An Empirical Analysis of Louisiana Small Farmers' Involvement in the Conservation Reserve Program

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Abstract

The study examines Louisiana small farmers' reasons for not participating in the Conservation Reserve Program (CRP), their awareness of the program, and their willingness to participate in the program. The results suggest that: farmers do not participate in the CRP if revenues from cropland are an important source of income, or if they are tenants; awareness is significantly related to education, income, race, and average return per acre; willingness is positively influenced by payment per acre, age, and farm status. Participation depends on whether payments per acre are comparable to the opportunity costs of removing cropland from production.

Key Words: binomial and multinomial logit models, conservation reserve program, nonparticipation, small farmers, socioeconomic characteristics

Introduction

The Conservation Reserve Program was first authorized by Title XII of the 1985 Food Security Act, and later extended by the 1990 Food, Agriculture, Conservation and Trade Act. The main objective of the CRP is to reduce the productive capacity in agriculture and to advance conservation. Specifically, the CRP compensates farmers for removing highly erodible or hydric soils from crop production and establishing a vegetative cover of trees or grass.

To participate in the CRP, farmers must submit bids to their local Agricultural Stabilization and Conservation Service (ASCS) to indicate the rent per acre they will accept to remove highly erodible cropland from production. Contracts extend from 10-15 years and carry stiff penalties for noncompliance. Each county can sign up no more than 25 percent of its cropland in the CRP. The local Soil Conservation Service determines land eligibility for the CRP. Approximately 36.5 million acres have now been contracted to the CRP, and the average rental cost per year is about $50.00 per acre (Heimlich and Osburn).

Because participation in the CRP is voluntary, the rate of participation depends on farmers' perceptions of costs and benefits. Farmers will participate in the CRP if the expected utility from participating exceeds the expected utility from not participating (Konyar and Osborn). Voluntary participation in farm programs has both economic and social consequences (Chambers and Foster; Martin, et al.; Perry, et al.; Shoemaker). Although voluntary participation in the CRP has been studied extensively (Barbarika and Langley; Dicks, Riely, and Shagam; Esseks and Kraft (1988, 1989); Gillespie, Hatch, and Duffy; Heimlich and Osborn;

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Hertel and Preckel; Konyar and Osborn; Martin, et al.; Reichelderfer and Boggess; Taylor and Smith), we are unaware of any study of this nature on small farmers. Our study explores why small farmers with highly erodible cropland have not participated in the CRP. Specific issues examined include the influence of socioeconomic characteristics on: (a) small farmers' reasons for not participating in the CRP; (b) their awareness of the program; and (c) their willingness to participate in the CRP.

Data and Empirical Models

The study's geographical region consisted of three-adjacent parishes in northeast Louisiana: Franklin, Richland and West Carroll. They were selected because of: (a) the heavy dependence on agriculture[2]; (b) the number of small farmers; and (c) the large percent of highly erodible cropland. Average farm sizes in these parishes are 282, 394, and 246 acres, respectively, compared to 293 acres for the state (*1987 Census of Agriculture*). Louisiana Cooperative Extension Service identified 313 small farmers in the three parishes, and provided names, addresses, and acreage farmed. Based on acres farmed, 10 percent of the farmers were ineligible for the survey. A questionnaire was developed and pretested by personal interviews on a small sample of farmers. After pretest and revision, the questionnaires were mailed to the 282 eligible small farmers during fall, 1989. Follow-up postcards were sent monthly to nonrespondents over a four-month period.

Seventy-five (27 percent) farmers responded to the survey, and useful data were compiled from 69 questionnaires. The data included information on socioeconomic characteristics; participation; awareness of, and attitudes toward, participation; reasons for nonparticipation; sources used for farm information; and assessments of benefits from farm programs (Joseph).

