



Munich Personal RePEc Archive

The effect of rental rates on the extension of Conservation Reserve Program contracts

Cooper, Joseph C. and Osborn, Tim

Economic Research Service, USDA

February 1998

Online at <https://mpra.ub.uni-muenchen.de/24781/>
MPRA Paper No. 24781, posted 10 Sep 2010 15:53 UTC

The Effect of Rental Rates on the Extension of
Conservation Reserve Program Contracts

by

Joseph C. Cooper

C. Tim Osborn¹

December 5, 1995

¹The authors are in the Food Consumption Economics Division and the Natural Resource Economics Division, respectively, of the Economic Research Service, U.S. Department of Agriculture, 1301 New York Ave., NW, Washington, DC 20005. The views expressed herein are the authors' and do not necessarily represent the views of the U.S. Department of Agriculture. The authors would like to thank Robin Shoemaker and Ralph Heimlich, ERS, for their valuable assistance.

The Effect of Rental Rates on the Extension of Conservation Reserve Program Contracts

Abstract

This paper presents a model for estimating the change in conservation reserve program (CRP) contract extensions as a function of the change in rental rates. The majority of the CRP contracts on approximately 36 million acres of enrolled land are expiring within the next two years, with the result that re-enrollment decisions by farmers and the federal government will have high budgetary implications. In a modification of the traditional dichotomous choice method for estimating random utility models in consumer surveys, we develop an ordered response referendum model that allows us to explicitly model the range in rental rates over which the representative farmer may be ambivalent to renewing the CRP contract. We use the empirical results from the ordered response model to estimate acreage re-enrollment as a function of the rental rate.

I. Introduction

Under the voluntary Conservation Reserve Program (CRP), the United States Department of Agriculture has (USDA) established contracts with farmers to retire highly erodible or environmentally sensitive cropland from agricultural production. Over the life of a typical ten CRP contract, cropland is converted to grass, trees, wildlife cover, or other conservation uses. This shift in land use can provide society with numerous environmental benefits including improvement of surface water quality, creation of wildlife habitat, preservation of soil productivity, protection of groundwater quality, and reduction of offsite wind erosion damages (Ribaud et al., 1990). The program also assists farmers by providing them with a dependable source of income from their retired land and reduces commodity surpluses (Young and Osborn, 1990). During 1986-1992, 36.4 million acres of cropland were enrolled in the CRP at an average annual government rent of \$50 per acre (Osborn, et al., 1992). The bulk of this land will be coming out of contract in 1996 and 1997, thereby raising concerns that a large percentage of CRP land may return to crop production, especially if prices and/or commodity programs are favorable.

For the 33.9 million of these acres that were enrolled prior to November, 1990, the CRP contract acceptance process was noncompetitive in nature (U.S. General Accounting Office, 1989)ⁱ and a significant number of CRP participants are likely receiving rental payments well in excess of what their cropland would rent for on the cash rental market. This paper investigates how CRP participants may react to changes in existing rental rates, and how this change could affect the number of CRP acres on which contracts are renewed. To do so, we develop a supply function that models total acreage enrolled as a function of the CRP rental payment and other explanatory variables. We use a referendum contingent behavior analysis of current CRP contract holders across the nation to develop this function. In a modification of the traditional survey approach, the referendum approach used here explicitly accounts for farmers who may be ambivalent

between re-enrolling and leaving the program.

This paper is organized as follows: Section II presents the theoretical framework for addressing this issue, Section III discusses the data set, Section IV presents the econometric results, and Section V discusses the potential levels of re-enrollment of CRP acres and the associated government costs of these renewals.

