{T} P_t(j_t|\beta_i) f(\mu, \sigma) d\beta_i \tag{4}$$

$$= \int_{\beta_i} \prod_{t=1}^{T} \left[\frac{e^{V_{ijt}}}{\sum_{j=1}^{J} e^{V_{ijt}}} \right] f(\mu, \sigma) d\beta_i, \tag{5}$$

We can consider the unconditional probability as a weighted average of the standard logit probability evaluated at different values of β, with derived from the density of β.

Since the integral does not have an analytical solution, we approximate the solution through simulation using the expectation maximization (EM) algorithm (Train, 2009). Each simulation in our EM algorithm uses 500 Halton draws. We assume all attributes and ASCs have a normal preference distribution except for contract payment, which we model as fixed.

To further specify the model, choice attributes include characteristics of the offered contracts and an ASC for the status-quo option of rejecting both offered contracts. We also allow for heterogeneity in preference for the required practice contract attributes and ASCs by contract type (enrollment-restricted or unrestricted).[4] The following gives the observable indirect utility for farmer i from contract j:

$$\begin{aligned} V_{ij} = \beta_{i1} Length + \beta_2 Payment + \\ I(N) * \left[\beta_{iN3} I(CoverCrop) + \beta_{iN4} I(NoTill) + \beta_{iN5} I(SplitN) + \beta_{iN6} SQ \right] + \\ I(R) * \left[\beta_{iR3} I(CoverCrop) + \beta_{iR4} I(NoTill) + \beta_{iR5} I(SplitN) + \beta_{iR6} SQ \right], \end{aligned} \tag{6}$$

where $Length$ indicates the number of years the proposed contract will cover; $NoTill$, $CoverCrop$, and $SplitN$ are indicator variables for whether the proposed contract requires no-till/strip-till, winter cover crops, and split N application, respectively; $Payment$ denotes the annual cost-share payment in the proposed contract; SQ is an indicator variable for the status-quo ASC; and, $I(R)$ and $I(N)$ are indicator variables for whether the choice involved contracts designed with and without enrollment restrictions, respectively.

Welfare Estimates and Policy Simulations

We use our discrete choice model estimates to conduct a counterfactual analysis, which allows for assessment of policy efficiency. We model farmers' minimum WTA using

[4]Models that allow contract length and program payment attributes to vary by enrollment restriction yield virtually identical results to those presented here.

compensating variation, which measures the incremental change in income that makes individual i indifferent to an exogenous change (Haab and McConnell, 2002). In our study, the compensating variation for a conservation contract is the amount of money paid that leaves a farmer at a utility level equal to the status-quo state. Thus, this WTA measure is the minimum amount of money a farmer will accept to opt-in to a program. Using the farmer behavioral model described above, we generate individual-specific preference parameters for each attribute of contracts (as well as parameters for ASCs). We condition these farmer-specific parameters on farmer's choice in the survey and simulate them using 1,000 Halton draws to populate preference values for all random contract attributes and ASCs. Using these individual preference parameters, we estimate each farmer's minimum WTA for a specified contract. Let $\widehat{V_{ij}}$ and $\widehat{V_{iSQ}}$ denote the estimated utility of the non-payment attributes of the offered contract and the status-quo alternative for farmer i. In this setting, the following formula gives the minimum WTA of individual i for program j:

$$WTA_{ij} = -\frac{\widehat{V_{ij}} - \widehat{V_{iSQ}}}{\widehat{\beta_2}}, \tag{7}$$

where $\widehat{\beta_2}$ is the estimated preference parameter on contract payment. If $\widehat{V_{ij}}$ is an enrollment-restricted contract, preference parameters for restricted contract attributes are populated. The converse is true for unrestricted contracts, with only preference parameters for unrestricted contracts used in the estimation of $\widehat{V_{ij}}$ and $\widehat{V_{iSQ}}$ for these contracts.

In the policy simulation, we follow EQIP payment rate lists and consider six pseudo conservation contracts where we offer cost-share payments of: \$40/acre for cover crops; \$10/acre for no-till or strip-till; \$9/acre for split N application; \$50/acre for a bundle of cover crops and no-till or strip-till; \$49/acre for a bundle of cover crops and split N application; and, \$19/acre for a bundle of split N application and no-till or strip-till. Each contract requires implementation of the specified practices for two years with offered annual cost-share payments. When simulating responses to cost-share contracts, we assume that any farmer whose estimated WTA is below the offered cost-share payment will accept the contract.

Results

Descriptive Summary

Table 1 presents summary statistics of demographic and socioeconomic characteristics of farmers in restricted and unrestricted enrollment groups. We collect a survey sample that includes a total of 568 farmers—297 presented with unrestricted conservation programs and 271 presented with enrollment-restricted programs. Among the 568 respondents, 376 answered two choice questions and 54 answered only one choice question, generating a total of 806 choice cases in the data set. In the sample, 96.5% of the farmers are male, around 38% have a bachelor's degree, and about half have an annual gross income over $250,000. The average respondent has nearly 36 years of farming experience and operates about 800 acres farmland, about 61% of which is rented from others. Demographics are very similar between the restricted and unrestricted groups, and t-test results show that the difference is neither economically nor statistically significant.

Table 2 shows farmers' conservation practice usage for the previous season. In the questionnaire, before the choice question on hypothetical conservation programs, we asked farmers to indicate which practices they used on the field in the previous growing season. This question determines eligibility status for a future enrollment-restricted program, as the restricted program only supports practices that were not already in use in previous years. Table 2 shows that, in general, about half of the respondents in the sample indicated they did not use any of the three conservation practices (cover crops, no-till or strip-till, and split N application), and half used at least one of these practices. Based on this information, we characterize farmers that indicated using at least one of the three practices as green farmers, and as brown farmers otherwise. If the enrollment-restricted program could help motivate more brown farmers to adopt at least one of these conservation practices, then the program will contribute to generating much higher environmental externality. Among these three practices, there are remarkable differences in the involvement ratio. Cover crops are the least popular conservation practice, with only a 15% participation rate. Split N application is the most prevalent and recognized practice—nearly one-third of farmers implement it, which is reasonable considering that split N application can improve N uptake and enhance optimum yields, thus directly influencing farmer's net private benefits. Comparing the unrestricted and restricted groups, there is no economically and statistically significant difference in the percentages of farmers using cover crops, no-till or strip-till, and split N application.

Table 3 summarizes farmers' responses to the choice questions. There are a total of 806 choices, of which 505 offered unrestricted programs and 301 offered restricted programs. The opt-in rate of restricted programs A and B are 4.4 and 7 percentage points higher, respectively, than that of the unrestricted program. As a whole, the participation rate of the restricted program increased 11.4 percentage points relative to the unrestricted program.

Table 4 lists and compares the mean values on the attributes of the selected contracts between the unrestricted and restricted groups. As mentioned in Table 3, there are 505 choice cases, 301 of which offered restricted programs. Table 4 shows 241 cases where farmers selected an unrestricted conservation contract and 178 cases where they selected a restricted contract, generating a participation rate of 47.7% and 59.1%, respectively. For the selected unrestricted contracts, 44.4% of contracts require growing cover crops, 38.6% require implementing no-till/strip-till, and 57.3% require split N application. In contrast, for the selected restricted contracts, 47.2% require growing cover crops, 39.3% require no-till/strip-till, and 47.8% require split N application. The raw data illustrate that attributes of the accepted contracts are roughly equivalent across treatments with the exception of split-N application, which is more often selected when programs do not have enrollment restrictions. This is likely due to the fact that this practice is more likely to be a binding enrollment restriction for farmers than the other practices, as almost 35% of our sample reported using split-N application the previous year compared with 23% for no-till and 15% for cover crops.