This study uses qualitative response models (binomial and multinomial models) to analyze the data because of the discrete nature of the responses (Maddala; Greene). For the binomial-logit model, a binary variable is defined as y_i - for example, y_i = 1 if a small farmer is aware of or willing to participate in the CRP, and y_i = 0 otherwise. The vector of y_i is hypothesized to depend on a personal utility function (U) which is determined by a vector ($\mathbf{X}$) of socioeconomic characteristics (x_i). A binomial-logit model can be expressed as follows:

$$\ln (P_i/1\text{-}P_i) = \mathbf{X}'\beta + \varepsilon. \qquad (1)$$

A multinomial-logit model is used to examine how socioeconomic characteristics influence small farmers' reasons for not participating in the CRP. For this study, the multi-response variable, Y_{ij}, is grouped into two main reasons: low CRP payments, Y_{i1} = 1 and lack of resources, Y_{i2} = 2. The latter group is a composite of responses: (a) insufficient land and (b) lack of financial resources to carry out the conservation practices dictated by the CRP. A multinomial-logit model is usually written as follows:

$$\ln (P_{ij}/P_{i0}) = \mathbf{X}'\beta + \varepsilon \qquad (2)$$

where, j is the reason given by individual i (j = 0, 1, 2; i = 1,..., n); P_{ij} is the probability of individual i giving reason j; and P_{i0} is the probability of individual i with the remaining reasons.

Reasons for not participating are hypothesized to be influenced by Age, Education, Farm Size, Income, Farm Status, Race, Ownership, and Average Return/Acre. The selection of the independent variables is based on previous studies and data availability, as follows:

$$\begin{aligned}(\ln P_{ij}/P_{i0}) = {} & \beta_0 + \beta_1 AGE + \beta_2 EDUC + \\ & \beta_3 INCOME + \beta_4 FARM\ STATUS + \\ & \beta_5 FARM\ SIZE + \beta_6 RACE + \\ & \beta_7 OWNERSHIP + \beta_8 AVG\ RTN/A \qquad (3)\end{aligned}$$

where, *AGE* is farmers' age in years. *EDUC* indicates educational levels: 1 if educational level is ≥ high school, and 0 if ⟨ high school. *FARM SIZE* is total operated acreage (owned plus leased). *INCOME* (net income from the farming operation) is defined as: 1 if income is ≥ $20,000, and 0 if ⟨ $20,000. *FARM STATUS* indicates the farmer classification, that is, 1 if operator works full-time on the farm, 0 if part-time. *RACE* is classified as: 0 if white, 1 if African American. *OWNERSHIP* is calculated by dividing acreage owned by total operated acreage. *AVG RTN/A* is the average return in dollars per acre of land farmed.

For the analysis, awareness is defined as whether respondents knew about the CRP and willingness is identified by the question: "Would you have participated in the CRP if the payment per acre was based on your revenue per acre rather than a maximum payment per acre?" The binomial-logit model examines the influence of selected socioeconomic characteristics on awareness of and willingness to participate in the CRP, as follows:

$$\textit{Awareness } (\ln P_i/1\text{-}P_i) = \beta_0 + \beta_1 \textit{ AGE} + \beta_2 \textit{ EDUC} + \beta_3 \textit{ FARM SIZE} + \beta_4 \textit{ INCOME} + \beta_5 \textit{ FARM STATUS} + \beta_6 \textit{ RACE} + \beta_7 \textit{ OWNERSHIP} + \beta_8 \textit{ AVG RTN/A} \quad (4)$$

$$\textit{Willingness } (\ln P_i/1\text{-}P_i) = \beta_0 + \beta_1 \textit{ PAYMT/A} + \beta_2 \textit{ AGE} + \beta_3 \textit{ EDUC} + \beta_4 \textit{ FARM SIZE} + \beta_5 \textit{ INCOME} + \beta_6 \textit{ FARM STATUS} + \beta_7 \textit{ RACE} + \beta_8 \textit{ OWNERSHIP} \quad (5)$$

where, *PAYMT/A* is the payment per acre in dollars (the average return per acre is a proxy for *PAYMT/A*, according to the question: "Would you have participated in the CRP if the payment per acre was based on your revenue per acre rather than a maximum payment per acre?"). The binomial and multinomial-logit models are estimated by the LIMDEP computer package.

Results

Of the 69 respondents, 87 percent were 41 years of age or older; almost two-thirds (64 percent) were African Americans; 40 percent had less than a high school education; 28 percent completed high school; 10 percent attended college; 12 percent had college degrees; and 10 percent had education beyond the baccalaureate level. Sixty-two respondents had incomes of $20,000 or less; while, 56 owned 100 acres or less. Survey results also showed that nonparticipation in the CRP was attributed to lack of resources (37 percent) and low CRP payments (22 percent).

