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DETERMINANTS OF CONSERVATION RESERVE PARTICIPATION IN THE NORTHWEST STATES

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INTRODUCTION

Completing the third year of the Conservation Reserve Program (CRP) of the 1985 Food Security Act, we are now able to assess how well the program is meeting its objectives. The interim objectives were reducing erosion, protecting our long term productive capacity, curbing surplus production, and providing needed relief to farmers. These objectives were later amended to reducing erosion citing all other objectives as "secondary benefits that may ultimately result from the CRP."(USDA 1986)[1]. Is the CRP meeting its objective? Who is participating in the CRP? What effect has the CRP had on rural communities, and income distribution? Prior analyses of CRP participants have assumed participants a homogenous group, failed to formulate a theoretical basis for understanding participant behavior, or been sub-regional in scope. In this paper I analyze a theoretical model of the decision to enter the CRP using data for three northwestern states.

It is hypothesized that factors endogenous to different classes of owners affect the decision to participate in the CRP, that non-operating owners and land owners close to retirement will be most likely to participate in the program, and that the CRP is not necessarily removing from production the most erodible fields and may not be removing those fields with the highest erosion rates.

THE DATA SET

All ASCS producers who have participated in an ASCS administered conservation program activity and who own a highly erosive tract in Washington, Oregon, or Idaho make up the population. Highly erosive for the purposes of this study will be defined as any tract with a Land Capability Class and Sub-class (LCC) of II, III,IV,or V and an RKLSCP $\geq$ 3T; or an LCC of VI,VII, or VIII regardless of the 'T' value. The definition approximates the definition for CRP eligibility through round six[2]. Since ASCS has expanded its CRES files to include all participants in any ASCS conservation program involving cost share payments most government it is hoped that most owners of CRP eligible fields regardless of CRP participation will be included in the data set. The sample contains 1500 observations.

DECISION TO ENTER THE CRP

The decision to enter the CRP has been modeled by Boggess as a utility maximization problem subject to market, commodity program and risk constraints (Boggess 1986). Land owners will attempt to maximize utility over time. Expected utility is function of annual income, wealth accumulation, risk and other personal objectives. Limiting the utility maximizing decision to either entering the CRP or continuing to keep the field in its current use, a land owner will enroll in the CRP if the present value of the CRP rental payments is greater than the present value of the expected net returns from keeping the field in its existing use. This inequality can be expressed as:

$$\int_0^{10} (CRP_i - M_i)\, e^{-ri}\, \partial i - [1/2\, F + O_{k,w} + T_{l,k,w}] \geq \int_0^{10} E(NR_i) e^{-r'i}\, \partial i$$

ERS/RTD/USDA

where:

CRP_i = the CRP rental payment,

M_i = the maintenance costs for CRP land (mowing, tree trimming) in year i, and,

r = a risk free rate of return similar to the Treasury bill rate,

r' = the risk adjusted rate of return,

F = the land owners share of the establishment costs of entering the CRP,

$O_{k,w}$ = opportunity costs of entering the CRP associated with labor (w) and capital (k),

$T_{l,k,w}$ = transaction costs T_l are lease negotiations and T are the costs associated with finding new investment opportunities, for capital (k) and labor (w),

NR_i = net returns to the land from keeping the field in its existing use in year i,

i = years 1-10 of CRP contract.

Note that for landlords the transaction costs of reinvesting capital and labor ($T_{k,w}$), and the opportunity costs of entering the CRP to labor and capital ($O_{k,w}$), are zero because non-operating owners are not assumed to have any under-employed labor or capital to reinvest as a result of participation in the CRP. Landlords participation in the CRP generates a savings equal to the transaction costs of establishing a lease (T_l) represented by a negative number on the left hand side of the equation. For owner operators the transaction costs ($T_{l,k,w}$) and the opportunity costs of entering the CRP ($O_{k,w}$) are positive. The more risk averse a land owner, the greater risk adjustment (r'-r) becomes. As the risk adjustment (r'-r) increases, the discounted net returns from keeping the field in its existing use falls and the probability of entering the CRP rises. The variables included in the model, their definition, and their units of measurement are explained below.

THE MODEL

The individual "producer" as defined by ASCS will be the level of observation. The hypothesized independent variables affect net returns, costs, subjective components of a decision makers discount rate or psychic income associated with production or participation in the CRP. This section presents the variables hypothesized to affect the probability of entering the CRP, their measurement and source.