II. Theoretical Framework for the Farmer's Decision to Re-enroll

The farmer's decision to re-enroll in the CRP can be modelled using the random utility model (RUM) approach. From the utility theoretic standpoint, a farmer is willing to extend his CRP contract for an additional ten years if the farmer's utility with the extension is greater than or equal his utility per acre without the extension, i.e., if $U(0,y;x) \leq U(1,y + RP;x)$, where 0 is the state without the CRP contract; 1 is the state with the CRP contract extension; y is farmer i 's income; and \mathbf{x} is a vector of other attributes of the farmer that may affect the decision to extend the contract. RP is the CRP rental payment per acre. RP implicitly includes any change in income the farmer believes will be associated with enrolling the land in CRP versus employing the land in other uses. The farmer's utility function $U(i,y;s)$ is unknown due to components of it that are unobservable to the researcher, and thus, can be considered a random variable from the researcher's standpoint. The observable portion is $V(i,y;x)$, the mean of the random variable U . With the addition of an error ε_i , where ε_i is an independently and identically distributed random variable with zero mean, the farmer's decision to extend the contract can be re-expressed as

$$[1] V(0,y;x) + \varepsilon_0 \leq V(1,y + RP;x) + \varepsilon_1.$$

If $V(i,y;x) = \gamma_i + \alpha y$, where $\alpha > 0$, for $i = 0,1$, then the farmer is willing to extend the contract if γ_0

$$+ \alpha y + \varepsilon_0 \leq V_1 + \alpha(y+RP) + \varepsilon_1.$$

The decision to extend the contract can be expressed in a probability framework as $\Pr\{RPR \geq \$RP\} = \Pr\{V_0 + \varepsilon_0 \leq V_1 + \varepsilon_1\} = \Pr\{\varepsilon_0 - \varepsilon_1 \leq V_1 - V_0\}$, where RPR is the farmer's reservation price to extend the contract, $V_1 - V_0 = \gamma + \alpha RP$, and where $\gamma = V_1 - V_0$. Since $V_1 - V_0 = \gamma + \alpha RP$ is generated directly from the utility model given above, it is compatible with the theory of utility maximization. Hanemann (1984; 1989) describes how to calculate the mean and median minimum rental payments the farmers are willing to accept for the extension. For this paper, the mean, or median value is of secondary importance to estimating the probability of extension of the contract. The probabilities of extension will be converted into a schedule of CRP acres enrolled as a function of the rental payment.

Extension of the Theoretical Model to Allow for Farmer Indifference

Typically, the RUM discussed above is modelled in a dichotomous framework that does not allow for a "don't know" response: either the respondent selects "yes" to accepting the payment (assuming WTA) if the individual's utility in the new state is greater than or equal that in the base state or the respondent selects "no" to accepting the payment if the individual's utility in the new state is less than that in the base state. This model conforms to the neoclassical assumption that the decision-maker can unambiguously rank options. However, in reality, individuals do not always have a well-defined utility function and hence, may be ambivalent in the ranking of some bundles of goods. Akerlof and Dickens (1982) conducted the earliest economic research on incorporating ambivalence in the decision-making process. Heiner (1983) discusses how uncertainty affects optimization of the utility function. Believing that respondents should not be forced into a choice between only "yes" or "no", the National Oceanic and Atmospheric Administration's Blue Ribbon Panel on the use of CVM (Department of Commerce, 1993)

recommended that survey respondents be given the option to give an indecisive response to a referendum question.

The possibility of ambivalence or uncertainty in the farmer's decision to accept the offer of renewing the CRP contract can be depicted in Figure 1 in a manner similar to Opaluch and Segerson (1989).ⁱⁱ The 45 degree line is placed in the graph to depict choices that do not represent a change in total acreage. However, for this discussion, we assume that the farmer can purchase or sell land. Assume the farmer is currently at point A in his allocation of land between CRP acres and non-CRP acres. As it provides more of both types of acreage, any bundle in area I is strictly superior to bundle A. As it provides less of both types of acreage, any bundle in area II is strictly inferior to bundle A. As bundles in area III gives up little CRP acreage in exchange for much more non-CRP acreage and bundles in area IV gives up little non-CRP acreage in exchange for much more CRP acreage. Hence, the farmer prefers bundles in areas III and IV to bundle A. However, bundles in areas V and VI are not preferred to bundle A as they tend to represent a relatively high loss in one type of acreage with little gain in the other. This then leaves areas VII and VIII, which contain bundles for which this farmer is ambivalent to with respect to bundle A. In this graph, the farmer is indifferent between bundle B, which represents nonrenewal of the CRP contract with no change in the total land base, and the current allocation A, but prefers both these bundles to allocation C. The goal of this paper is to model the farmer's minimum WTA to stay at bundle A, with bundle B as the alternative. Putting this theoretical model aside, some ambiguity in the farmer's decision to renew the CRP contract is not unexpected because while the CRP income per acre is certain, the income on non-CRP land is not.