Random Parameter Logit Model Results

Table 5 shows the estimation results from our random parameter logit model. As we expect, program payment has a positive and statistically significant effect on utility, indicating that with a higher payment rate, farmers are more willing to accept a contract. Mean coefficient estimates for contract length is negative and statistically significant at the 1% level, suggesting that generally farmers prefer not to be locked into long-term conservation contracts. There are several things worth noting regarding the estimated coefficients for our conservation practice attributes. First, the estimated coefficients for cover crops and no-till/strip-till have statistically significant and negative signs under both contract types, which suggests that on average, Iowa farmers dislike growing cover crops or using no-till/strip-till practices on their field. The estimated coefficients for split N application are also negative under both contract types but only statistically significant for restriction contracts. Second, comparing the results under unrestricted versus restricted programs, the magnitudes of the estimated coefficients on cover crops and split N increases but that on no-till/strip-till decreases, though none of these differences are statistically significant.[5] Third, the results also reveal that farmers have a more dispersed taste for cover crops under the restricted contract, which can be seen from the larger standard deviation on cover crops. In general, preference estimates for conservation practice attributes do not appear to differ in a systematic way between restriction and unrestricted respondents.

The largest difference in preferences we find between restricted and unrestricted

[5]T-tests with a null hypothesis that the mean parameter estimate for the conservation practice in restricted programs is equal to the mean parameter estimate in unrestricted programs yield p values of 0.764, 0.124 and 0.277 for cover crops, no-till/split-till, and split-N application, respectively.

contracts is captured by the status-quo ASC, which captures the mean utility level of the status-quo alternative relative to the conservation contract options. We expect the ASC in the restricted program to be smaller than that of unrestricted program, which indicates that farmers are more willing to join a program when they know not all farmers have the opportunity to do so. From Table 5, the coefficient on ASC is positive for unrestricted contracts while negative and statistically significant for restricted contracts,[6] which implies that farmers are more likely to leave their status-quo and agree to a contract when they know enrollment restrictions apply to the program. However, both distributions have large standard deviations, which describes the farmers' dispersed taste for these programs.

To test whether our findings are robust to other model specifications, we run a conditional logit (CL) model with the same set of attributes (see Appendix A - Table 7 for regression results). The results of the CL model are largely similar and consistent with the RPL model results. However, the CL model assumes that the respondents share the same utility functions, thereby the taste parameters are homogeneous across all farmers in the sample. Previous studies (Broch and Vedel, 2012) show that farmers' preference heterogeneity for agri-environmental contracts is a key aspect to take into account for policy improvements, and this heterogeneity could have profound influence on the efficacy of program and public policy design (Hudson and Lusk, 2004; Sun et al., 2021).

Lastly, we examine whether our different findings for restricted and unrestricted could be driven by sample selection issues. Farmers who have used these conservation practices last year (Green farmers) are excluded from the sample in our enrollment restriction treatment but are included in the unrestricted treatment. If these Green farmers have different preferences for these programs, their exclusion might be driving some of the differences in groups we are attributing to the treatment. To test whether such sample selection misleads our results, we restrict the sample to farmers who would be eligible for

[6] The difference between the two means is statistically and economically significant (the p-value for the two-sided hypothesis t-test is 0.009). This evidence helps illustrate that enrollment restrictions play a significant role in farmer's contract choice behavior.

all contracts (Brown farmers) in both restriction and no-restriction samples, and then run both CL and RPL model regressions (see Appendix A - Table 7 and Table 8 for regression results). Comparing the results from the full sample v.s. brown sample, we find the regression results are quite similar and consistent with each other. This is strong evidence that our findings are not driven by sample selection issues.

Policy Simulations

In this section, we examine the results of our policy simulations. All simulated conservation contracts are two years in length, and we consider six different combinations of required practices (CC, NT, SN, CC + NT, CC + SN, and NT + SN). In Table 6, we estimate farmers' WTA for each program with and without enrollment restrictions using Equation 7 and the model from Table 5. The reduction percentage of WTA for each program under restriction compared with WTA under no restriction is also shown in the last column of Table 6. We consider two approaches to estimate the WTA. The first approach, in the top panel of the table, uses the estimated mean preference parameter values on each random attributes to calculate WTA. The second approach uses individual-specific generated preference parameters to estimate WTA values for each farmer and then calculates the median WTA in our sample for each contract. The introduction of enrollment restrictions reduces WTA for no-till/strip-till, split N application, and cover crops contracts by a remarkable 93.4%, 91.6%, and 82.5%, respectively. In addition, we can see that the two approaches generate similar WTA values and percentage differences for all contracts, which means that our results are quite robust.

Next, we show in Figure 2 the distributions of WTAs for three different conservation contracts — cover crops, no-till/strip-till, and split N application contracts, again assuming a two-year program period. Comparing the WTA distributions of enrollment-restricted v.s. unrestricted contracts, we find that all three WTA curves with enrollment restrictions shift left, indicating a significant reduction of WTAs for enrollment-restricted contracts.

However, the WTA curves with enrollment restrictions have heavier tails, which implies a larger group with strong aversion to enrollment restriction programs.

Finally, we plot participation supply curves for the same three specified two-year contracts in Figure 3. There are three curves in each plot: the blue curve denotes supply for programs without enrollment restrictions. The red curve is a naive supply curve for programs with enrollment restrictions. We describe this curve as naïve because it focuses on estimated WTA without examining whether the farmer in question is eligible for the contract. The green curve, which we call the amended restriction supply curve, uses WTA estimates for enrollment restriction contracts but accounts for the restriction by excluding ineligible farmers. As an example, if a conservation practice was currently used by 25% of our sample, this amended supply curve could never exceed 75% enrollment at any payment level.

For each curve, given a payment rate, we predict the participation rate in our sample. For example, given an annual cost-share payment of $50/acre for cover crops, we predict that there would be 26% of farmers enrolling in the unrestricted contract, 82% of farmers enrolling in the naïve restricted contract. After mediated by the percentage of the sample that is ineligible, which is about 13.5% for cover crops, our amended restriction supply curve indicates enrollment of about 70%, lower than our naïve supply curve but still much higher than the supply curve for our unrestricted contract. For all three practices, when payments are relatively low the proportion enrolled for contracts with enrollment restrictions far exceeds the proportion enrolled for comparable contracts without restrictions. As payments rise, the gap between contract types narrows, though the rate of this narrowing is principally a function of the proportions of farmers for whom the enrollment restriction is binding. Specifically, in our sample a much larger share of farmers use split-N application than the other conservation practices, and as one might expect this translates to enrollment restrictions being less advantageous when it comes to spurring greater levels of enrollment.

Conclusion

Using a mixed-mode mail and online survey of 568 farmer respondents in the Boone and North Raccoon River watersheds, we build a discrete choice model and estimate preferences for voluntary conservation programs to examine farmer behavioral response to a new policy design—enrollment restrictions in cost-share programs. The results from our random parameter logit regression show that preference parameters are significantly negative for most practices. This suggests that generally farmers dislike adding these conservation practices on their field. Moreover, the coefficient on status-quo ASC is positive for unrestricted contracts, but has a significantly negative sign for enrollment-restricted contracts. This implies that farmers are more likely to leave their status-quo and enroll in a program when they know this is an exclusive contract.

