Environmental Quality Incentives Program: Why are so many contracts being cancelled?

by

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Introduction

Over the last fifteen years, economic instruments have gained much ground relative to command-and-control mechanisms for the promotion of environmental policies, based on the view that incentive-based tools, directed towards voluntary means of reducing negative environmental externalities, are flexible and economically more efficient. Such was the reasoning behind the establishment by the 1996 Farm Act of the Environmental Quality Incentives Program (EQIP), a voluntary conservation program providing assistance to farmers facing threats to their natural resource base. EQIP's main efficiency-enhancing features are (i) a bidding mechanism where farmers compete for funds based on their "bids" (proposals) for the provision of environmental services, and (ii) the targeting of funds to specific resource concerns – such as soil erosion, nutrient management, water resources management, and wildlife habitat conservation – aimed at achieving the greatest possible environmental benefits per dollar of program expenditure. These are innovative features relative to previous programs, which allocated funds on a first-come, first-served basis, according to political jurisdiction. EQIP's innovative approach is of particular interest given the trend towards agri-environmental payments in the debate for the upcoming Farm Bill.

This paper moves to close an apparent gap in the empirical work on incentive-based environmental programs. A sizeable literature exists that tests the efficiency of various such programs, focusing primarily on their use to tackle point source pollution, and particularly on tradable permits systems (OECD, 1999; Jensen and Rasmussen, 2000; Schwarze and Zapfel, 2000; Brännlund *et al.*, 1998). On the other hand, few empirical analyses have so far focused on the use of economic instruments to curb non-point source pollution (Johnsen, 1993; Malik *et al.*, 1994).

Cost- sharing and incentive payments are special cases of economic incentives for environmental policy and natural resource conservation. Cost-sharing covers some or all of the start- up and/or installation costs of implementing management practices that reduce natural resource degradation, while incentive payments are monetary incentives used to encourage farmers to initiate improved practices. These two approaches are very similar in that they provide farmers with an incentive to voluntarily adopt less polluting technologies as opposed to non-voluntary mechanisms such as taxing degrading activities or setting standards governing farmers' land management practices. The main draw back of cost-sharing and incentive payments is the welfare cost associated with the opportunity cost of public funds and by possibly introducing price distortions. The first-best economic incentive is a corrective tax on the undesired externality, or limiting the aggregate amount of externality and allowing trades between agents; however, monitoring costs and institutional complexity required by tax or permit schemes often make cost-sharing and incentive payments the preferred option from a practical standpoint. For previous empirical work on cost-sharing and incentive payments see Cooper and Keim (1996), Lichtenberg and Lessley (1991), and Madariaga (1987). A theoretical analysis of optimal cost-sharing arrangements is provided by Malik and Shoemaker (1993).

The analysis of EQIP's performance enables us to assess some of the problems faced in the implementation phase of an incentive-based program. The implementation of EQIP is particularly interesting because it deals with the diffuse environmental impacts of agricultural activities by (i) trying to elicit the farmers' willingness-to-accept payments for undertaking conservation practices, and (ii) allowing for funding of a broad set of conservation practices thereby leaving flexibility to farmers to target natural resource concerns. More specifically, the objective of this paper is to understand the reasons behind the apparently high number of contracts (17% of total) involving withdrawal, after signing, of one or more practices. The paper is structured as follows: the next section provides a brief introduction to EQIP's implementation, and the third section describes the extent of contract withdrawals. We then continue by presenting the model describing farmers' incentives to apply for a contract and then withdrawing. In the final section, the model estimation is performed and discussed.

How is EQIP implemented?

The funding mechanism adopted by EQIP relies on the definition of *priority areas* defined at the watershed level, or around areas of special environmental sensitivity or presenting significant natural resource concerns. These concerns could include soil erosion, decline in water quality and availability, loss of wildlife habitat, and degradation of wetlands, and forest and grazing lands. These priority areas are identified on an annual basis, through a locally led participatory conservation process.