If there is a range of rental prices over which the farmer is indifferent to extending the contract, then forcing the farmers to make a definitive "yes" or "no" choice over this range of prices could

bias the results, especially if there is a particular tendency for the indifferent farmers to chose "no" over "yes" (or the other way around) when forced to make a "yes" or "no" decision. If this potential for bias is present, then, in addition to asking the farmer to choose or not choose to extend the contract, the farmer should be allowed to choose a third option of being indifferent. Since a farmer will not be willing to extend the contract for a low price, may be indifferent at a higher price, and has some reservation price above which the farmer will definitely extend the contract, these three choices can be ranked ordinally as "no", "don't know", and "yes", which will take on the values 0, 1, and 2, respectively. As explained in more detail in footnote 3, note that "don't know" is defined in this paper only for respondents who understand the nature of the good being offered, as opposed to a "don't know" response stemming from the respondent not understanding the CVM question.

Ordered probit is the appropriate model to analyze multinomial-choice variables that are ordinally ranked (Greene, 1990; Zavoina and McElvey, 1975). Since the basic multinomial-choice model does not consider the ordinal ranking of the discrete outcomes, an application of this model would not make full use of the information contained in this data set. Ordinary regression analysis of this data is also inappropriate since it would presume that 0,1, and 2 are cardinally ranked, and thus, would infer too much information from the data. The ordered probit model for multiple outcomes in the referendum format can be specified as before as:

$$(2) \Delta V^* = \gamma + \alpha RP + \varepsilon$$

where ΔV^* is the unobserved utility difference. What is observed are the responses

$$y = 0 \quad \text{if } \mu_{-1} \leq \Delta V^* \leq \mu_0,$$

$$y = 1 \quad \text{if } \mu_0 \leq \Delta V^* \leq \mu_1,$$

$$y = 2 \quad \text{if } \mu_1 \leq \Delta V^* \leq \mu_2.$$

If a constant is to be included in the regression, then one of the μ 's is not identified. In this case, μ_0 is normalized to 0 (Greene, 1992). By convention, μ_{-1} and μ_2 (equal to μ_J in the three choice case) are set equal to $-\infty$ and ∞ , respectively. Hence, with three outcomes, the only μ that needs to be estimated is μ_1 . The log of the likelihood function for the ordered response model (Greene, 1990) with three outcomes is

$$(3) \ln L(\alpha, \gamma) = \sum_i D_{y_i=0} \times \ln \phi[-\Delta V_i] + D_{y_i=1} \times \ln \phi[\mu_1 - \Delta V_i] - \phi[-\Delta V_i] + D_{y_i=2} \times \ln 1 - \phi[\mu - \Delta V_i]$$

where D_{y_i} equals 1 if $y_i = j$, $j = 1, 2, 3$, and zero otherwise. The dependent variable, $y_i = 0$ for a "no" response, 1 for a "don't know", and 2 for a "yes" response to the survey questions.