Our findings have implications for the efficiency of conservation program designs. We utilize the individual-specific parameter estimates populated from the farmer choice model to assess the potential impacts on farmers' WTAs and participation rates. We conduct several different policy simulations comparing WTAs of a baseline program (enrollment-unrestricted contract that is available to everyone), to those of a enrollment-restricted contract. We mainly consider three pseudo conservation contracts: incentivizing cover crops ($40), no-till ($10), and split N application ($9) for two years. Our results suggest that introducing enrollment restrictions in conservation programs reduces estimated WTAs.

Furthermore, participation supply curves demonstrate that farmer's enrollment is significantly increased when introducing enrollment restrictions in conservation contracts at most payment levels, even if we exclude the ineligible portion from the sample. Therefore, our findings suggest that the implementation of enrollment restrictions are likely to increase program participation rates for the target population. This is especially true in cases where conservation budgets are tight and the incentivized practices have relatively low adoption rates in the targeted watershed.

This paper contributes to an understanding of how farmers would respond to additionality-based programs. We find that introducing enrollment restriction significantly motivates pro-environmental behavior. This implies the government can spend less money to attain a similar level of environmental benefits through additionality-based programs. However, there is a caveat that the overall effectiveness of enrollment restrictions will be influenced by the size of the excluded population as well as the target enrollment goal of the program. It is critical to know the current practice adoption rates at county/watershed-level and adjust enrollment restrictions correspondingly in contract design with a purpose to achieve policy goals.

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Figure 1: Example Conservation Program Choice Experiment Question

Section 3: Hypothetical Voluntary Conservation Program for Your Field

Conservation Program Overview.

Consider a hypothetical situation where a government agency or conservation group is offering multiple ***voluntary conservation contracts*** *with different lengths* ***starting the 2021 growing season*** (from after harvest in the fall of 2020 until harvest in the fall of 2021). All contracts include the adoption of one or more management practices to reduce nutrient loss that **are not already in use or planned for use in the 2020 growing season**, as well as an annual per-acre cost-share payment to the farmer. The practices, as well as the per-acre cost share, apply to the acreage of the entire field.

These conservation programs are designed to encourage **additional, new** acres of three conservation practices: no-till or strip-till, cover crops, and split N application. As a result, not all acres are eligible for this program. For example, a field which currently uses cover crops is not eligible for conservation programs adding cover crops.

24. Still considering your field from the previous section, please indicate whether this field would be eligible for a voluntary conservation program based on the practices you will use in the 2020 season. Note that in this new conservation funding concept, **funding is only available to add additional, new conservation practices**.

(Circle all that apply.)

1 = I will not use no-till/strip-till, cover crops, or split-N-application on this field in 2020, so it is eligible for any conservation contracts presented in the next two scenarios.

2 = No-till/strip-till will be used on this field for the 2020 crop, so it is not eligible for contracts in 2021 ***adding*** no-till/strip-till.

3 = Cover crops will be planted on this field for the 2020 crop year (post-harvest 2019 until harvest 2020), so it is not eligible for contracts in 2021 ***adding*** cover crops.

4 = Split nitrogen application will be used on the field for the 2020 crop, so it is not eligible for contracts in 2021 ***adding*** the practice of split nitrogen application.

Scenario 1

Please consider the terms of Programs A & B below for your field and answer the questions that follow as if a real conservation contract was being offered to you.

	Program A	**Program B**
Length of Contract	2 years (2021, 2022)	4 years (2021 - 2024)
No-Till or Strip-Till (Leaving more than 90% residue)	Not Required	Must be used in 2021-24, ***not*** used in 2020
Cover Crops (Planting a crop after harvesting the main cash crop)	Not Required	Must be used in 2021-24, ***not*** used in 2020
Split Nitrogen application (Apply some N preplant/at-plant and the remainder sidedress)	Must be used in 2021-22, ***not*** used in 2020	Must be used in 2021-24, ***not*** used in 2020
Annual Cost Share Payment to You	$70/acre	$100/acre

25. As mentioned earlier, the program is available for fields currently not using these practices. Based on the information above, is your field eligible for either Program A or Program B for the 2021 growing season?

1 = Yes, eligible for A and B
2 = Yes, but eligible for A only
3 = Yes, but eligible for B only
4 = Not eligible for either (If not eligible for either, go to Page 7)

26. If your field is eligible, which program do you prefer?

1 = Program A 2 = Program B 3 = Neither Program (If Neither, go to Page 7)

Table 1

Characteristics	Full Sample		Unrestricted Group		Restricted Group		t-statistics
	Mean	Std.Dev	Mean	Std.Dev	Mean	Std.Dev	
Age	60.24	12.97	60.54	12.71	59.91	13.28	0.56
Gender	0.965	0.18	0.965	0.18	0.965	0.18	0.01
Income [1]	0.482	0.50	0.504	0.50	0.459	0.50	1.02
Farm years	35.57	15.11	35.73	14.87	35.4	15.40	0.26
Education [2]	0.376	0.485	0.387	0.49	0.364	0.48	0.56
Owned farm size	312.8	407.14	331.12	444.24	292.93	362.44	1.10
%Rented farmland	0.61	0.34	0.629	0.33	0.59	0.36	1.35
# Farmers	568		297		271		

[1] Income is an indicator variable for reported gross annual farm income exceeding $250,000.
[2] Education is an indicator variable equal to 1 if the respondent has a bachelor's degree.

Table 2: Farmer's Actual Conservation Practice Adoption Rate in the Previous Year

	Full sample		No Restriction		Restriction		*t*-stat
	%Farmer	#Farmers	%Farmer	#Farmers	%Farmer	#Farmers	
Use at least one	47.01%	267	49.83%	148	43.91%	119	1.41
Use cover crops	13.91%	79	13.80%	41	14.02%	38	0.07
Use no-till	21.48%	122	22.22%	66	20.66%	56	0.45
Use split N	32.22%	183	34.01%	101	30.26%	82	0.95
# Farmers	568		297		271		

Notes: the *t*-test compares the conservation adoption rates between restricted and unrestricted groups. All t-statistics are quite small and the corresponding two-tailed *p*-values are greater than 0.05. We conclude that the difference of adoption rates between restricted and unrestricted groups is not different from 0.