EQIP's principal objective is to achieve the greatest possible environmental benefits per dollar of program expenditure The objectives of the program are achieved by requiring farmers to implement a conservation plan that may include a combination of structural, vegetative, and land management practices. All EQIP-funded activities must be carried out according to an approved conservation plan explaining what changes in farming practices are expected and how these changes address primary natural resource concerns in the area. EQIP relies on a bidding framework whereby the farmers propose a cost-share level for the practices they intend to undertake as part of their conservation plan. An "offer index" is calculated for each proposal by considering the environmental benefits and the total cost-share request.

Local work groups evaluate and rank proposals from producers based on a point system. Ranking points are determined numerically according to the general guidelines provided at the state level. Each resource concern has an associated maximum point value. The rankings have been developed so that the greater the expected benefit, the greater the point value for that practice or structure.[1] The "offer index" is calculated for each proposal by dividing the total cost-share request by the number of ranking points obtained. Proposals are most likely to be funded if they address crucial resource concerns, furthermore, the "offer index" mechanism also takes government costs into consideration by ranking the proposals with a low offer index as most preferred. This means that proposals providing the same benefits for the least amount will be favored.

Agricultural producers not located in priority areas are eligible to receive funds from a separate state allocation budget if their conservation plan addresses statewide environmental concerns.[2]

The EQIP program was authorized at $1.3 billion over the seven-year period of FY 1996 through FY 2002, with annual amounts of $200 million per year.[3] Based on an economic analysis performed by NRCS to assess the potential impacts of EQIP, assuming the level of funding authorized by the 1996 Act, an estimated 35.7 million acres of agricultural land would be treated over the seven years of the program, including 18.5 million acres of cropland, 3.7 million acres of pasture, and 13.5 million acres of rangeland (Federal Register, 1997). Table 1 presents the contractual obligations underwritten by the government and the acreage covered by these contracts both in terms of farmland and of cropland. With a total of nearly 35 million acres of farm-

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[1] Conceptually this is similar to the Environmental Benefits Index (EBI) used to rank the proposals for the Conservation Reserve Program (CRP). The main difference between the two is that the EBI is more structured and transparent in how it functions, while the EQIP ranking methods favor locally-driven criteria under the oversight of the NRCS State Conservationist.

[2] At least 65 percent of the funds are to be used in designated priority areas and up to 35 percent can be used for other significant statewide natural resource concerns.

land already under contract the, the goal of 35.7 million acres set out at the inception of the program has nearly been reached two years ahead of time.

Table 1. Overview of EQIP contractual obligations: the first four years

	1997	1998	1999	2000	Total
Number of Contracts	24,512	20,722	19,805	16,204	81,243
Contract Obligations (Millions $)	175	155	142	131	603
Farm Acres (Millions of Acres)	8.641	9.402	9.188	7.657	34.888
Cropland Acres (Millions of Acres)	2.605	2.300	2.155	1.818	8.878

The share of projects dealing explicitly with cropland, whether addressing soil erosion or other resource management issues, appears to be lower than initially anticipated. Of the 35 million acres already under contract only 8.9 million appear to be cropland. Even though the total acres of farmland being brought into the program are greater than expected, the lower proportion of cropland means the program will probably not reach by 2002 the initial estimate of 18.5 million acres of cropland. This factor is significant given that in the benefit-cost analysis performed by NRCS cropland played a major role in computing the benefits of the program: benefits were estimated at $1651 million for cropland, $324 million for pasture, and. $438 million for rangeland, respectively (based on acreage projections mentioned above and excluding any benefits from conservation practices for treatment of animal waste).[4]

[3] The funding for the initial interim year was of $130 million. During the interim administration period in FY 1996 the $130 million were used to continue implementation of the terms and conditions of the superseded programs to the extent that such terms and conditions were consistent with the statutory provisions of EQIP.

[4] The total discounted present value of benefits for EQIP (excluding any benefits from conservation practices for treatment of animal waste) amount to $2.41 billion while the present value of total discounted costs, both public and private, are estimated at $1.65 billion.

EQIP contracts: full performance *vs.* withdrawal of conservation practices

The main objective of this paper is to provide insight into the practical implementation of EQIP, and especially to understand the reasons behind the apparently high rate of withdrawal of contracted conservation practices by participating farmers. EQIP's framework, by combining a bidding process with the prioritization among natural resource concerns, would appear to be an efficient mechanism for allocating the limited funds available for natural resource conservation; however, once proposals are approved and a contract signed, approximately 11% of the conservation practices in the conservation plan never get implemented. Of the 215,000 conservation practices scheduled to be implemented in the 1997-2000 period, 24,299 were withdrawn after a contract was signed (see first row in Table 2).