The determination of the median and median benefits values with the ordered model is somewhat ambiguous when compared to the dichotomous choice model. In the dichotomous probit model, the median value can be found where $\text{Prob}[RPR \leq \$RP] = \text{Prob}[\text{No}] = F[-\Delta V] = 1 - \text{prob}[\text{Yes}] = 50\%$. However, because the ordered model has more than two choices, $\text{Prob}[\text{No}]$ is not equal to $1 - \text{Prob}[\text{Yes}]$ (i.e., $\text{Prob}[\text{Yes}] + \text{Prob}[\text{No}] + \text{Prob}[\text{Indifferent}] = 100\%$). Figure 2 provides a graphical depiction of the farmer response function CDFs under the assumption that the distributions are symmetric. In this figure, the dollar value corresponding to a 50 percent of a "no" response occurs at point a and the dollar value corresponding to the 50 percent probability of a "yes" response occurs at point b . The band over which the representative farmer is indifferent runs from point a to point b . With a nonzero probability of an indifferent response, the point where the probability of a "yes" is equal to the probability of a "no" occurs at a probability less than 50% (point c). $\text{Prob}[\text{No}] = 50\%$ is found where $\mu_0 = \Delta V$, and $\text{Prob}[\text{yes}] = 50\%$ is found where $\mu_1 - \Delta V = 0$. Hence, either choice would produce a legitimate median and the choice would be subjective. Since $\mu_0 = 0$, note that the width of the dollar indifference range is proportional to μ_1 .

III. Data Sources and Description

In late 1993, the Soil and Water Conservation Society (SWCS), along with the assistance of the United States Department of Agriculture's (USDA) Economic Research Service, Soil Conservation Service, Forest Service, and the Environmental Protection Agency conducted a national survey of CRP participants. Questionnaires were mailed to more than 17,000 randomly chosen individuals representing 5 percent of CRP contract-holders. Ultimately, 68 percent (11,578) of the questionnaires in useable form were completed by farmers and returned to SWCS. The reliability of the responses should be enhanced by the fact that for many of the sampled contract holders, expiration dates were close to the survey date.

According to USDA, through the 12th signup period, a total of 375,000 contracts covering 36.4 million acres were enrolled in the CRP. However, the 2.5 million acres enrolled in signups 10-12 after passage of the 1990 Farm Act will not begin to expire until the year 2000. To increase the reliability of the responses, sample selection was limited to the 333,000 contracts enrolled in signups 1-9. A random sample of 5-percent, or 17,300, of these contracts were chosen by USDA's Agricultural Stabilization and Conservation Service (ASCS). Review of the survey questionnaire was conducted by an ad hoc committee of individuals from government, the nonprofit sector, and academia. The survey was conducted, to the extent resources allowed, according to common mail survey techniques (Dillman, 1978). The survey was mailed in September, 1993. A month later, follow-up questionnaires were sent to nonrespondents. Budget constraints prevented a second follow-up mailing.

Contract Extension Questions

The current CRP contract holders were elicited for their willingness to extend their CRP contracts

under two scenarios. In the scenario 1, they were asked "Would you accept [X] percent of your current annual CRP rental payment per acre to extend your CRP contract for an additional 10 years if the contract extension **did not** allow haying or grazing?" This is the base scenario as haying or grazing is not currently allowed on CRP land. In the scenario 2, they were asked "Would you accept [Y] percent of your current annual CRP rental payment per acre to extend your CRP contract for an additional 10 years if the contract **did** allow haying and/or grazing according to a management plan that prevents overgrazing and does not allow haying until mid-July to protect soil, water, and wildlife resources?" In either scenario, the farmer is asked to respond by checking off either "no", "don't know", or "yes".ⁱⁱⁱ The percentage values posted in the scenarios were varied across the respondents and assigned randomly, and since the second scenario allows the farmer more management flexibility, the value posted in the second scenario is set lower than that in the first scenario.^{iv}

Even though the above questions are framed in the WTA format, and hence, are not income constrained, we believe that they may be more incentive compatible than many WTP survey questions. Some level of incentive compatibility is likely as many of the respondents may quite rationally believe that their responses may influence the setting of CRP-related policies. In fact, the survey's introduction states that the survey results (short of names and addresses of the respondents) will be shared with Congress and the USDA. If contract-holders do believe that the results may influence policy, then exaggerating their WTA may suggest to Congress that the program is too expensive and increase the probability that the program will be dropped or reduced in magnitude. Under-reporting WTA may lead to a re-evaluation of current payments with the result that the farmer may be offered payments lower than his reservation price.