Table 3: Summary of Farmers' Responses for the Choice Question

	No Restriction		Restriction	
	#cases	percentage	#cases	percentage
Program A	132	26.14%	92	30.56%
Program B	109	21.58%	86	28.57%
Status Quo	264	52.28%	123	40.86%
Total cases	505		301	

Table 4: Mean Values on Contract Attributes for the Selected Programs

	No Restriction		Restriction	
	Mean	S.D.	Mean	S.D.
Cover crops	0.444	0.498	0.472	0.501
No-till/strip-till	0.386	0.488	0.393	0.49
Split N	0.573	0.496	0.478	0.501
Length	2.78	0.978	2.876	0.995
Payment	90.041	36.816	86.011	40.356
#Opt-in cases	241		178	

Table 5: Random Parameter Logit Results

Attributes		**Mean**	**Std. Dev.**
Payment	Contract payment rates	0.029***	
		(0.006)	
Length	Contract length in years	-0.702***	0.611**
		(0.206)	(0.298)
CoverCrops	Cover crops cost-share without Restrictions	-1.195***	0.619
		(0.374)	(0.988)
	Cover crops cost-share with Restrictions	-1.362**	2.758***
		(0.612)	(1.032)
NoTill	No-till cost-share without Restrictions	-2.384***	3.077***
		(0.652)	(0.880)
	No-till cost-share with Restrictions	-1.133**	0.167
		(0.534)	(1.612)
SplitN	Split N application cost-share without Restrictions	-0.253	1.592**
		(0.347)	(0.734)
	Split N cost-share with Restrictions	-1.026*	1.376
		(0.553)	(1.013)
Status-Quo ASC	Status-quo without Restrictions	0.206	3.981***
		(0.620)	(0.794)
	Status-quo with Restrictions	-2.272**	5.169***
		(0.982)	(1.372)
Observations		2,266	
(Respondents)		(424)	

Notes: Standard deviations in parentheses.
***,**, and * indicate significance at the 1%, 5%, and 10% level, respectively.
We model all attributes with normal preference distributions except for Payment, which is fixed. The model uses the expectation-maximization (EM) algorithm with 500 Halton draws for simulation.

Table 6: WTA Values for Restricted *v.s.* Unrestricted Contracts

	Practices	No Restriction	Restriction	Difference(%)
Mean Preference Values	CC	$96.45***	$16.93	82.45%***
		(15.92)	(27.44)	
	NT	$137.35***	$9.07	93.40%***
		(21.95)	(27.52)	
	SN	$64.04***	$5.39	91.59%**
		(15.47)	(27.84)	
	CC + NT	$178.45***	$55.90*	68.67%***
		(25.47)	(28.94)	
	CC + SN	$105.14***	$52.22*	50.33%*
		(15.88)	(28.76)	
	NT + SN	$146.04***	$44.36*	69.62%***
		(21.42)	(25.61)	
Median Value from Individually-generated Preference Values	CC	$103.96	$22.67	86.16%
	NT	$146.00	$14.66	92.51%
	SN	$67.66	$11.80	89.51%
	CC + NT	$186.88	$61.63	77.47%
	CC + SN	$109.20	$58.88	72.54%
	NT + SN	$154.49	$50.64	79.87%

Notes: ***,**, and * indicate significance at the 1%, 5%, and 10% level, respectively. CC denotes cover crops, NT denotes no-till or strip till, SN denotes split N application. Standard errors generated using the Delta Method in parentheses. All programs assume 2-year contracts.

Figure 2: WTA Distribution for Conservation Contracts

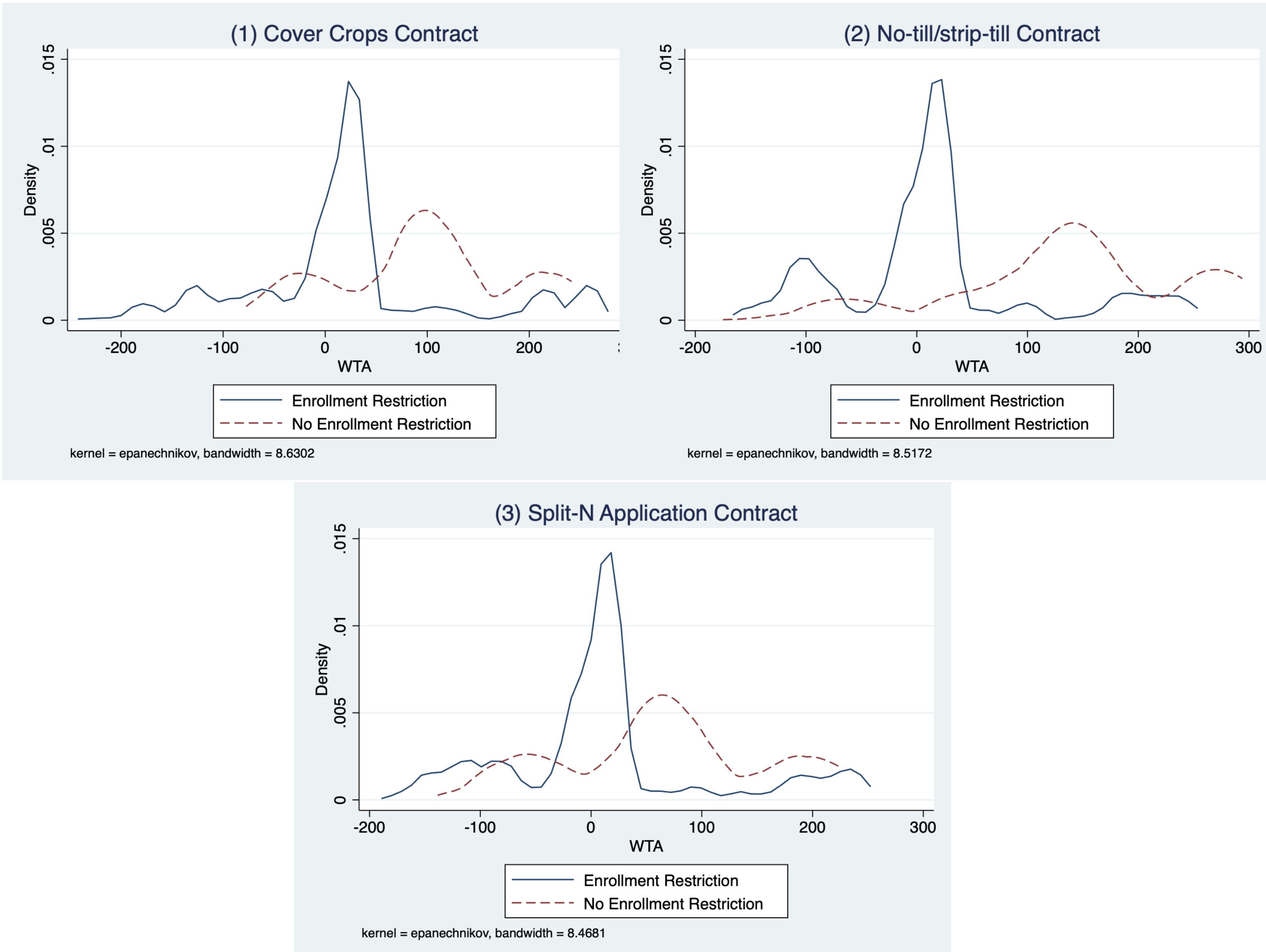
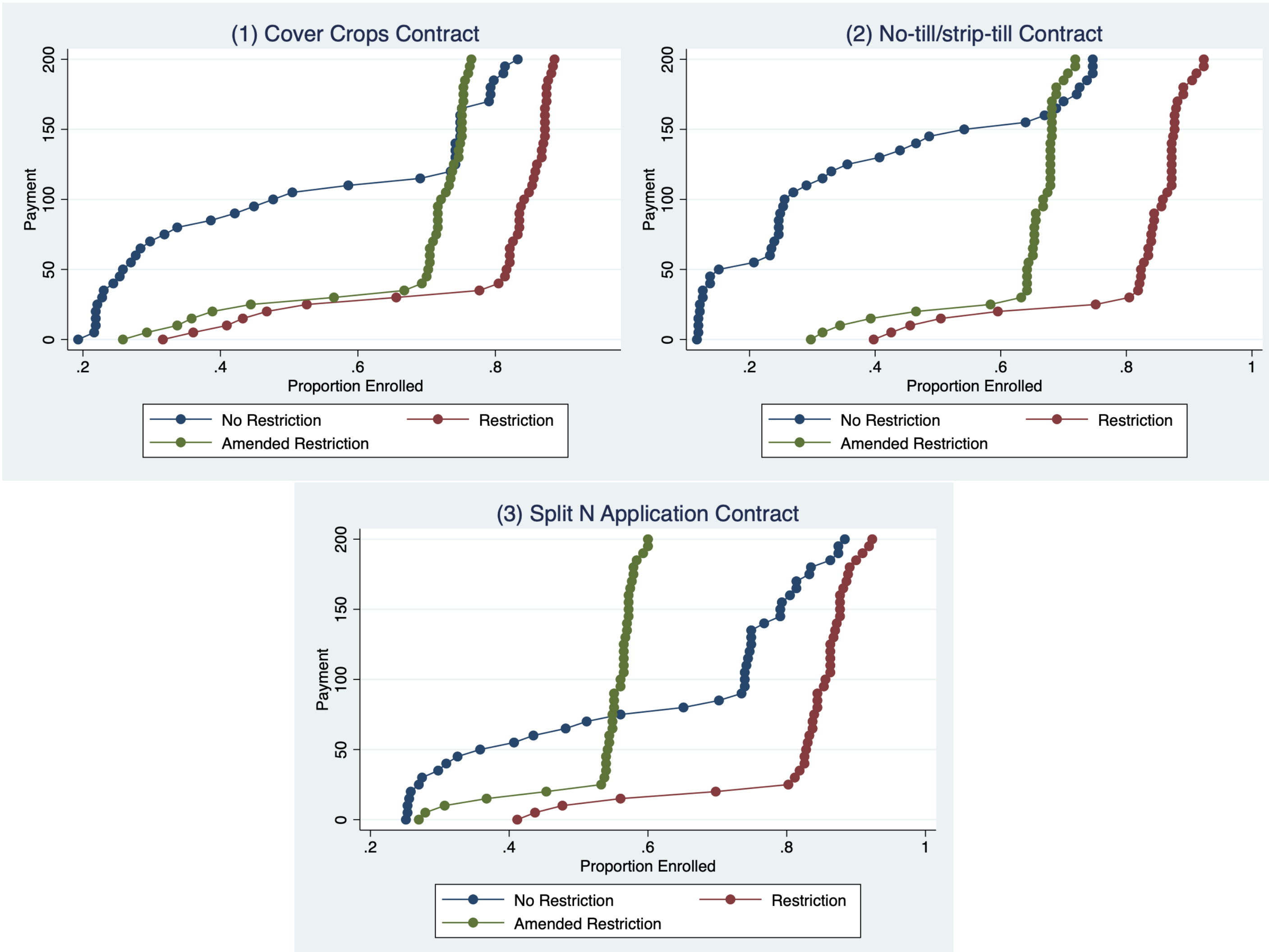