		Number of Practices withdrawn in a contract												Total
		0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**>10**	
Number of CPs withdrawn		0	5201	4616	3396	2892	1910	1578	959	848	603	580	1716	24299
Number of contracts linked to withdrawals														
Share of contract that is withdrawn	ws=0	52237												**52237**
	0<ws<0.10		337	17	2									**356**
	0.10< ws <0.20		1155	187	21	6	4	3						**1376**
	0.20< ws <0.30		486	295	86	39	24	9	4		1		1	**945**
	0.30< ws <0.40		647	369	171	79	32	30	18	11	1	5	1	**1364**
	0.40< ws <0.50		954	288	199	102	63	33	25	18	5	10	15	**1712**
	0.50< ws <0.60					46	22	36	8	10	13	4	7	**146**
	0.60< ws <0.70			277	85	77	22	19	18	9	6	7	15	**535**
	0.70< ws <0.80				88	60	38	19	8	12	5	3	20	**253**
	0.80< ws <0.90						33	17	8	9	9	3	12	**91**
	0.90< ws <0.99											5	17	**22**
	ws = 1.0		1622	875	480	314	144	97	48	37	27	21	32	**3697**
Total Contracts by # of CPs withdrawn		**52237**	**5201**	**2308**	**1132**	**723**	**382**	**263**	**137**	**106**	**67**	**58**	**120**	62734

Table 2. Number of conservation practices (CPs) by share of contract withdrawn (ws) and by number of withdrawn CPs.

One can observe that the number of practices withdrawn from a contract varies substantially, ranging from zero to more than 10 practices being withdrawn from a same contract. Out of

62,734 contracts, 10,497 contracts were involved in the withdrawal of one or more of the conservation practices approved according to the conservation plan (17% of contracts). The resulting disconnect between the expected social benefits as approved in the conservation plan and the ones arising from the practices actually being implemented can be highly relevant in the overall evaluation of EQIP as a program.

From Table 2 one can observe that nearly 3,697 contracts (6% of total) were withdrawn in full (ws=1.0). This drop-out rate is puzzling given the voluntary nature of the program and the considerable transaction costs involved in preparing a conservation plan, bidding, and finalizing a contract. Did farmers underestimate the contractual burden compared to business-as-usual financial assistance? If so, has this phenomenon decreased over time? Are some farmers bidding too low?

At the other extreme, there are a substantial number of contracts involving withdrawal of conservation practices where still most practices in the conservation plan are performed. For example, there are 2,677 contracts (involving withdrawals) for which 70% or more of the proposed practices are implemented (ws<0.3). An interesting research topic, pursued in this paper, is whether, taking into account all other relevant factors, certain types of conservation practices are being dropped more than other practices once the conservation plan is approved. This would be consistent with rational behavior if some conservation practices increase the probability of acceptance in the program of the conservation plan. Addressing these questions is important when considering that the funds allocated to withdrawn contracts are lost to the program. This raises the question of whether EQIP is in fact achieving the stated objective of obtaining the greatest possible environmental benefit per dollar used, especially in light of the fact that 17% of the contracts, by not being implemented in full, are not providing the benefits intended when the conservation plan was approved.

Model Specification

In the economic model adopted here we focus on two aspects of the EQIP implementation process: (i) each producer when presenting a conservation plan for approval tries to maximize the expected private benefits he/she will obtain, and (ii) once a contract is approved we assume that for every proposed conservation practice the producer will compute private benefits and costs and decide whether to implement the practice.

Given EQIP's selection criteria, the producer can control which conservation practices (CP) to propose and at what cost-share level. These two variables will determine the producer's expected benefits of a proposal. Neglecting the uncertainty surrounding the actual benefits and costs of conservation practices, we decompose the problem as follows: let the $Net\ Benefit_{ij}$ for producer *i* and practice *j* be defined as

$$Net\ Benefit_{ij} = Gross\ Private\ Benefit_{ij} - (1 - offlevel_{ij}) \cdot Estimated\ Cost_{ij} \qquad \textbf{(1)}$$

where $Net\ Benefit_{ij}$ is the benefit to the producer after accounting for the practice's costs and $offlevel_{ij}$ which is the proposed cost-share level.