TENURE Landlords are more likely to enter the CRP for two reasons. First, entering the CRP represents a net reduction in transaction costs associated with securing a tenant to operate an eligible field, monitoring the tenant for

potential contract violations, securing information about changes in going rental rates, etc for all landlords. Second, owner operators incur transaction costs in finding new uses for their capital and labor, and opportunity costs of holding underemployed resources by participating in the CRP, landlords do not. The decision to participate in the CRP generates costs for operators, and savings for landlords.

EROSION POTENTIAL Conventional wisdom states that erodibility and productivity are negatively correlated and as erodibility rises land values, rents, and reservation prices to enter the CRP should fall. My hypothesis is that erodibility and erosion rates are uncorrelated to CRP enrollment in Washington Oregon and Idaho. Although I would expect erodibility and CRP participation to be inversely correlated in the Palouse because the fertile loessial soils there are also highly erodible and thus the opportunity costs of enrolling them are higher. Estimated RKLSCP values from the CRES data set is used as a measure of the erosion rate.

NET RETURNS
As the net returns to a field in its existing use rise so do the opportunity costs of participating in the CRP. Thus fields with high net returns from cropping are less likely to be enrolled in the CRP. Because it is not possible to calculate the which fields might have been enrolled in the CRP it is impossible calculate the net returns for those fields. For this reason net returns were calculated as a weighted average net return for each farm by crop. The sum of the actual yields for each crop produced on a given farm multiplied by the percentage of the total cropped acres devoted to that crop times its target price equals the estimated gross returns. USDA/ERS estimates of production costs for each crop by state were subtracted from the estimated gross returns to yield the net return figure used in this analysis.

OWNERS AGE Older owners tend to be more risk averse and therefore discount uncertain investments more highly, thus making a program like the CRP relatively more attractive. The transaction costs of obtaining information may be higher for older owners. Finally where the owner also operates the farm and wishes to retire or partially retire, the CRP presents an attractive means of continuing to obtain rents on the land without incurring the transaction costs of obtaining a tenant.

Age of owners were estimated from their social security numbers. Social Security numbers are issued in groups of ten thousand. The first three digits of the number identify the region in which the number was issued. The second two digits indicate the block the social security number was issued from. Mean age and standard deviation were provided for every area block combination by the Social Security Administration from a one percent sample. From this information age estimates were assigned to individuals' social security numbers.

RESULTS

A logistic regression using SAS was used to estimate the probability of an eligible land owner or operator entering the CRP. The logit model was selected for its appropriateness at estimating equations with ordinal dependant and discrete independent variables (Pindyck and Rubinfeld 1981,

Effron 1975). The coefficients represent the derivatives of the log of the odds of entering the CRP with respect to the explanatory variables.

The age and erosion rate variable is significant at the .005 level. Tenure is significant at the .00001 level. Net returns is significant at the .1 level. Number of crop acres is not significant. All coefficient signs except for the erosion rate variable were consistent with our expectations. Table 2 presents the results of the logit regression.

TABLE 1

LOGIT ANALYSIS

Variables	Parameter Estimate	Standard Error	Chi Square	P Value
Intercept	0.937	1.058	0.79	0.3754
Age	0.038	0.014	8.00	0.0047
Crop acre	0.000	0.001	0.01	0.9359
Erosion Rate	-0.073	0.019	14.61	0.0001
Net Return	-0.013	0.001	4.30	0.0754
Tenure	-1.53	0.376	16.60	0.0001
Model			49.46	

*The P value, the probability of rejecting Ho if Ho is true, is based on the Chi squared value with one degree of freedom.

Increasing age of the owner positively affects the decision to enter the CRP. This is consistent with expectations of age and time preference for present income. Non-operating owners are much more likely to enter the program than owner-operators, supporting my hypothesis that non-operating owners have higher transaction costs associated with negotiating crop leases than do owner operators, and lower downsizing costs resulting from the under employment of machinery and equipment than owner operators.
The negative coefficient for the erosion variable and its significance level are surprising. The results suggest that the CRP is not pulling the most highly eroding fields out of production. One possible explanation is that mining highly erosive fields may be more profitable than farming less erosive fields. All that we know about fields with high erosion rates is that they will eventually lose productivity if the erosion is not controlled. In the short term, fields eroding at high rates may have little or no reduction in profitability (Raitt 1985). An alternate explanation for our results is that we actually were measuring erodibility and not erosion rates with our erosion rate variable. By using county average values for crop rotations and tillage practices (C and P) in our calculation of each fields Universal Soil Loss Equation (RKLSCP), we may have sacrificed accuracy in estimating change in

erosion rate due to cropping practices. If this is the case, we cannot say that the CRP is removing the most highly erodible fields from production as was originally intended, but may still be effectively targeting erosive fields.