For estimation, using USDA records of the current rental payment made to the each of the

respondents, the percent value in the questions are converted to dollar values.^v Due to the range and variation in CRP rental payments, it was more convenient to pose the survey question in the form of a percentage increase of reduction in the current rental payment than as dollar values. Statistical significance of the bid changed little regardless of whether the bid was in percent or in dollar terms.

For the regressions, additional explanatory variables besides the offered rental payment thought to be likely determinants of the contract holder's decision to extend were chosen from both the SWCS survey and USDA records (CRP contract data, Consolidated Farm Services Agency, USDA). The appendix contains the description of the explanatory variables and their sources.

Table 1 presents the mean and standard deviations for the continuous explanatory variables for the observations used in regressions. Excluding all observations with at least one missing value for the variables included in the regressions, the sample sizes are 8,125 and 8,027 for the no haying/grazing scenario and the haying/grazing allowed scenarios, respectively. The level of correlation between any two variables is no more than 0.28. Note that, except for the RPAY variable, which is lower by design in the second scenario, there is very little difference between the variable statistics for the two scenarios.

Table 2 presents the proportion of "no", "don't know", and "yes" responses for each offered bid. For the no haying/grazing option, there seems to be little systematic change in proportion of "don't knows" as the rental offer increases. However, the two lowest "don't know" percentages do occur around the upper end of the rental offers. As a simple test for a relationship between the bid value and the probability of receiving a "don't know" response to that bid value, a linear regression of the percentage of "don't know" responses to each offered cost share percentage on a constant and the

vector of rental offers (denominated as X percent of current rent) yielded an R^2 of 0.20 and t-ratio of -1.23 on the rental offer. For the haying/grazing allowed option, the percent of "don't knows" displayed a more systematic decrease with increases in the rental offers. In this case, the linear regression of the percent of "don't know" responses to each bid regressed on a constant and the vector of rental offers yielded an R^2 of 0.79 and negative coefficient on the rental offer, which has a t-ratio of -4.6. These results suggests that, for the second scenario, farmer indecision about accepting the rental offer has a significant tendency to fall as the rental offer increases. Note too that the second scenario's "don't know" proportions are higher at each bid offer than those for the first option. This increase in uncertainty for the second scenario over the first is not surprising considering that haying and/or grazing on the CRP land is not currently permissible. Hence, for the second scenario, the farmer must give more thought to the implications of a lower CRP payment but more management control than in the first scenario, which is simply a continuation of their current rental agreements.

IV. Results

For the two scenarios, the ordered probit log-likelihood function in Equation 5 was maximized using the both the canned ordered probit routine in Limdep (Greene, 1992) and with a maximum likelihood program written by the authors using Gauss. The results were the same using either program. Table 3 presents the regression results. Also presented in the table are univariate probit results for the data sets with all "don't know" responses thrown out. Since we were not allowed to split the survey into two groups, with one group receiving dichotomous choice versions of the scenarios, the data sets with the "don't knows" deleted are the closest approximation possible to a dichotomous choice version possible.

The signs of the coefficients in Table 3 are generally as expected. The coefficient on the rental

payment (RPAY) is positive and strongly significant. Not surprisingly, the coefficient on LSTOCK is larger and more significant for the scenario allowing haying and/or grazing than for the one not allowing it. FARMINC and MRKTVAL are both negative and significant at the 2.5 percent and 0.5 percent significance levels, respectively. EROSION is negative and is significant (2.5 percent) only for the haying and/or grazing allowed scenario. Of the regional dummy variables, the negative coefficient on CORNBELT is the largest and most significant. This is not unexpected given the productivity of the cropland in the Corn Belt and the value of commodity program corn base. The coefficient on RETIRED is particularly interesting. For the scenario with no haying and/or grazing allowed, the coefficient is positive and significant, which is sensible as one would expect that the retired farmer would desire to extend the contract. For the scenario with haying and/or grazing allowed, the coefficient is negative and significant, which is a sensible result as one would expect the retired farmer would prefer to receive a higher rental payment and not be able to work the land than to receive a lower rental payment but have the option of working the land. The grand means listed at the bottom of the table are the γ 's from the RUM, and are calculated by taking the sum of the products of the variable coefficients and means (excepting RPAY).