The benefit from each conservation practice, however, is conditional on the approval of the conservation plan as a whole. We can assume that the probability of approval, P_{app}, will depend on the type of practices proposed (CP_{ij}, a dichotomous variable representing whether practice j is present in the conservation plan), on the cost-share requested (*offlvl*$_i$), and on factors outside of the producer's control (*EXT*). Then we have that the total expected benefits can be written as:

$$E[Total\,Benefit_i] = P[CP_{ij}, offlvl_{ij}, EXT] \cdot \left[\sum_j Net\,Benefit_{ij} \right] \qquad \textbf{(2)}$$

Once a contract has been approved and signed the producer's decision problem becomes a different one: since there is no penalty for opting out of implementing a specific conservation practice, each conservation practice is analyzed separately and a decision is made based on benefits and cost.[5] This implies that a practice that may have been attractive because it increased the probability of approval, either by its very nature or because of a low cost-share request, may not be viable.

In this second stage, let w_{ij} be the decision by producer i to withdraw from conservation practice j. Since w_{ij} can take on only two possible values, the stochastic behavior of w_{ij} is described by the probability of a positive response, $P(w_{ij} = 1 | \mathbf{X})$, which is here taken to depend on a vector-valued variable $\mathbf{X}$ representing the benefits and cost components of a practice, and socio-economic characteristics of the producer. Assuming producers weigh benefits and costs for each practice we can represent the decision process as

$$w_{ij} = \begin{cases} 1 & if \quad Net\,Benefit_{ij} < 0 \\ 0 & if \quad Net\,Benefit_{ij} \geq 0 \end{cases}$$

where negative net benefits lead to withdrawal. In what follows we assume that $Net\_Benefit_{ij}$ is related to $\mathbf{X}$ linearly (as in eq. [1]) with an additive random component,

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[5] EQIP contracts contain a "liquidated damages" provision, providing for payment from the producer to the government of a certain fixed amount in the event of a breach (actual damages from the breach being extremely difficult to ascertain). However, we are unaware of the application this clause in practice by FSA. It is therefore reasonable to assume that the expected penalty of a breach is negligible.

$$Net\ Benefit_{ij} = a + \text{ß} \cdot \mathbf{X}_{ij} + e$$

then outcome probabilities are determined by

$$P(w_{ij} = 1 \mid \mathbf{X}) = P(a + \text{ß} \cdot \mathbf{X}_{ij} + e < 0) \tag{3}$$

Three common specifications of the probability model are the linear probability model, the probit model, and the logit model. The logit specification was employed in this study (Amemiya, 1981; Theil,1972).[6] Specifically, the logit is defined as the natural logarithmic value of the odds in favor of a positive response (in this case withdrawal from a contracted practice).

$$L_{ij} = \log\left[\frac{P_{ij}}{1 - P_{ij}}\right] = a + \text{ß} \cdot \mathbf{X}_{ij} \tag{4}$$

where: Producers $i = 1, 2, \ldots, n$

Conservation practices $j = 1, 2, \ldots, m$

P_{ij} is the conditional probability of a conservation practice being withdrawn given The knowledge of $\mathbf{X}_{ij}$,

$\mathbf{X}_{ij}$ are a set of producer characteristics, contracted conservation practices, cost-share level and other factors influencing the benefit-cost considerations

ß is a vector of parameters to be estimated.

Data Description and Empirical Analysis

Data for the analysis, which spans from 1997 to the end of fiscal year 2000, was provided by the Natural Resource Conservation Service (NRCS) the USDA agency in charge of administering EQIP. As part of administering the program, NRCS collects an extensive amount of data on the conservation plans submitted by producers, on the cost-share requested in the bids, and, for approved contracts, the implementation of practices, total costs, and the dollar amount disbursed by EQIP. The data comprising 224,000 observations for approved conservation practices were taken from an electronic database maintained jointly by NRCS and the Farm Services Agency (FSA). After accounting for inconsistencies and missing values 215,136 observations remained that could be used for the analysis. An observation is constituted by a conservation practice associated with a specific contract and producer and includes the cost of the practice, the offer level, and the FIPS code identifying the farm location by county. Variables are also available identifying the extent of the practice to be performed according to the appropriate units of measurement, the farmland involved, the amount of cropland involved, whether the contract is linked to livestock production, and finally whether there are multiple producers associated with a contract.