The negative sign of the net returns coefficient and its significance level is consistent with our expectations. The more profitable keeping a field in crops is the less likely it will be enrolled in the CRP. Surprising is that ownership characteristics more significantly affect the likelihood of participation than do returns to land. This lends support to my hypothesis that costs endogenous to tenure classes drive the decision making model.

Tables 2 and 3 lists the predicted probabilities of entering the CRP for selected values of age and erodibility for both non-operating owners and owner-operators. The three values of net returns and erodibility were the mean, mean plus one standard deviation, and mean minus one standard deviation. The values for age were arbitrarily selected to illustrate a young owner versus an older one.

TABLE 2
ESTIMATED PROBABILITY OF ENTERING THE CRP BY TENURE, OWNERS AGE, EROSION RATE FOR LOW NET RETURN FARMS

Erosion Rate	RKLSCP-10		RKLSCP-20		RKLSCP-30	
Owners Age	35 Years	70 Years	35 Years	70 Years	35 Years	70 Years
Owner Operator	0.33	0.65	0.19	0.48	0.10	0.30
Non-operating Owner	0.70	0.90	0.53	0.81	0.35	0.67

TABLE 3
ESTIMATED PROBABILITY OF ENTERING THE CRP BY TENURE, OWNERS AGE, EROSION RATE FOR HIGH NET RETURN FARMS

Erosion Rate	RKLSCP-10		RKLSCP-20		RKLSCP-30	
Owners Age	35 Years	70 Years	35 Years	70 Years	35 Years	70 Years
Owner Operator	0.21	0.61	0.12	0.41	0.06	0.21
Non-operating Owner	0.60	0.79	0.43	0.72	0.30	0.60

CONCLUSIONS

The most likely participants in the CRP are older, non-operating owners who own less highly erosive acres in the area. This is not the group targeted by the architects of the CRP.

The findings suggest that for the north western states, it cannot be assumed that highly erodible soils are less productive than less erodible soils. More erodible land may not have lower opportunity costs, and fields with high erosion rates may not be less profitable to operate than less erosive fields. Idling highly erosive land will in many cases mean idling some of our most productive lands. Removing those lands from production will require higher incentives than originally thought.

The concentration of CRP benefits in the hands of older non-operating owners has implications for income transfers out of rural communities and out of the agricultural sector. Any economic rents generated by the CRP will disproportionately benefit non-operating owners. In cases where non-operating owners do not live in the communities in which they own farms the CRP transfers rents out of the community. The CRP may well reduce local income by the returns to labor and capital foregone as a consequence of removing rented crop land from production.

Full tenants and part owners will be adversely affected by the reduction in the supply of rentable lands in the short run. Government programs are intended to help farmers without discrimination with reference to tenure status. The conditions under which the CRP is available to owners or operators of agricultural lands create unequal opportunities for participation in the program benefits among different tenure groups. Renting has for a long time been viewed as a means for young people to enter farming, and for part owners to increase the size of their operations. The CRP appears to have adversely affected these two groups to the advantage of non-operating owners.

Because ownership characteristics significantly influence the probability of participating in the CRP and because many highly erosive soils are also highly productive the targeting objectives will be more difficult to attain. The CRP has the potential to be the most far reaching of the conservation programs of 1985 Food Security Act. In order to meet the objective of removing highly erosive lands from production at a minimum cost to the government, more care needs to be given to the design of eligibility criteria.

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NOTES

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1. The final rules amended the objectives initial objectives by assigning weights to them. The final rules state, "..The primary purpose of the CRP is reducing the amount of erosion... other objectives are secondary benefits that may ultimately arise from the CRP" (USDA 2, 1986).

2. In the original CEP study eligibility was determined by selecting all farms in the sample with at least half of the soils in the field belonging in the Land Capability Classification system categories IIIe or higher. Next a weighted average RKLSCP was calculated for each field in the study. The C and P values were based on averages for the soil type. This is where for some observations a discrepancy will exist between the CEP data sets erosion rate and the erosion rate calculated for CRP bidders by the SCS. SCS calculates the C and P values using a formula including the presence of terraces and owners stated cropping practices to measure the erosion rate. Further, there are some differences in the eligibility criteria for the CEP study and the CRP. For a better discussion of the changing CRP eligibility requirements, see (Dicks 1987).