The model on reasons for not participating in the CRP is estimated using the Newton maximum-likelihood method, and the empirical results in table 1 represent the coefficients and marginal effects of the socioeconomic factors on the two main reasons given by farmers for not participating in the CRP: low CRP payments (Y_{i1}) and lack of resources (Y_{i2}). The results indicate that as educational level changes from below high school to high school or above, the marginal probability of nonparticipation because of low payments decreases by 0.0886; while, the probability tends to increase by 0.0018, 0.1446, or 0.0521, respectively, as farm size, ownership ratio, or average return per acre increases by one. Farm sizes have a negative marginal effect (-0.0070) on nonparticipation due to lack of resources; while, incomes have a positive marginal effect (1.0412).

From the signs of the coefficients, respondents complain about low payments if they are older, less educated, part-time, African-American farmers; and if they have larger farms, lower incomes, higher land-owned ratios, or higher average returns per acre. These farmers elect not to participate in the CRP because revenues from their cropland are an important source of income. On the other hand, respondents state lack of resources if they are more educated, full-time, or African-American farmers; and if they have higher incomes, lower land-owned ratios, small farms, or higher returns per acre. Perhaps those who gave lack of resources as a reason were tenant farmers.

The binomial-logit model further examines the influence of socioeconomic characteristics on farmers' awareness of and willingness to participate in the CRP. Results from the awareness model (table 2) show that education, income, race, and average return per acre are statistically significant, and imply that these factors influence awareness of the CRP. The marginal effects for education (0.2321) and income (0.3801) indicate that more educated or higher income farmers have a greater awareness of the CRP. The marginal effects on race (-0.1833) and average return per acre (-0.0772) imply that African-American farmers or farmers who have higher average returns per acre are less likely to be aware of the program. Except for the *OWNERSHIP* coefficient, the signs for all other independent variables are as expected.

Table 3 shows that the likelihood of a farmer being willing to participate in the CRP is influenced by payment per acre, age, and farm status. As payment per acre or age or farm status changes, the probability of being willing to participate in the CRP increases by 0.1604, 0.0102,

Table 1. Multinomial-Logit Model of Socioeconomic Characteristics Influencing Reasons for not Participating in the CRP

Characteristics	Ln P_0/P_{10}					
	Low Payments			Lack of Resources		
	Coefficient	t-Ratio	Marginal Effects	Coefficient	t-Ratio	Marginal Effects
CONSTANT	-12 9570***	-2 633	-0 4217	-0 5759	-0 228	0 0347
AGE	0 0347	0 907	0 0008	0 0261	0 800	0 0057
EDUC	-2 3300**	-1 962	-0 0886	0 7158	0 963	0 2002
FARM SIZE	0 0419**	2 369	0 0018	-0 0272**	-2 370	-0 0070
INCOME	-16 5230	-0 103	-0 5933	3 4782*	1 750	1 0412
FARM STATUS	-0 1429	-0 148	-0 0112	0 4909	0 689	0 1181
RACE	0 4909	0 394	0 0085	0 5879	0 789	0 1327
OWNERSHIP	4 0373*	1 758	0 1466	-0 9756	-0 776	-0 2842
AVG RTN/A	1 6102***	2 873	0 0521	0 0965	0 344	0 0016
Model Chi-Square	53 55***					

[a] One, two, and three asterisks imply that the coefficients are statistically significant at the 0 10, 0 05, and 0 01 levels, respectively

Table 2. Logit Model of Small Farmers' Awareness of the Conservation Reserve Program

Characteristics	Coefficient	t-Ratio	Marginal Effects[a]
CONSTANT	0.2617[b]	0.114	0.0449
AGE	-0.0157	-0.486	-0.0027
EDUC	1.3541*	1.684	0.2321
FARM SIZE	0.0006	0.308	0.0001
INCOME	2.2180*	1.636	0.3801
FARM STATUS	0.7073	0.972	0.1212
RACE	-1.0694*	-1.645	-0.1833
OWNERSHIP	-0.0080	-0.159	-0.0014
AVG RTN/A	-0.4505*	-1.686	-0.0772
Model Chi-Square	22.427***		

[a] The marginal effects on probability are determined for all variables at their mean values.

[b] One, two, and three asterisks imply that the coefficients are statistically significant at the 0.10, 0.05, and 0.01 levels, respectively.