From the model presented in the previous section we are interested in both the expected total benefits from presenting a conservation plan and the net benefits stemming from implementing a single conservation practice. Unfortunately the expected total benefits could not be computed. The reason is that detailed data is kept only for contracts that are approved; therefore, the probability of acceptance of a conservation plan cannot be estimated since no data are available concerning practices proposed, total cost, and offer level for conservation plans that were not approved. On the other hand, data on cost of practices and offer levels of approved contracts are available since they are recorded in the contracts. This means that we will not be able to test directly whether including certain conservation practice in a proposal will increase the expected total benefits. However, we will be able to test this hypothesis indirectly by seeing if certain types of practices are consistently dropped after approval.

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[6] The logit model was selected primarily because the majority of the independent variables in our model are dichotomous which results in data being concentrated in the tails and in the probability distribution resembling a logistic function.

As mentioned above, the cost data is available; however, the private benefit to the farmer is not observable. While we know there must be private benefits, since EQIP does not allow for full refunds, the question is what variables can be used as proxies for them. We assume, following the USDA cost-benefit analysis procedure for assessing EQIP performance, that the amount of farmland and the amount of cropland involved in a contract are directly related with benefits. We also assume that different practices provide benefits of different magnitude to the producer. Incorporating these changes, we perform a logit estimation of the form

$$P_{ij} = F(\mathbf{ß}'\mathbf{X}) = \frac{1}{1+e^{-(a+ß'\mathbf{X}_{ij})}} \qquad \textbf{(5)}$$

and the basic equation used in the logistic regression is:

$$\begin{aligned} Net\ Benefit = {} & b_0 + b_1 \cdot PRACTYPE + b_2 \cdot FMLD + b_3 CRPSHR + b_4 \cdot OFFLVL \\ & + b_5 \cdot ESTCOST + b_6 \cdot SCHEDYR + e \end{aligned} \qquad \textbf{(6)}$$

where *PRACTYPE* is a categorical variable that indicates the type of technical practice involved, FMLD is the amount of farmland (in hundreds of acres), and CRPSHR is the portion of farmland in crops covered by the contract (in percentage terms). The above equation is a bare bones formulation that takes into consideration only the variables in Eq. [1]. Three alternative formulations were also estimated to test the hypotheses that some practices may be added on just to obtain approval of the conservation plan, and to take into account the socio-economic conditions of the producers involved in the contracts. In Table 3 we present the full set of independent variables hypothesized to affect the probability of withdrawal from implementing a conservation practice.

The inclusion of SCHEDYR among benefits and costs is meant to capture how the producers' perception of benefits and costs may change over the lifetime of the program, representing in some way the learning curve associated with participating in a new program.[7] With this interpretation one would expect a decrease in the probability of withdrawal over time.

Variable	Definition	Units	Expected Sign
Benefits			
PRACTYPE			
Soil & Land Mng	Categorical variable specifying broad types of conservation practices based on the NRCS definition for each practice		?
Water Management			?
Livestock Nutrients			?
Crop Nutrients			?
Habitat			-
Other Practices			?
FMLND	Amount of farmland under contract for a conservation practice	10^2 Acres	-
CRPSHR	Share of FMLND that is in crops	%	-
Costs			
OFFLVL	Cost-share requested for practice	%	-
COST	Total estimated cost per practice	10^3 $	+
SCHEDYR	Year of program in which practice is to be performed (values=1,2,3,4)		-
Contract Characteristics			
PRNUM			
Practice number=1	Categorical variable indicating total number of practices specified in a contract		
Practice number: 2-3			+
Practice number: 4-7			+
Practice number >8			+
HABT_G3	Dummy variable for habitat conservation practices included in contracts that contain more than three practices		+
MULTPRD	Multiple Producers (=1 if more than one producer is listed in the contract)		?
Producer Characteristics			
LIVSTPRD	Livestock Producers (=1 if livestock producer)		?
REGION			
Northern Crescent	Location of producer according to ERS Farm Resource Regions used to capture the socio-economic variation in the sample.		?
Northern Plains			?
Prairie Gateway			?
Eastern Uplands			?
Southern Seabord			?
Fruitful Rim			?
Basin & Range			?
Mississippi Portal			?