Figure 3: Participation Supply Curves for Conservation Contracts



Appendix A to Evaluating the WTA and Participation in Agricultural Conservation Programs: The Effects of Enrollment Restrictions

Table 7. Conditional Logit Results: All Farmers v.s. Brown Farmers

Table 8. Random Parameter Logit Results: All Farmers v.s. Brown Farmers

Table 9. WTA Values for Restricted v.s. Unrestricted Contracts: Brown Farmers

Figure 4. WTA Distribution for Conservation Contracts: Brown Farmers

Figure 5. Participation Supply Curve for Conservation Contracts: Brown Farmers

Table 7: Conditional Logit Results: All Farmers v.s. Brown Farmers

Variables	**Restrictions**	**All Farmers**	**Brown Farmers**
Payment		0.012***	0.0113***
		(0.054)	(0.002)
Length		-0.227***	-0.251***
		(0.001)	(0.083)
CoverCrops	No	-0.555***	-1.210***
		(0.162)	(0.269)
	Yes	-0.508**	-0.622**
		(0.213)	(0.289)
Notill	No	-0.734***	-0.924***
		(0.169)	(0.275)
	Yes	-0.556***	-0.807***
		(0.206)	(0.286)
SplitN	No	-0.035	0.054
		(0.171)	(0.288)
	Yes	-0.251	-0.461*
		(0.214)	(0.266)
Status-Quo ASC	No	0.379	0.158
		(0.268)	(0.412)
	Yes	-0.371	-0.436
		(0.316)	(0.458)
Observations		2,266	1095
(Respondents)		(424)	(195)

Notes: Standard deviations in parentheses.
***,**, and * indicate significance at the 1%, 5%, and 10% level, respectively. We model all attributes with fixed parameters.

Table 8: Random Parameter Logit Results: All Farmers v.s. Brown Farmers

Variables	Restrictions	All Farmers		Brown Farmers	
		Mean	Std. Dev.	Mean	Std. Dev.
Payment		0.029***		0.0267***	
		(0.006)		(0.00687)	
Length		-0.702***	0.611**	-0.663***	0.531*
		(0.206)	(0.298)	(0.254)	(0.308)
CoverCrops	No	-1.195***	0.619	-1.834***	0.148
		(0.374)	(0.988)	(0.555)	(1.098)
	Yes	-1.362**	2.758***	-1.926**	3.146**
		(0.612)	(1.032)	(0.889)	(1.604)
Notill	No	-2.384***	3.077***	-1.792***	-0.943
		(0.652)	(0.880)	(0.666)	(1.413)
	Yes	-1.133**	0.167	-1.330*	-0.159
		(0.534)	(1.612)	(0.739)	(1.773)
SplitN	No	-0.253	1.592**	0.228	0.869
		(0.347)	(0.734)	(0.495)	(1.445)
	Yes	-1.026*	1.376	-1.734**	1.559
		(0.553)	(1.013)	(0.805)	(1.101)
Status-Quo ASC	No	0.206	3.981***	0.381	3.183***
		(0.620)	(0.794)	(0.808)	(0.955)
	Yes	-2.272**	5.169***	-2.848*	7.663***
		(0.982)	(1.372)	(1.648)	(2.776)
Observations		2,266		1095	
(Respondents)		(424)		(195)	

Notes: Standard deviations in parentheses.
***,**, and * indicate significance at the 1%, 5%, and 10% level, respectively.
We model all attributes with normal preference distributions except for Payment, which is fixed. The model uses the expectation-maximization (EM) algorithm with 500 Halton draws for simulation.