In Table 3, for both scenarios, μ_1 is positive and significant. Solving $\mu_0 = 0 = \Delta V^* = \gamma + \alpha RPR$ and $\mu_1 = \Delta V^* = \gamma + \alpha RPR$ for RPR yields the lower and upper value limits of the rental offer interval over which the farmers are indifferent to extending the CRP contract. For the extension option with no haying or grazing allowed, this interval is \$48.80 per acre to \$60.20 per acre per year.^{vi} For the extension scenario with haying and/or grazing allowed, this interval is \$41.15 per acre to \$63.48 per acre per year.^{vii} The point where $F[Y = 0] = F[Y = 2]$ occurs at \$54.50 for the first scenario and \$52.32 for the second. The indifference interval for the latter scenario is approximately \$10 wider than for the former. While these two mid-points are quite similar, this

increase in the interval width suggests that the level of indecision increases as new (untested) options are added to an existing good.

For the regressions with the "don't knows" removed, the mean minimum rental payments are almost identical at \$54.79 and \$54.72 per acre per year for scenarios 1 and 2, respectively. What these dichotomous results do not convey is that while the central tendencies may be similar between the two scenarios, in reality (as defined by the ordered probit results) the point at which there is a 50% chance of nonrenewal is over \$7 per acre lower for scenario 2 than for scenario 1.

V. Forecasts of CRP enrollment extensions.

The major use of our model is to estimate a schedule of the CRP acres extended as a function of the rental price. To do this, the coefficients from the ordered probit regression in Table 3 were used to calculate the probability of a "yes" response (i.e., $\text{Prob}[y_i = 2]$) to some rental offer \$X for each of the N farmers in the regression sample. Next, for each observation $i = 1, \dots, N$, using a Bernoulli distribution with parameter P_i , a 0 (no) or 1 (yes) response is generated. If the predicted response is a 1, then the farmer's current CRP acreage is extended. The re-enrolled acreage at rental offer \$X are summed across all the farmers to get the total acreage re-enrollment at that rental offer. The \$X rental offers were chosen in ten dollar increments from \$0 to \$130 per acre. In order to increase the simulation precision, this procedure was carried through 25 times for each bid offer, with the final acreage enrolled predictions taken as the average of the 25 simulations.^{viii} A similar procedure was used to find the number of acres associated with "don't know" responses to the \$X rental offer as well as to find the number of acres extended based on the univariate probit regressions.

Figures 3 (scenario 1) and 4 (scenario 2) present these simulation results with the total CRP acres

extended converted into percent of total current CRP acres. In both figures, the univariate probit based results predict higher (up to 10% higher in scenario 2) percents of total contract acres extended than the ordered probit based results. Each table also charts the percent of total CRP acres associated with indifferent farmers.

VI. Conclusions

Our results give policy makers some indication of how many CRP acres might be renewed under the contract extension intentions recently announced by the Secretary of Agriculture. The simulations based on the ordered probit model results show that up to 50 percent of current CRP acreage can be renewed at less than the current average CRP cost of \$50 per acre. On the other hand, as our results show, achieving near 100 percent contract renewal will be expensive.