Table 3. Independent Variables for Logistic Regression

[7] The variable SCHEDYR may also pick up variation over time of the economic condition of producers, however, this is unlikely because change in producer income was not monotonic in the period going from 1997 to 2000.

In Table 4 we present the results for the basic logistic regression, and alternative formulations that take into consideration the characteristics of a contract, and the socio-economic conditions of producers. The results are presented as e^{β} because the exponentiated form conveys the change in odds (as a multiplicative effect) that each independent variable has on the chances of withdrawal from a conservation practice. Column (1) of Table 4 presents the results for the basic regression. The categorical variable PRACTYPE proved to be significant as a categorical variable at the 1% level, and when it is decomposed into *k-1* dummy variables (Soil & Land management was dropped) the only coefficient that was not significantly different from zero was that for "Livestock nutrient management". The coefficient for WATER MANAGEMENT is 1.0461 and means that if a conservation practice is classified as a water management practice the odds of withdrawal will increase by 4.6% relative to the unweighted average odds of the sample. The striking result to come out of this basic regression, and to be confirmed by the alternative formulations, is the 26% higher odds of HABITAT conservation practices to be withdrawn (1% significance level). This result appears to confirm the hypothesis that some practices may be attractive in the proposal stage but not in the implementation phase because of low private benefits. Also interesting, are the substantially lower odds of withdrawal for crop nutrient management practices (-18%) which indicate higher private returns in those practices that also are considered to have the highest social returns in USDA's benefit-cost analysis. Farmland (FMLND) and the share of cropland (CRPSHR) are both highly significant and with the expected sign; however, even though they do reflect greater benefits, it appears from the limited impact on the odds of withdrawal (less than1%) that the extent of the practice is less important to producers than the type of practice in determining whether to implement a practice. The odds of withdrawal decrease by 2% for every additional 1000 acres involved in a conservation practice, and similarly for the share of land in crops a 2% decrease in odds is encountered for an increase of 10 percentage points implying greater private benefits associated with practices linked to cropland. At first glance it would appear that the same observation can be made of the cost-share requested (OFFLVL) which is also highly significant but with an impact of only 1% ; however, considering the range of variation in the cost-share requests (from 20% to 80%), a one-to-one relationship on the withdrawal odds would have a considerable impact (for example, an increase in the OFFLVL from 50% to 70% would decrease the odds of withdrawal by 20%). On the cost side the result is quite surprising to the extent that COST is significant at the 1% level but with an opposite sign from that expected. This may indicate that given the heterogeneity of practices inside our broad classification, even accounting for these broad classes, the more costly practices inside our broad categories may be the ones with higher returns and therefore preferred. Finally, the scheduled year of implementation (SCHEDYR) is highly significant and shows a 19% decrease in the odds of withdrawal for every additional year since the inception of the program indicating that a greater number of contracts were cancelled at the beginning of EQIP as part of a learning curve associated with the innovations introduced by the program.

In the second regression, the total number of conservation practices contracted in a single contract (PRNUM) was added in the equation. The rationale behind the inclusion of this variable is that if practices are being added to increase the probability of acceptance of the conservation plan to then be dropped in the implementation phase then this should reflect as a higher probability of withdrawal if a practice is part of a contract with many other practices.[8] The results for PRNUM are presented as the impact on the odds relative to contracts with only one practice.[9]

[8] This is not to be confused with the fact that contracts with more practices will have by default a higher probability of having at least one withdrawal.
[9] Indicator contrasts were used for PRNUM which compare each group of the categorical variable to a reference category that is excluded (in our case Practice Number=1).

The findings indicate a very large and significant impact with the expected sign: if a practice belongs to a contract with a total of two to three practices the odds of withdrawal increase by 26% relative to the case where it is the only practice in the contract. This rises to 61% if the practice belongs to a contract with eight or more practices. Adding PRNUM as an additional independent variable does not affect the significance or the magnitude of the coefficients indicating that the results of the basic regression are robust.