Table 9: WTA Values for Restricted v.s. Unrestricted Contracts: Brown Farmers

		All Farmers			Brown Farmers		
Method	**Practices**	**No Res**	**Res**	**Diff(%)**	**No Res**	**Res**	**Diff(%)**
Mean Preference Values	CC	$96.45***	$16.93	82.45%***	$132.46***	$15.13	88.58%**
		(15.92)	(27.44)		(24.47)	(50.71)	
	NT	$137.35***	$9.07	93.40%***	$130.89***	-$7.16	105.47%**
		(21.95)	(27.52)		(24.15)	(51.82)	
	SN	$64.04***	$5.39	91.59%**	$55.35***	$7.94	85.66%
		(15.47)	(27.84)		(21.08)	(50.75)	
	CC + NT	$178.45***	$55.90*	68.67%***	$199.49***	$64.88	67.48%**
		(25.47)	(28.94)		(32.58)	(52.29)	
	CC + SN	$105.14***	$52.22*	50.33%*	$123.95***	$79.98	35.48%
		(15.88)	(28.76)		(23.67)	(51.33)	
	NT + SN	$146.04***	$44.36*	69.62%***	$122.38***	$57.69	52.86%
		(21.42)	(25.61)		(23.54)	(47.67)	
Median Value from Individually -generated Preference Values	CC	$103.96	$22.67	86.16%	$133.13	$19.78	88.06%
	NT	$146.00	$14.66	92.51%	$131.96	-$2.67	99.11%
	SN	$67.66	$11.80	89.51%	$54.03	$12.84	86.41%
	CC + NT	$186.88	$61.63	77.47%	$200.58	$69.51	70.79%
	CC + SN	$109.20	$58.88	72.54%	$122.72	$84.93	56.43%
	NT + SN	$154.49	$50.64	79.87%	$122.41	$62.51	67.84%

Notes: ***,**, and * indicate significance at the 1%, 5%, and 10% level, respectively.
CC denotes cover crops, NT denotes no-till or strip till, SN denotes split N application. Standard errors generated using the Delta Method in parentheses. All programs assume 2-year contracts.

Figure 4: WTA Distribution for Conservation Contracts for Brown Farmers

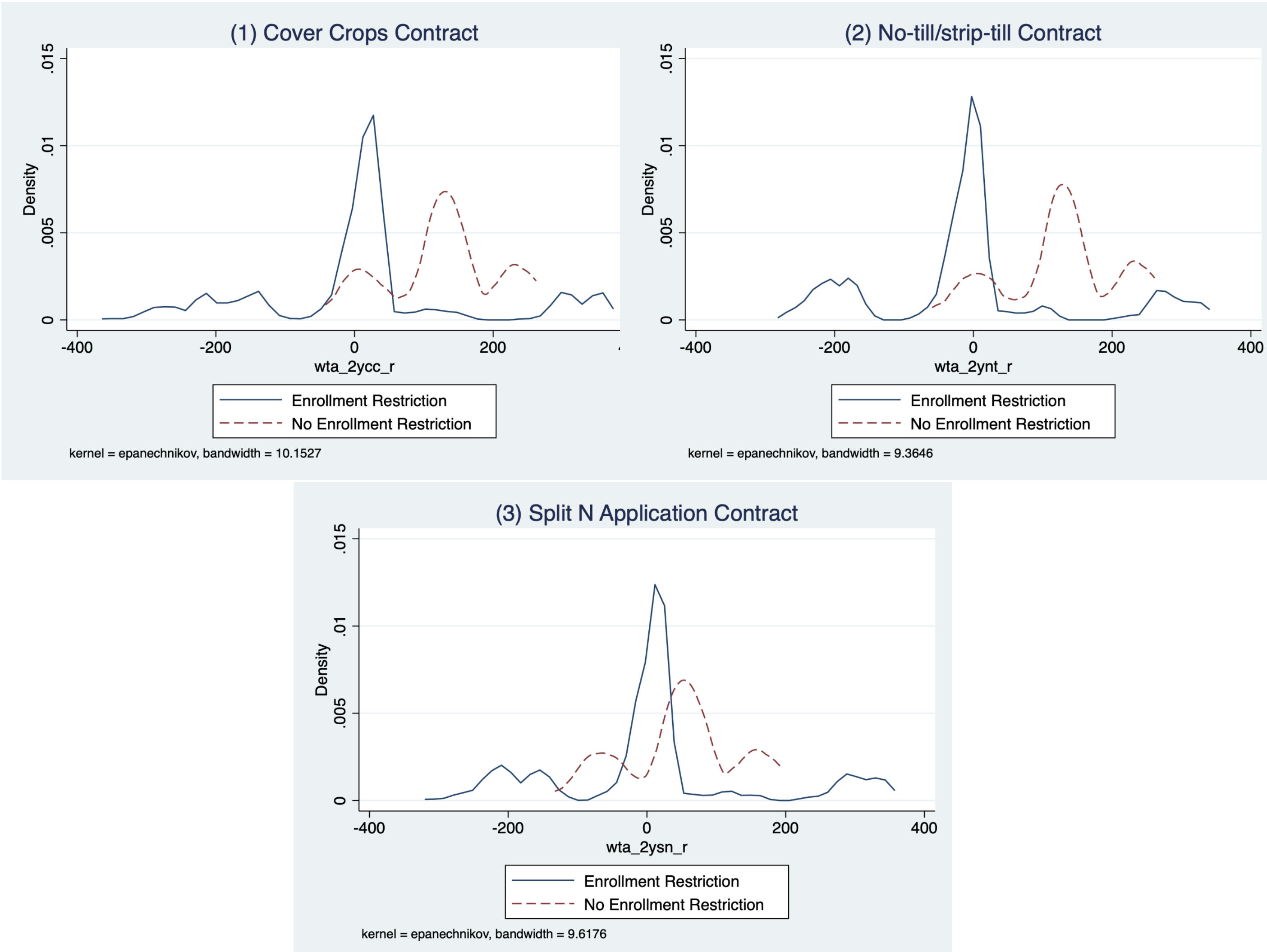
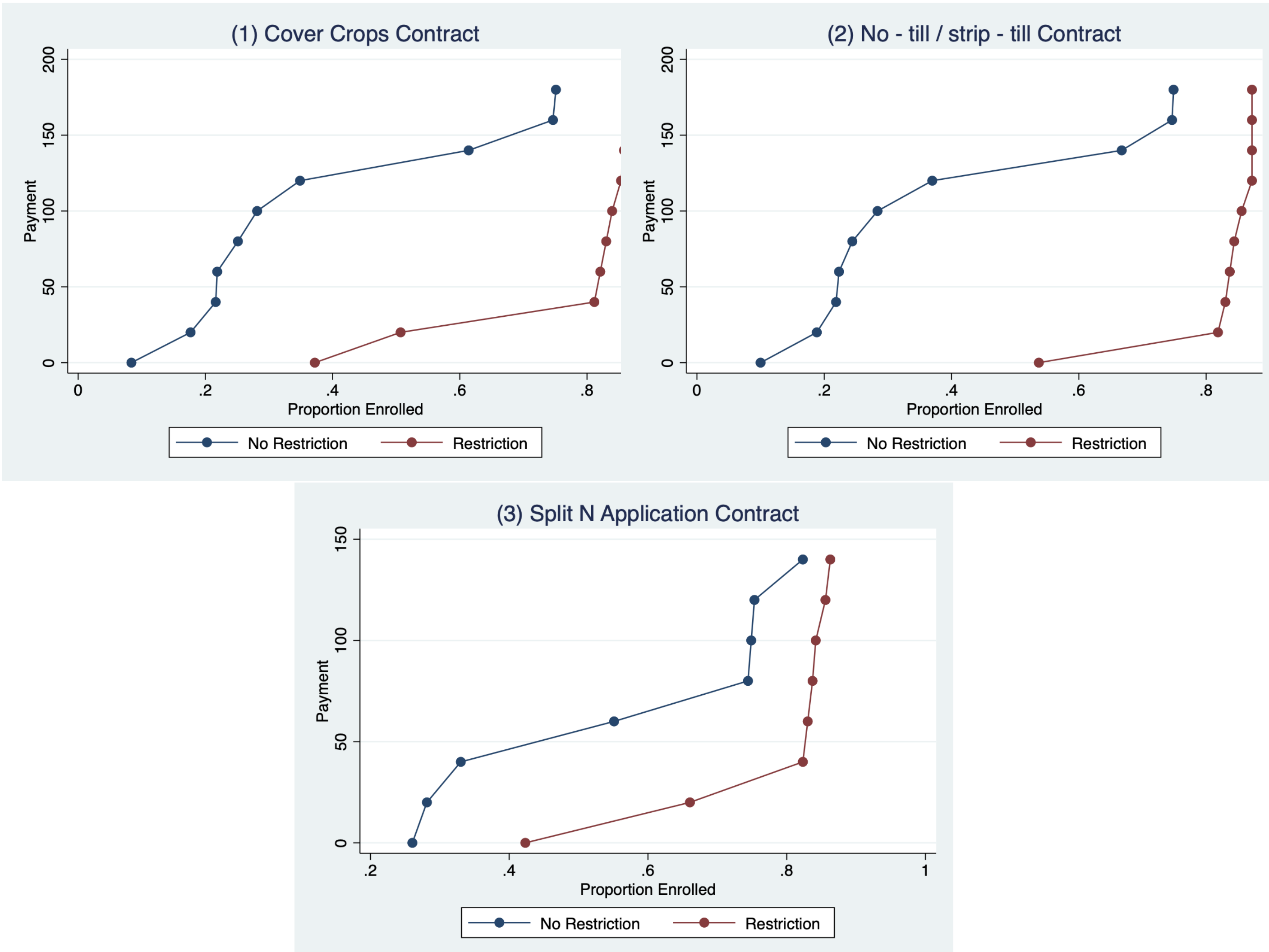