Table 3. Logit Model of Small Farmers' Willingness to Participate in the Conservation Reserve Program[a]

Characteristics	Coefficient	t-Ratio	Marginal Effects[b]
CONSTANT	-5.1859**[c]	-2.488	-1.2714
PAYMT/A	0.6544***	2.810	0.1604
AGE	0.0418*	1.665	0.0102
EDUC	0.7605	1.151	0.1864
FARM SIZE	0.0026	0.489	0.0006
INCOME	0.1901	0.171	0.0466
FARM STATUS	1.1323*	1.816	0.2776
RACE	0.2621	0.419	0.0643
OWNERSHIP	0.0243	0.635	0.0060
Model Chi-Square	16.94**		

[a] Respondents were asked: "Would you have participated in the CRP if the payment per acre was based on your revenue per acre rather than a maximum payment per acre?"

[b] The marginal effect on probability is determined for all other variables at their mean values.

[c] One, two, and three asterisks imply that the coefficients are statistically significant at the 0.10, 0.05, and 0.01 levels, respectively.

or 0.2776, respectively. Payment per acre is a motivating factor for small farmers to participate in the CRP. The signs of the independent variables suggest that willingness to participate in the CRP is greatest among those who are more educated, older, full-time farmers or land owners. Willingness to participate depends on whether payments per acre are comparable to the opportunity costs of removing cropland from production.

Conclusions

The objective of this study was to investigate why small farmers in northeast Louisiana elected not to participate in the CRP. Specifically, we examined farmers' reasons for not participating, their awareness of the program, and their willingness to participate in the CRP. Decisions not to participate in the CRP are linked to economic and noneconomic factors. The results imply that farmers do not participate in the program if revenues from cropland are an important source of income, or if they are tenants.

Awareness and willingness vary with socioeconomic characteristics. The more educated and higher income farmers seem to have a greater awareness of the CRP than other respondents. African-American farmers or farmers who have higher average returns per acre are less likely to be aware of the program. Willingness is positively influenced by payment per acre, age, and farm status. Participation depends on whether payments per acre are comparable to the opportunity costs of removing cropland from production.

These results should be interpreted cautiously because of the size of the sample and the time lag of the data. A check with the local ASCS offices in October, 1993 indicated that seven small farmers from the study region were now participating in the CRP. In spite of this, nonparticipation among small farmers remains high.

The heterogeneity of small farmers often makes the design of policy for this group difficult. No matter the approach taken, the desired results may not accrue to the majority of these farmers. From the survey, it appears that farmers prefer one-on-one contact with government agencies when information is being disseminated. The respondents also reported contact with at least one government agency, and some participation in past farm programs. This survey was conducted almost four years after the CRP was authorized. However, only 56 percent of the respondents were aware that the program existed. Sixty-four percent of the African-American farmers reported that they were unaware of the CRP. The educational level of most respondents was at high school level or less, and may help to explain the lack of knowledge about the program. The Cooperative Extension Service in general, but specifically at 1890 institutions, will need to find creative ways to distribute information on future government programs to African-American farmers. If these farmers are absent from scheduled meetings because of off-farm employment or discomfort in attending meetings with commercial farmers, then other approaches are needed. One approach is to present the information at places where these farmers are likely to be in attendance. Another would be to involve civic, social, and religious groups, and community leaders in the outreach programs. For example, extension agents could make oral presentations and disseminate written information about new or up-coming farm programs at church services and other such gatherings.

Given the budget situation at the federal level, it may not be possible to make drastic changes in how future compensations are made to farmers for participating in programs such as the CRP. However, farmers in this study felt that variable cost sharing rates would provide more incentive for them to participate in government sponsored programs, including the CRP. Variable cost share rates may also help future government programs to achieve their desired objectives.

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Endnotes

1. USDA Office of Advocacy and Enterprise defines small farmers as follows: (a) household net income below non-metropolitan median income for his or her state ($14,564 in 1979 dollars) or county, with the majority of income provided by the farm; and (b) farming 400 acres or less. For our study, farms were initially screened by acres farmed. Because of low response rate, we also defined small farmers by criterion (b).

2. The main crops planted by small farmers in the study are cotton, wheat, soybeans, and corn. From the data, the average annual net income from these crops is about $9,700.