In the third regression, we add two dummy variables: (i) HABT_G3 tests for the relevance towards withdrawal of habitat practices in contracts with 4 or more contracts, and (ii) MULTPRD indicates whether the fact that a conservation practice belonging to a contract involving multiple producers has an impact on the probability of withdrawal. Given the very big impact of HABITAT in the previous two regressions, HABT_G3 is introduced to further refine our hypothesis that some conservation practices are simply add-ons to improve the probability of acceptance. Since we are already controlling for habitat and for the number of practices in a contract, the presence of HABT_G3 tests the possibility that the habitat practices that are being withdrawn have a stronger presence in contracts with a large number of practices. This is indeed the case: HABT_G3 is significant at the 5% level and indicates that the odds of withdrawal for habitat practices in large contracts are 13% above those for other habitat practices. One should note that introducing HABT_G3 as an additional variable has an impact, as would be expected, on the coefficient of HABITAT, which is reduced from 27% to 17%.

	Basic	with contract characteristics		All regressors
Variable Name	(1)	(2)	(3)	(4)
PRACTYPE	(0.000) **	(0.000) **	(0.000) **	(0.000) **
Water Management	1.0461	1.0437	1.0594	1.0885
	(0.001) **	(0.002) **	(0.009) **	(0.000)
Livestock Nutrients	0.9751	0.9940	1.0109	1.0489
	(0.321)	(0.813)	(0.681)	(0.081)
Crop Nutrients	0.8227	0.8074	0.8193	0.7973
	(0.000) **	(0.000) **	(0.000) **	(0.000) **
Habitat	1.2645	1.2721	1.1777	1.1181
	(0.000) **	(0.000) **	(0.000) **	(0.004) **
Other	0.9506	0.9346	0.9496	0.9600
	(0.002)**	(0.000) **	(0.004) **	(0.023)*
FMLND	0.9989	0.9987	0.9987	0.9983
	(0.000) **	(0.000) **	(0.000) **	(0.000) **
CROPSH	0.9969	0.9973	0.9972	0.9980
	(0.000) **	(0.000) **	(0.000) **	(0.000) **
OFFLVL	0.9911	0.9907	0.9907	0.9911
	(0.000) **	(0.000) **	(0.000) **	(0.000) **
COST	0.9836	0.9884	0.9883	0.9888
	(0.000) **	(0.000) **	(0.000) **	(0.000) **
SCHEDYR	0.8128	0.8153	0.8150	0.8075
	(0.000) **	(0.000) **	(0.000) **	(0.000) **
PRNUM		(0.000) **	(0.000) **	(0.000) **
Practice number: 2-3		1.2634	1.2644	1.2897
		(0.000) **	(0.000) **	(0.000) **
Practice number: 4-7		1.2960	1.2817	1.3024
		(0.000) **	(0.000) **	(0.000) **
Practice number >8		1.6107	1.5922	1.6074
		(0.000) **	(0.000) **	(0.000) **
HABT_G3			1.1362	1.1290
			(0.018)*	(0.025)*
MULTPRD			0.9399	0.9522
			(0.017)*	(0.064)
LIVSTPRD				0.9094
				(0.000) **
REGION				(0.000) **
Northern Crescent				0.8935
				(0.000) **
Northern Plains				0.8923
				(0.000) **
Prairie Gateway				1.4105
				(0.000) **
Eastern Uplands				0.8873
				(0.000) **
Southern Seabord				1.1746
				(0.000) **
Fruitful Rim				1.0254
				(0.276)
Basin & Range				0.9270
				(0.004) **
Mississippi Portal				1.1049
				(0.000) **
Model P^2	2087	2472	2483	3240
Probability	0.0000 (df 10)	0.0000 (df 13)	0.0000 (df 15)	0.0000 (df 23)
Nagelkerke R^2	0.019	0.023	0.023	0.030

Numbers in parentheses are significance levels: single and double asterisks indicate statistical significance at 5% and 1% respectively.