Figure 5: Participation Supply Curves for Conservation Contracts for Brown Farmers



Appendix B Sample Survey Questionnaire of Iowa Farmers: Boone and Raccoon River Watersheds

Survey of Iowa Farmers:
Boone and Raccoon River Watersheds

This survey should be completed by the principal decision maker of your farm business. Answer each question with the response you believe is most representative of you and your farm.
Thank you in advance for your time and attention!

Section 1: About You and Your Farm

1. Did you operate a farm in 2019?

1 = No
2 = Yes

2. Do you plan to operate a farm in 2020?

1 = No
2 = Yes

If you answered No to Q2, please return the blank survey in the postage paid envelope provided. Thank you!

****

3. How many of the acres that you farm are:

a. **owned by you**? ___________ # Acres owned

b. **rented from others?** ___________ # Acres rented
(including cash rent, flexible lease, crop share)

4. How many of the **FIELDS** that you farm are:

a. **owned by you**? ___________ # *Fields* owned

b. **rented from others**? ___________ # *Fields* rented
(including cash rent, flexible lease, crop share)

5. How many acres of corn and soybeans did you harvest in 2019?

a. __________________Corn Acres b. ___________________Soybean Acres

6a. Since 2010, have you converted woodland, pasture, wasteland, fallow, or CRP land into cropland?

1 = No
2 = Yes ➡ 6b. If Yes, how many acres? ______________acres

7. Do you use any of the following tillage practices? If yes, how many acres are tilled in each way?

	No	Yes	# Acres
a. Conventional Tillage (30% residue or less)	1	2	
b. Conservation Tillage (30 – 90% residue)	1	2	
c. Strip-till (90% residue or more)	1	2	
d. No-till (90% residue or more)	1	2	

8. Do you have land enrolled in any of the following programs?

	No	Yes	# Acres Enrolled
a. Conservation Reserve Program (CRP)	1	2	
b. Environmental Quality Incentive Program (EQIP)	1	2	
c. Iowa Department of Agriculture and Land Stewardship (IDALS) Cost Share Programs	1	2	
d. Conservation Stewardship Program (CSP)	1	2	
e. Iowa Mississippi River Basin Initiative (MRBI)	1	2	

9. Did you raise the following types of livestock in 2019? Please circle all that apply.

1 = Beef cattle
2 = Dairy cattle
3 = Hogs
4 = Poultry
5 = Other (Please specify:_________________________)

Section 2: Nutrient Management on a Specific Field

Please answer the following questions in reference to **ONE** of your fields that plan to operate for 2020 and 2021, and where soil erosion and nutrient runoff may be a potential problem. If there are several possible fields to choose from, choose **the field where *erosion or runoff is of greatest concern***.

10. What is the size of this field in acres? ______________ # acres

11. In which County and Township is this field located?

_________________________ County _________________________ Township

12a. Does this field have drainage tile installed?

1 = No
2 = Yes → 12b. If Yes, what is the depth of the tile? ______________feet
3 = Unsure

13. What is the general slope of this field?

1 = 0-2%	4 = More than 10%
2 = 2-5%	5 = Not sure
3 = 5-10%	

14. Are there buffer strips on this field?

1 = No 2 = Yes

15. How close is the nearest stream, ditch or other surface water to this field?

1 = Less than 25 feet
2 = 25 – 200 feet
3 = Greater than 200 feet

16. What is the **dominan**t soil type in this field? (Please circle all that apply.)

a. Clarion soil	e. Kossuth soil
b. Nicollet soil	f. Bode soil
c. Webster soil	g. Other
d. Marna soil	h. Not sure

17. When do you ***typically*** plant crops in this field?

1 = April 15 or before	4 = May 15-31
2 = April 16-30	5 = June 1-10
3 = May 1-15	6 = after June 10

18a. Do you rent this field from someone else?

1 = No [If No, go to Q19]
2 = Yes →

18b. If Yes, who makes the nutrient management decisions for this field?

1 = I do, with **no** landlord input
2 = I do, with landlord input
3 = My landlord and I equally
4 = My landlord, with my input
5 = My landlord alone
6 = Someone else

19. In the 2020 crop year, what would typical cash rent be for this field? $___________/acre
(Please provide an estimated cash rent even if you operate this field or rent it on a crop-share basis.)

20a. What crop was planted on this field in 2019?

1 = Corn 2 = Soybeans 3 = Some other crop

20b. What crop will be planted on this field in 2020?

1 = Corn 2 = Soybeans 3 = Some other crop

21. How much nitrogen and phosphorous, from both commercial and manure sources, do you plan to apply on this field**, in total**, for the 2019 and 2020 crop years?

a. Nitrogen (**in total** for the 2019 and 2020 crop years:________________lbs/acre

b. Phosphate (P_2O_5) before corn ____________lbs/acre

c. Phosphate (P_2O_5) before soybeans: ____________lbs/acre

22. The following table lists potential nutrient management practices. Are you ***planning to use*** any of these practices on **this** field in during the ***2020*** growing season (spanning from after harvest in the fall of 2019 until harvest in the fall of 2020)?