Comparison of acreage re-enrollment projections based on our ordered response model, which allows for farmer indifference to re-enrolling at the offered rental rate, versus the traditional dichotomous choice response model suggests that modelling farmer response using the latter model provides inadequate information. Although both models find that the rental rate at which the probability of acceptance is equal to the probability of rejection is similar for the two CRP contract renewal scenarios, the dichotomous choice model cannot reveal that the rental rate range over which the farmer may be indifferent between renewing or not renewing the contract is different for the two scenarios. While the dollar rental rates per acre at which the probability of nonrenewal equals the probability of renewal are close for the two scenarios at \$54.50 for the first scenario and \$52.32 for the second scenario, the indifference interval around the latter value is \$10 wider than around the former. The policy implications of wider indifference ranges is that small changes in farmer attitudes towards reenrollment in CRP may lead to relatively larger shifts in the probability of reenrollment at a given bid offer.

References

- Akerlof, G., and W. Dickens. "The Economic Consequences of Cognitive Dissonance." American Economic Review 72:307-319.
- Cameron, T.A. 1991. "Interval Estimates of Non-market Resource Values from Referendum Contingent Valuation Surveys." Land Economics 67(4):413-21.
- Dillman, Don A. 1978. *Mail and Telephone Surveys-The Total Design Method*. John Wiley and Sons, Inc., New York.
- Greene, W. 1992. Limdep: User's Manual and Reference Guide, Version 6.0. Econometric Software, Inc., Bellport, New York.
- Greene, W. 1990. Econometric Analysis. MacMillan Publishing Company, New York, NY.
- Hanemann, M. 1989. "Welfare Evaluations in Contingent Valuation Experiments with Discrete Response Data: Reply." American Journal of Agricultural Economics 71(4):1057-1061.
- Hanemann, M. 1984. "Welfare Evaluations in Contingent Valuation Experiments with Discrete Response Data." American Journal of Agricultural Economics, 66(3):332-341.
- Heiner, R. 1983. "The Origin of Predictable Behavior." American Economic Review, 73(September):560-587.
- Krinsky, I. and A. Robb. 1986. "Approximating the Statistical Properties of Elasticities." Review of Economics and Statistics 68(Nov.):715-719.
- MacKenzie. 1993. "A Comparison of Contingent Preference Models." American Journal of Agricultural Economics 75(3):593-603.
- Opaluch, J. and K. Segerson. 1989. "Rational Roots of 'Irrational' Behavior: New Theories of Economic Decision-Making." Northeastern Journal of Agricultural and Resource Economics 18(2):81-95.
- Osborn, C. Tim and Ralph E. Hemlich. 1994. "Analysis of the Conservation Reserve Program: Farmers' Plans and Environmental Targeting Issues. Congressional Briefing Booklet,

Economic Research Service, USDA.

Osborn, T., F. Llacuna, and M. Linsenbigler. 1992. "The Conservation Reserve Program: Enrollment Statistics for Signup Periods 1-11 and Fiscal Years 1990-92." USDA/ERS, Statistical Bulletin No. 843.

Ribaudo, Marc O., Daniel Colacicco, Linda Langner, Steven Piper, and Glenn D. Schiable. 1990. Natural Resources and Users Benefit from the Conservation Reserve Program. AER 627, Economic Research Service, USDA.

Shonkwiler, J.S. and G.S. Madalla, 1994. "An Examination of the Krinsky-Robb Procedure for Approximating the Statistical Properties of Elasticities." Manuscript, Department of Agricultural Economics, University of Nevada, Reno.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration. 1993. "Proposed Rules: Natural Resource Damage Assessment." Federal Register, 58(10): 4601-4614. 15 CFR, Chapter IX.

U.S. General Accounting Office. Farm Programs: Conservation Reserve Program Could Be Less Costly and More Effective. RCED-90-13. November 1989.

Young, C. Edwin, and C. Tim Osborn. "Costs and Benefits of the Conservation Reserve Program." Journal of Soil and Water Conservation, Vol. 45, No. 3, May-June 1990.

Appendix. Description of the Explanatory Variables and their Sources^{ix}

LSTOCK = Acres of Non-CRP land used by CRP participant for livestock. Source: SWCS

survey. Note: Based on participant's answer to survey questions 33 and 34 that asked percentage of acres used for livestock and total acres owned and/or operated.