Table 4. Parameters Estimates of Factors Affecting Conservation Practice Withdrawal

The impact of MULTPRD in regression (3) indicates a statistically significant 6% decrease in the odds of withdrawal. The logic behind the possible impact of MULTPRD was that organizational complications stemming from multiple producer contracts might increase the odds of withdrawal. However, it appears not to be the case, and this can be interpreted to mean that higher transaction costs associated with putting together multi-producer contracts leads to lower withdrawal rates if the contract is approved.

In the final regression, we tried to include producers' socio-economic characteristics that are independent of EQIP procedures but that may affect the probability of withdrawal. These were whether the producer contracting a practice is a livestock producer (LIVSTPRD) and the location of the farm according to the Economic Research Service's Farm Resource Region classification. The Farm Resource Regions are used here as a proxy for a set of variables encompassing type of commodities produced, natural resource constraints, and general economic conditions that may differ from one area to another. An important finding emerges from the regression: LIVSTPRD is highly significant indicating that if a practice is contracted by livestock producers the odds of withdrawal are 9% lower relative to the same practice being contracted to non-livestock producers. The relevance of this result arises from the fact that by law EQIP must explicitly channel at least 50% of funds to livestock-related practices. The reliability, in contractual terms, of livestock producers is therefore good news for EQIP and for environmental issues arising from livestock production since EQIP is the only conservation provision targeting livestock producers.

Introducing the distinction between location of producers in different regions is highly significant for all regions except the Fruitful Rim. Relative to the unweighted average odds of the sample the location of the producer has a considerable impact on the odds of withdrawal of a practice. The impact ranges from a 41% increase in the odds of withdrawal for producers in the Prairie Gateway to an 11% decrease for those in the Northern Crescent, Northern Plains, and Eastern Uplands. Interestingly, introducing this additional information alters only slightly the coefficients of the independent variables included in the previous regressions confirming the robustness of the results concerning our hypotheses about the characteristics of EQIP as a program that may be leading to high withdrawal rates.

In all four regressions the Likelihood ratio test indicated that the amount of variation explained by the model was significantly different from zero beyond the 1% level. However, the overall goodness-of-fit for the model is to be considered poor with a Nagelkerke-R^2 of only two to three percent. Hosmer and Lemeshow's goodness-of-fit test rejects the hypothesis that the models fitted generated the data. The poor fit is probably attributable to the unbalanced nature of the sample shares of the two outcomes: although 24,300 conservation practices were withdrawn, this represents only 11% of the sample.

Conclusions

The conclusion one may draw from the results is that multiple factors contributed to the considerable withdrawal rate of approved conservation practices. Some factors, such as socio-economic conditions of the producers are external to the administration of the EQIP program; however, others relate directly to the EQIP's financing mechanism and the incentives that the program creates. A temporary effect which had a considerable effect is that a greater number of contracts were cancelled at the beginning of EQIP as part of a learning curve associated with the innovations introduced by the program. This effect has decreased over time but is important from a program evaluation standpoint given the relatively short authorization intervals of government programs (4-6 years).

Structural components of the program that may be leading to withdrawal from conservation practices are a reason of concern:

(i) low cost-share requests that may arise from the bidding process tend to have a higher withdrawal rate;

(ii) the possibility to opt out of a conservation practice once the conservation plan has been approved creates an incentive to include practices in the conservation plan that will increase the probability of approval but may not be viable in the implementation stage. This appears to be particularly true for habitat-related practices;

(iii) related to the previous point, the approval process creates incentives to propose a broad conservation plan with many practices; however, it appears that if a conservation practice belongs to a contract with many other practices the odds of its withdrawal are higher.

In a broader policy context, the EQIP program is a flexible, voluntary program that has been very successful with producers (with current funding only 32% of applications were approved) because it does not require to take land out of production as is done by other USDA programs (CRP, WRP, and WHIP). However, the flexibility that makes EQIP a successful program creates the shortcomings listed above. The problem is essentially one of moral hazard that introduces considerable uncertainty on the benefit side of the program. This uncertainty is not addressed by any mechanism in the program and it may need to be resolved. In the meantime, EQIP is one among several valuable options of programs available for natural resource conservation. The existence of other conservation programs that address habitat concerns on which EQIP seems to be weak may mitigate the concern surrounding the implementation of the program.

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