Practices	**Will not use in 2020**	**Will use in 2020 as part of a conservation cost share agreement**	**Will use in 2020 but not part of a conservation cost share agreement**
a. Plant winter cover crops	1	2	3
b. Use conservation tillage (30-90% of residue)	1	2	3
c. Use no-till or strip-till (> 90% residue)	1	2	3
d. Apply manure, if needed, based on P index	1	2	3
e. Place P & K more than 2 inches below the soil surface	1	2	3
f. Use split N application (apply some N preplant/at-plant and the remainder sidedress)	1	2	3

23. Do you expect to use any of these practices on **this** field ***during the 2021 growing season*** (from after harvest in the fall of 2020 until harvest in the fall of 2021)***?***

Practices	**Will not use in 2021**	**Will use in 2021 as part of a conservation cost share agreement**	**Will use in 2021 but not part of a conservation cost share agreement**
a. Plant winter cover crops	1	2	3
b. Use conservation tillage (30-90% of residue)	1	2	3
c. Use no-till or strip-till (> 90% residue)	1	2	3
d. Apply manure, if needed, based on P index	1	2	3
e. Place P & K more than 2 inches below the soil surface	1	2	3
f. Will use split N application (apply some N preplant/at-plant and the remainder sidedress)	1	2	3

Section 3: Hypothetical Voluntary Conservation Program for Your Field

Conservation Program Overview.

Consider a hypothetical situation where a government agency or conservation group is offering multiple ***voluntary conservation contracts*** *with different lengths* ***starting the 2021 growing season*** (from after harvest in the fall of 2020 until harvest in the fall of 2021). All contracts include the adoption of one or more management practices to reduce nutrient loss that **are not already in use or planned for use in the 2020 growing season**, as well as an annual per-acre cost-share payment to the farmer. The practices, as well as the per-acre cost share, apply to the acreage of the entire field.

These conservation programs are designed to encourage **additional, new** acres of three conservation practices: no-till or strip-till, cover crops, and split N application. As a result, not all acres are eligible for this program. For example, a field which currently uses cover crops is not eligible for conservation programs adding cover crops.

24. Still considering your field from the previous section, please indicate whether this field would be eligible for a voluntary conservation program based on the practices you will use in the 2020 season. Note that in this new conservation funding concept, **funding is only available to add additional, new conservation practices**.

    (Circle all that apply.)

    1 = I will not use no-till/strip-till, cover crops, or split-N-application on this field in 2020, so it is eligible for any conservation contracts presented in the next two scenarios.

    2 = No-till/strip-till will be used on this field for the 2020 crop, so it is not eligible for contracts in 2021 ***adding*** no-till/strip-till.

    3 = Cover crops will be planted on this field for the 2020 crop year (post-harvest 2019 until harvest 2020), so it is not eligible for contracts in 2021 ***adding*** cover crops.

    4 = Split nitrogen application will be used on the field for the 2020 crop, so it is not eligible for contracts in 2021 ***adding*** the practice of split nitrogen application.

Scenario 1

Please consider the terms of Programs A & B below for your field and answer the questions that follow as if a real conservation contract was being offered to you.

	Program A	Program B
Length of Contract	2 years (2021, 2022)	4 years (2021 - 2024)
No-Till or Strip-Till (Leaving more than 90% residue)	Not Required	Must be used in 2021-24, ***not*** used in 2020
Cover Crops (Planting a crop after harvesting the main cash crop)	Not Required	Must be used in 2021-24, ***not*** used in 2020
Split Nitrogen application (Apply some N preplant/at-plant and the remainder sidedress)	Must be used in 2021-22, ***not*** used in 2020	Must be used in 2021-24, ***not*** used in 2020
Annual Cost Share Payment to You	$70/acre	$100/acre

25. As mentioned earlier, the program is available for fields currently not using these practices. Based on the information above, is your field eligible for either Program A or Program B for the 2021 growing season?

    1 = Yes, eligible for A and B
    2 = Yes, but eligible for A only
    3 = Yes, but eligible for B only
    4 = Not eligible for either (If not eligible for either, go to Page 7)

26. If your field is eligible, which program do you prefer?

    1 = Program A 2 = Program B 3 = Neither Program (If Neither, go to Page 7)

27. Consider that your decision to the above scenario is binding, and you receive compensation according to your choice. **In addition to** the conservation practices specified in the program of your choice, would you use any of the following practices in this field **in the 2021 growing season?**

Practices	Would not use in 2021	Would use in 2021 with a cost share	Would use in 2021 without cost share
a. Use conservation tillage (30-90% of residue	1	2	3
b. Apply manure based on P index	1	2	3
c. Place P & K more than 2 inches below the soil surface	1	2	3
d. Use buffer strips	1	2	3

Scenario 2

The table below describes **different** conservation programs. Please consider the terms of Programs C & D and answer the questions that follow as if a real contract was being offered to you.

	Program C	Program D
Length of Contract	2 years (2021, 2022)	4 years (2021 - 2024)
No-Till or Strip-Till (Leaving more than 90% residue)	Must be used in 2021-22, ***not*** used in 2020	Not Required
Cover Crops (Planting a crop after harvesting the main cash crop)	Must be used in 2021-22, ***not*** used in 2020	Not Required
Split Nitrogen application (Apply some N preplant/at-plant and the remainder sidedress)	Not Required	Must be used in 2021-24, ***not*** used in 2020
Annual Cost Share Payment to You	$10/acre	$130/acre

28. As mentioned earlier, the program is available for fields currently not using these practices. Based on the information above, is your field eligible for either Program C or Program D for the 2021 growing season?

    1 = Yes, eligible for C and D
    2 = Yes, but eligible for C only
    3 = Yes, but eligible for D only
    4 = Not eligible for either (If not eligible for either, go to Q31)

29. If your field is eligible, which program do you prefer?

    1 = Program C 2 = Program D 3 = Neither Program (If Neither, go to Q31)

30. Consider that your decision to the above scenario is binding, and you receive compensation according to your choice. **In addition to** the conservation practices specified in the program of your choice, would you use any of the following practices in this field **in the 2021 growing season?**

Practices	**Would not use in 2021**	**Would use in 2021 with a cost share**	**Would use in 2021 without cost share**
a. Use conservation tillage (30-90% of residue	1	2	3
b. Apply manure based on P index	1	2	3
c. Place P & K more than 2 inches below the soil surface	1	2	3
d. Use buffer strips	1	2	3

Section 4: More about You

31. Are you male or female? 1 = Male 2 = Female

32. What is your age? _________ Years old

33. How many years have you been farming? _________ Years

34. What is the highest level of education you have completed?

1 = Some high school
2 = High School diploma or GED
3 = Some college, or Associate's degree
4 = Bachelor's degree
5 = Graduate or Professional degree

35. What was your **total farm operation's** annual gross income in 2018?

1 = Less than $50,000
2 = $50,000 - $99,999
3 = $100,000 - $249,999
4 = $250,000 - $499,999
5 = $500,000 or greater

36a. Does anyone in your household receive income from off farm sources such as an off-farm job, social security, retirement income, or something else?

1 = No [If No, go to Q37]
2 = Yes ➡

38b. If Yes, what percent of your household's annual gross income comes from off-farm sources? _______________%

37. ***In general*** are you someone who is willing to take risks or do you try to avoid taking risks?

Avoid taking risks					**Willing to take risks**	
1	**2**	**3**	**4**	**5**	**6**	**7**

38. ***In your occupation as a farmer***, are you someone who is willing to take risks or do you try to avoid taking risks?

Avoid taking risks					**Willing to take risks**	
1	**2**	**3**	**4**	**5**	**6**	**7**

39. Please record any other thoughts or comments about water quality issues in Iowa.

Thank you!! Please mail your completed survey in the postage-paid envelope provided.