RETIRED = Does CRP participant consider himself or herself retired from farming (1 = yes, 0 = no). Source: SWCS survey. Note: Based on participant's answer to survey question 37.

FARMINC = CRP participant's 1992 gross income from all farming sources. Source: SWCS survey. Note: Based on participant's answer to survey question 38. Includes government commodity and conservation program payments.

MRKTVAL = Market value of local cropland similar to participant's CRP land. Source: SWCS survey. Note: Based on participant's answer to survey question 43.

AENROLL = Number of acres covered by participant's identified CRP contract. Source: USDA CRP contract records. Note: CRP participants may have more than one contract. Consequently Survey identified a specific contract for consideration.

EROSION = Erosion rate on CRP land prior to its enrollment (tons/acre/year). Source: USDA CRP contract records. Note: Total water-caused and wind-caused soil erosion, estimated by USDA's Natural Resource Conservation Service, divided by AENROLL.

RPAY = Rental payment offered to extend CRP contract (\$/acre/year). Source: SWCS survey and USDA CRP contract records. Note: Product of payment percentage specified in survey and rental payment for existing CRP contract based on USDA records.

TREES = Acres of trees in CRP contract. Source: USDA CRP contract records

MOUNT = 1 if CRP acres are located in the Mountain, Northern Plains, or Southern Plains USDA regions; 0 otherwise. Source: USDA CRP contract records. Note: Regional dummy variable.

DELTA = 1 if CRP acres are located in the Delta, Southeast, or Appalachian USDA regions; 0 otherwise. Source: USDA CRP contract records. Note: Regional dummy variable.

CORNBELT = 1 if CRP acres are located in the Corn Belt, Lake States, or Northeast USDA regions; 0 otherwise. Source: USDA CRP contract records. Note: Regional dummy variable.

Endnotes

- i. In CRP signups 1-9 (Mar. 1986-Aug. 1989), county ASC committees compared rental rate requests made by producers to a single maximum acceptable rental rate (MARR) for a bid pool. GAO found that in some parts of the country, MARR's were set 200 to 300 percent higher than prevailing local rental rates. If the producer's rent request was less than or equal to the bid pool MARR, the county committee was authorized to accept the contract. After the first few signups, producers learned the MARRs, and many submitted rental rate requests equal to the MARR even though their land would have rented for less on the cash rental market.
- ii. MacKenzie (1993) presents a similar discussion in the context of contingent rating and rankings.
- iii. Since all farmers questioned are current holders of CRP contracts, their level of comprehension of these scenarios is very high, especially for the first one, which is a simple continuation of their current contract. Since the farmers have minimal confusion about the good whose value is being elicited, the major source of indecision should be the percent value posted in the question, and the response "Don't Know" should be equivalent to other potential choices such as "Indifferent" or "Undecided". Of these choices, "Don't Know" was chosen as a response choice based on its simplicity. On the other hand, for a researcher seeking to use this ordered approach to value a hypothetical good (that may not be well understood by the respondent), additional questioning is needed to separate responses which are undecided due to price from responses which are undecided due to confusion regarding the definition of the good.
- iv. The bid pairs for the first (second) scenarios are 35 (20), 55 (40), 70 (55), 80 (65), 90 (75), 100 (85), 115 (100), and 135 (120) percent.
- v. Econometric results of the responses regressed directly on the percent values are available from the authors.

- vi. Note the current average rental rate for the farmers in this regression data set is \$56.86 per acre per year.
- vii. The standard error on the \$48.80 is \$0.52 using the Krinsky and Robb approach (1986) and \$0.51 for both a second order Taylor series expansion approach (Shonkwiler and Maddala, 1994) and an approach described by Cameron (1991). The standard error for scenario 2's \$41.15 is \$0.67 and \$0.66, respectively.
- viii. Because of the high level of significance of the regressions, 25 repeat simulations was more than adequate to find the central tendencies.
- ix. The survey instrument is available upon request from the authors.